structures are located within the anticipated 200-foot ROW. Therefore, no displacement of residences are anticipated. A limited number of non-residential structures (less than three for each proposed route or variation) are located within the ROW, however as the proposed routes and variations cross relatively sparsely populated areas, adequate space is generally available to allow the alignment of the transmission line to be adjusted so that no buildings would ultimately be located within the ROW.

5.2.1.2 Noise

This section describes the potential for noise impacts from the proposed Project to residences and sensitive receptors within the proposed Project area.

Sound is an alteration of pressure through air thereby producing an auditory sensation is humans. Noise is generally defined as unwanted sound. Noise is commonly measured in units of decibel (dB) on a logarithmic scale. This scale is used to quantify sound intensity and to compress the scale to a more manageable range. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight." The A-weighted decibel scale (dBA) scale is used to emphasize the range of sound frequencies that are most audible to the human ear (Minnesota Pollution Control Agency (MPCA) 2008, reference (10)). The human range of hearing extends from approximately 3 dBA to 140 dBA, and the human ear can usually detect the difference when a sound changes by 3 dBA, while a 5 dBA change in sound is clearly noticeable to the human ear (MPCA 2008, reference (10)).

Table 5-1 shows a range of typical noise levels from common noise sources. Further discussion of noise impacts is provided in Appendix H.

Environmental noise is often expressed as a continuous sound occurring over a period of time, typically 1 hour. The average sound level is called the equivalent continuous noise level (Leq) and is variable. This metric is used as a baseline by which to compare project-related noise levels (i.e., noise modeling results, which are also expressed as an hourly Leq) and to assess the potential project-related noise increase over existing (or ambient) conditions.

Noise Regulations

The MPCA enforces the state of Minnesota noise rules (Minnesoat Rules, chapter 7030). Minnesota's noise limits for daytime (7:00 a.m. – 10:00 p.m.) and nighttime (10:00 p.m. – 7:00 a.m.) hours are set by "noise area classifications" based on the land use activity at the location of the receiver

Table 5-1 Noise Levels from Common Sources

Sound Pressure Level (dBA)	Typical Sources
140	Jet engine at roughly 80 feet (25 meters)
130	Jet aircraft at roughly 400 feet (100 meters)
120	Rock Concert
110	Pneumatic chipper
100	Jackhammer at roughly 3 feet (1 meter)
90	Chainsaw or Gas lawn mower at 3 feet (1 meter)
80	Heavy truck traffic, typical city street corner
70	Business office, vacuum cleaner
60	Conversational speech or typical television volume
50	Library
40	Bedroom
30	Secluded woods

Source(s): MPCA 2008, reference (10)

Table 5-2 Minnesota Noise Standards

Noise Area Classification	Daytime (dBA)		Nighttime (dBA)	
	L10[4]	L50[5]	L10[4]	L50[5]
Residential and other sensitive uses[1]	65	60	55	50
Non-Residential uses[2]	70	65	70	65
Non-Residential uses[3]	80	75	80	75

Source(s): MPCA 2008, reference (10)

(1) Includes residential, educational, medical, cultural, and designated recreational areas.
(2) Includes commercial, transportation facilities, and governmental services.
(3) Includes industrial areas, utilities, highways and streets, transportation, and communications centers.
(4) L10 – Noise level (dBA) that may be exceeded 10 percent of the time within one hour
(5) L50 – Noise level (dBA) that may be exceeded 50 percent of the time within an hour

(e.g., residential, commercial, or industrial land uses). These noise standards are expressed as a range of permissible noise levels (dBA) within a one hour period; L50 is the noise level (dBA) that may be exceeded 50 percent of the time within an hour, while L10 is the dBA that may be exceeded 10 percent of the time within one hour. Table 5-2 describes Minnesota's applicable noise standards.

The ROI for this analysis of noise includes receptors within a 1,500-foot radius from the anticipated alignment of the transmission line, proposed Blackberry 500 kilovolt (kV) Substation site, the 500 kV series compensation station, regeneration

stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites. Since construction areas and access roads may be located anywhere within the ROW and not necessarily only at the anticipated alignment, a conservative radius of 1,500 feet from the proposed project noise sources has been selected to assess the potential impacts of noise from the project on existing sensitive receptors. The attenuation of noise with distance results in a decrease in noise with distance. Typically, a radius of 0.25 miles to 1,500 feet is used while evaluating potential community noise impacts.

Noise in the ROI

Ambient noise in the ROI currently consists of noise from agricultural and farming equipment and vehicle traffic. Noise from the existing Blackberry Substation contributes to ambient noise in the ROI near the proposed Blackberry Substation.

General Impacts

Noise from construction and operation of the proposed Project would primarily affect rural residences located near the proposed Project. Potential noise associated with the proposed Project could result from machinery used for construction, operation of the transmission line, and operation of the proposed Blackberry Substation, 500 kV series compensation station, or regeneration stations. Since noise impacts are a function of the transmission line and equipment, predicted noise levels would not vary by proposed route or variation. Temporary, localized, adverse noise impacts during construction could exceed the Minnesota noise standards and occur regardless of the final route. Since potential construction impacts would be short-term and potential impacts from operation of the proposed Project are expected to be below Minnesota noise standards, noise is not discussed further in Chapter 6 of this EIS. Route permits issued by the Minnesota Public Utilities Commission (MN PUC) require compliance with Minnesota's noise standards.

Construction noise at any proposed Project location would occur on a temporary, intermittent, and localized basis during daytime hours. In the event construction works occur in the immediate vicinity (within 50 feet) from sensitive receptors, the following noise control practices are recommended to minimize construction noise levels and comply with Minnesota standards:

- Limit heavy equipment activity (e.g., pile driving, drilling, and crane use) adjacent to residences or other sensitive receptors to the shortest possible period required to complete the work activity;
- Minimize construction equipment idling;
- Ensure that proper mufflers, intake silencers and other noise reduction equipment are in place and in good working condition;
- Maintain construction equipment according to manufacturer's recommendations;
- Use portable noise barriers to enclose noisier stationary equipment; and
- Where practical, locate stationary equipment such as compressors, generators, and welding

Table 5-3 Typical Noise Levels of Construction Equipment

Equipment Type	Maximum Noise Level (Lmax, dBA)	Utilization Factor	Estimated Noise Level (dBA) at 50 feet
Pickup Truck	55	0.4	51
Crew Cab	55	0.4	51
Compressor Trailer	80	0.4	76
Crane	85	0.16	77
Backhoe/Frontend loader	80	0.4	76
Auger Truck	85	0.2	78
Water Truck	84	0.4	80
Dump Truck	84	0.4	80
Concrete Truck	85	0.4	81
Fork Lift	86	0.4	82
Vibratory Pile Driver	95	0.2	88
Estimated Transmission Line Construction Noise Level (at 50 feet)			**91**

Source(s): FHWA 2006, reference (11)

Note(s): Noise emission levels and utilization factors are based on FHWA guidelines.

machines away from sensitive receptors or behind barriers.

Construction Impacts

Construction of a 500 kV transmission line would require cranes, augers, compressors, air tampers, generators, trucks, and other equipment. Helicopters would be used in some areas to transport construction materials, place structures, and to string conductors. During construction of the proposed Project, short-term, localized noise from heavy equipment and increased vehicle traffic would be expected to occur along the ROW during daytime hours. Construction activity and crews would be present at a particular location during daytime hours for a few days at a time, but on multiple occasions throughout the period between initial ROW clearing and final restoration. Typical noise levels from heavy duty construction equipment commonly used for construction of transmission lines and associated facilities (at 50 feet from the source) are summarized in Table 5-3 and in Appendix H. Construction noise could temporarily affect residences within the ROI when temporary construction sites or access roads are located in the immediate vicinity of receptors; however, as explained above, the proposed routes and variations cross relatively sparsely populated areas and only a few sensitive receptors (schools, daycares, and nursing homes) could be impacted.

Construction noise would occur during daytime hours, so only daytime standards would apply. Because construction noise would be intermittent and levels decrease by 6 dBA with a doubling of distance from a point source, noise levels at residences within the ROI are generally not expected to exceed Minnesota's daytime noise standards (MPCA 2008, reference (10)). Limited construction could occur outside of daytime hours or on weekends if the Applicant is required to work around customer schedules, line outages, or other impediments to daytime construction.

Operation, Maintenance, and Emergency Repair Impacts

Noise levels related to activities during the operation, maintenance, and emergency repair of transmission lines are expected to be below state standards. Noise from transmission lines is primarily associated with the "corona effect," due to small electrical discharges which ionize surrounding air molecules around the line, causing a crackling or hissing noise that may be audible from a position located directly below the transmission line, especially during damp conditions. The Applicant has modeled audible noise from the proposed 500 kV transmission lines under rainy conditions (worst case scenario for noise generated from corona effect), considering two configurations: standalone 500 kV transmission line and collocation of the proposed Project with existing transmission lines. The Applicant's calculations for the audible noise results are provided in Table 5-4. Detailed results for the different cases modeled by the Applicant are presented in Appendix I.

Noise from operation of the proposed Project does not solely emanate from the transmission line; it also includes noise from the proposed Blackberry Substation and 500 kV series compensation station. Sources of audible noise at the proposed substation

Table 5-4 Predicted Audible Noise Levels from the Proposed Project Transmission Line in Rainy Weather Conditions

Proposed Transmission Line Configuration	Maximum Audible Noise Level (dBA)		
	Within ROW	At edge of ROW	At 300 feet from Anticipated Alignment
500 kV Transmission Line (Stand-alone, not paralleling existing lines)	51	48	43
500 kV Transmission Line paralleling existing 500 kV Transmission Line(1)	51	48	43
500 kV Transmission Line paralleling existing 230 kV Transmission Line(2)	51	50	46
500 kv Transmission Line paralleling existing 115 kV Transmission Line(3)	51	48	43
500 kV paralleling two existing 115 kV Transmission Lines(4)	52	52	51
500 kV paralleling existing 115 kV and 230 kV Transmission Lines(5)	51	48	44

Source(s): Power Engineer 2013, reference (12); Power Engineer 2014, reference (13)

(1) Existing 500 kV D602F transmission line (self-supporting tower structures). For this analysis, the Applicant calculated audible noise up to 400 feet from the anticipated alignment. Results are reported at 300 feet for comparison purposes.

(2) Existing 230 kV 83L transmission line (H-Frame structures).

(3) Existing 115 kV 28L tap (H-Frame structures).

(4) Existing 115 kV 62L and 63L transmission lines (H-Frame structures).

(5) Existing 115 kV 28L and 230 kV 83L transmission lines (H-Frame structures).

Table 5-5 Predicted Audible Noise Levels from Operation of the Proposed 500 kV Blackberry Substation

Proposed Project Noise Source/Distance to Receiver (feet)	Predicted Noise Level (dBA)				
	50	100	250	1,000	1,500
Blackberry 500 kV Substation Operation	47	41	33	27	17

Source(s): NEMA 2000, reference (14)

include transformers, capacitors, reactors, and coolers McDonald 2007, reference (14)). Major noise sources from a series compensation station include capacitor bank, damping circuits, by-pass switches, and protective devices.

Transformer noise is generally the dominant noise source at substations. Operating noise at the proposed Blackberry 500 kV Substation would result from vibrations associated with magnetic forces inside substation transformers and from cooling fans and pumps that control transformer temperature. Most of the other electrical equipment at substations is either silent or generates minimal noise in comparison to transformers. It is anticipated that the transformers to be installed at the proposed Blackberry 500 kV Substation would not exceed the values specified by the National Electrical Manufacturers Association (NEMA) Standards. The NEMA Standards maximum sound levels applicable to the proposed Project oil-immersed transformers are 91 dB at a 1 foot distance (NEMA 2000, reference (15)). Based on these assumptions, the predicted noise operational level perceived at 100 feet from the proposed Blackberry 500 kV Substation would be 41 dBA (assuming the use of a substation perimeter wall). The nearest residence is located approximately 560 feet northeast of the proposed Blackberry 500 kV Substation. At this location, noise from the proposed substation would be 26 dBA (assuming the use of a substation perimeter wall). Therefore, operation of the proposed Blackberry Substation is not expected to exceed Minnesota noise standards. The operation of the proposed series compensation station would generate noise from capacitor banks and other electrical equipment that would be lower than noise levels associated with substation transformers. As such, operation of the proposed series compensation station is not expected to exceed Minnesota noise standards.

Noise levels resulting from operation of the proposed Project are expected to be below Minnesota noise standards. The predicted transmission line operation values encompass the range of voltages and structure types proposed for the proposed Project. Substation operation values shown in Table 5-5 represents the range of values that result from modeling substation noise associated with transformer equipment compliant with NEMA standards at the proposed Blackberry 500 kV Substation. Operational noise levels from the proposed 500 kV series compensation station would be less than noise levels from the proposed Blackberry 500 kV Substation.

Although operational noise impacts are estimated to fall within acceptable state noise standards, the proposed Project would introduce a new permanent noise source that, in certain situations (e.g., a calm evening) may be heard by residents in the ROI. The primary means of mitigating this noise impact is prudent routing to avoid areas where residents in the project area live, work, and congregate. Noise impacts from the proposed substation operation could be mitigated by using additional natural or built sound barriers, e.g., berms, plantings. Since noise impacts are a function of the transmission line and equipment, predicted noise levels would not vary by proposed route or variation considered in this EIS. Noise levels resulting from operation of the proposed Project are also expected to be below Minnesota noise standards. Route permits issued by the MN PUC require compliance with Minnesota's noise standards.

5.2.1.3 Air Quality, Greenhouse Gas Emissions, and Climate Change

This section describes the potential for change in air emissions, namely criteria pollutants and greenhouse gases (GHGs), from the proposed Project to impact air quality and climate change.

Air pollution comes from many different sources:

- stationary sources such as factories, power plants, and smelters and smaller sources such as dry cleaners and degreasing operations;
- mobile sources such as cars, trucks, and construction equipment;
- naturally occurring sources such as windblown dust and volcanic eruptions; and
- removal of forest vegetation.

All of these sources contribute to air pollution. Air quality and the climate can be affected in many ways by the pollution emitted from these sources (EPA 2015, reference (16)).

Table 5-6 National Ambient Air Quality Standards

Pollutant [final rule citation]		Primary/ Secondary	Averaging Time	Level	Form
Carbon Monoxide (CO) [76 FR 54294, Aug 31, 2011]		Primary	8-hour	9 ppm	Not to be exceeded more than once per year
			1-hour	35 ppm	
Lead (Pb) [73 FR 66964, Nov 12, 2008]		Primary and Secondary	Rolling 3-month average	0.15 µg/m3 (1)	Not to be exceeded
Nitrogen Dioxide (NO_2) [75 FR 6474, Feb 9, 2010] [61 FR 52852, Oct 8, 1996]		Primary	1-hour	100 ppb	98th percentile, averaged over 3 years
		Primary and Secondary	Annual	53 ppb(2)	Annual mean
Ozone (O_3) [73 FR 16436, Mar 27, 2008]		Primary and Secondary	8-hour	0.075 ppm(3)	Annual fourth-highest daily maximum 8-hr concentration, averaged over 3 years
Particle Pollution [78 FR 3086, January 15, 2013](5)	$PM_{2.5}$	Primary	Annual	12 µg/m3	Annual mean, averaged over 3 years
		Secondary	Annual	15 µg/m3	Annual mean, averaged over 3 years
		Primary and Secondary	24-hour	35 µg/m3	98th percentile, averaged over 3 years
	PM_{10}	Primary and Secondary	24-hour	150 µg/m3	Not to be exceeded more than once per year on average over 3 years
Sulfur Dioxide (SO_2) [75 FR 35520, Jun 22, 2010] [38 FR 25678, Sept 14, 1973]		Primary	1-hour	75 ppb (4)	99th percentile of 1-hour daily maximum concentrations, averaged over 3 years
		Secondary	3-hour	0.5 ppm	Not to be exceeded more than once per year

Source(s): EPA 2014, reference (17)

(1) Final rule signed October 15, 2008. The 1978 lead standard (1.5 µg/m3 as a quarterly average) remains in effect until one year after an area is designated for the 2008 standard, except that in areas designated nonattainment for the 1978 standard, the 1978 standard remains in effect until implementation plans to attain or maintain the 2008 standard are approved.

(2) The official level of the annual NO_2 standard is 0.053 ppm, equal to 53 ppb, which is shown here for the purpose of clearer comparison to the 1-hour standard.

(3) Final rule signed March 12, 2008. The 1997 ozone standard (0.08 ppm, annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years) and related implementation rules remain in place. In 1997, EPA revoked the 1-hour ozone standard (0.12 ppm, not to be exceeded more than once per year) in all areas, although some areas have continued obligations under that standard ("anti-backsliding"). The 1-hour ozone standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is less than or equal to 1.

(4) Final rule signed June 2, 2010. The 1971 annual and 24-hour SO_2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated nonattainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

(5) The EPA revised the annual primary $PM_{2.5}$ standard by lowering the level to 12.0 µg/m3 and maintaining the 15.0 µg/m3 $PM_{2.5}$ standard as a secondary standard. The final rule was effective on March 18, 2013.

Air Quality Regulations

Frameworks are in place at the federal and state level to protect air quality and human health. The relevant frameworks discussed below include regulations applicable to criteria pollutants and guidance and proposed rulemaking related to climate change and greenhouse gas emissions.

Criteria Pollutants

The Clean Air Act (CAA) of 1970, 42 U.S.C. 7401 et seq., amended in 1977 and 1990, is the primary federal statute governing ambient air pollution. The CAA designates standards for the following criteria pollutants that have been determined to affect human health and the environment: particulate matter (PM_{10} and $PM_{2.5}$), carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), lead (Pb), and ozone (O_3). Volatile Organic Compounds (VOC) and NO_2 are precursors to O_3, which is not an emitted source but is formed by these pollutants in the atmosphere (40 Code of Federal Regulations (CFR) Part 50). The EPA has developed National Ambient Air Quality Standards (NAAQS) for these criteria pollutants to protect public health and welfare (Table 5-6; EPA 2014, reference (17)). Minnesota has also established state standards (Minnesota Ambient Air Quality Standards; MAAQS) for hydrogen sulfide (H_2S) and particulate matter (PM) (Minnesota Rules, part 7009.0080). The MPCA is responsible for compliance with state and federal standards for air quality in Minnesota.

Areas that do not meet the NAAQS are designated as "nonattainment" for that criteria pollutant. Areas that were previously designated "nonattainment", but are now in attainment, are designated as "maintenance." The CAA requires preparation of a State Implementation Plan (SIP), which is a compilation of laws, regulations, strategies, programs, and guidelines to improve and maintain air quality within the state. The General Conformity Rule applies to all Federal actions in nonattainment and maintenance areas (42 U.S.C. 7506(c)). The CAA, through the General Conformity Rule, prohibits federal agencies from engaging in, supporting, providing financial assistance for licensing, permitting, or approving any activity that does not conform to an applicable SIP.

The Regional Haze Rule of the CAA established protection of visibility within Class I areas, which are national parks or wilderness areas where visibility is important to the value of the area and/or threatened by air pollution (40 CFR Part 51).

Climate Change and Greenhouse Gas Emissions

Climate change refers to any significant change in measures of climate lasting for an extended period of time. GHGs are gaseous emissions that trap heat in the atmosphere. These emissions occur from natural processes and human activities. The most common GHGs emitted from human activities include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) (EPA 2015, reference (18)). On December 18, 2014, the Council on Environmental Quality (CEQ) issued revised draft guidance "to provide Federal agencies direction on when and how to consider the effects of GHG emissions and climate change in their evaluation of all proposed federal actions in accordance with the National Environmental Policy Act (NEPA) and CEQ Regulations implementing NEPA" (CEQ 2014, reference (19)). This revised draft guidance is intended to describe controlling requirements under the terms of NEPA and the CEQ regulations, and indicates that NEPA requires the documentation of the proposed Project's impacts on GHG emissions and climate change (CEQ 2014, reference (19)). CEQ's revised draft guidance indicates that NEPA requires not only the documentation of the proposed Project's potential impacts on GHG emissions, but also the need to assess how climate change would affect the proposed Project (CEQ 2014, reference (19)). Climate-related impacts are occurring across regions of the country and across many sectors of our economy. Many state and local governments are already preparing for the impacts of climate change through "adaptation," which is planning for the changes that are expected to occur (EPA 2015, reference (20)).

On a Federal level, EPA and other agencies have implemented various programs to encourage the reduction of GHG emissions to address climate change.[71] On June 2, 2014, EPA proposed draft rules under Section 111(d) of the CAA to cut carbon emissions from existing fossil fuel-fired power plants. The draft rules are commonly referred to as "the Clean Power Plan". The Clean Power Plan would establish goals for carbon reduction, but the states would determine the means of achieving the standards: "EPA's guidelines provide flexibility and encourage states to look across their whole electric system to identify strategies to include in their plans that reduce carbon pollution from fossil fuel fired power plants." (EPA 2015, reference (21)).

Minnesota has implemented various programs and legislation to reduce GHG emissions. Since the 1990s, the state has provided tax exemptions for renewable and alternative energy sources (Minnesota Statutes, sections 272.02 and 297A.68). The Next Generation Energy Act of 2007 established state GHG reduction goals of 15 percent by 2015, 30 percent by 2025, and 80 percent by 2050. In May

71 In October 2009, Executive Order (EO) 13514, titled Federal Leadership in Environmental, Energy, and Economic Performance, was signed and requires Federal agencies to set goals for reducing GHG emissions. One requirement within Executive Order 13514 is the development and implementation of an agency Strategic Sustainability Performance Plan (SSPP) that prioritizes agency actions based on lifecycle return on investment. Each SSPP is required to identify, among other things, "agency activities, policies, plans, procedures, and practices" and "specific agency goals, a schedule, milestones, and approaches for achieving results, and quantifiable metrics" relevant to the implementation of Executive Order 13514.

On September 20, 2010, the Department of Energy (DOE) publicly released its SSPP. This implementation plan describes specific actions the DOE will take to achieve its individual GHG reduction targets, reduce long-term costs, and meet the full range of goals of the Executive Order. The proposed Project, as an activity that requires a Presidential permit from DOE, would fall under the Scope 3 GHG emissions requirements. However, the Scope 3 GHG goals in the DOE SSPP do not include emissions generated by prime contractors not directly associated with DOE site operations.

On March 19, 2015, President Obama released the Executive Order 13693, Planning for Federal Sustainability in the Next Decade. This Executive Order revokes and replaces previous Executive Orders and presidential memorandums, including Executive Order 13514, and provides new, specific goals and requirements for energy, water, vehicle fleet, buildings and acquisition management. Each of the agencies will need to provide plans mid June 2015 to meet these new goals. The SSPP would be expected to be updated in the future as GHG reduction policy and implementation guidance become further developed. Future SSPP goals could include Scope 3 goals for these types of prime contractors, but that is uncertain at this time.

2013, the omnibus energy bill was passed, increasing Minnesota's Renewable Portfolio Standard (RPS) to 26.5 percent by 2025 by including 1.5 percent to be achieved through energy efficiency (Minnesota Statutes, section 216B.1691, subdivision 2).

As discussed in Chapter 2, the Applicant has implemented the "EnergyForward" plan to increase the percentage of renewable energy it provides to its customers while reducing air emissions (Minnesota Power 2015, reference (22)).

Air Quality in the ROI

The ROI for this analysis of air quality includes the counties of Roseau, Lake of the Woods, Beltrami, Koochiching, and Itasca. Air quality conditions relative to NAAQS in the State of Minnesota are assessed at the county level.

EPA designates all of the counties in the ROI to be in attainment or unclassifiable (to be considered in attainment) for all NAAQS (EPA 2015, reference (2)). Therefore, DOE's proposed action is exempt from applicability of the General Conformity Rule requirements of the CAA.

The state of Minnesota contains two Class I areas, Voyageurs National Park (in Koochiching and St. Louis counties) and the Boundary Waters Canoe Area (in St. Louis, Lake, and Cook counties) (EPA 2012, reference (23)). Neither the proposed routes nor the variations pass through a Class I area. Voyageurs National Park is approximately 25 miles northeast of the Central Section, and the Boundary Waters Canoe Area is over 50 miles to the east and northeast of the Central and East sections, respectively. Further, this proposed Project would not result in any major stationary emission sources, therefore prevention of significant deterioration requirements established to protect Class I Wilderness Areas are not applicable to the proposed Project.

According to the EPA's Air Quality Index (AQI) report statistics for Minnesota, all monitoring in the state indicates AQI ratings of good to moderate, and the state did not experience any days above the air quality standards in 2013 or 2014 (EPA 2015, reference (24)). Implementation of the state and federal air control programs have resulted in notable improvements in air quality throughout the state.

General Impacts

The construction and operation of the proposed Project would result in direct and indirect emissions of criteria air pollutants and GHG emissions. These emissions would be adverse, short-term, and localized. In addition, the proposed Project would result in reductions of indirect criteria pollutant and GHG emissions, as the proposed Project could allow the reduction of coal-fired electricity generation in Minnesota. The loss of forest carbon sink and forest carbon sequestration (see discussion of these terms below) from the clearing of forest in the transmission line ROW is not expected to result in significant changes to GHG emissions.

Construction emissions could be reduced using best management practices (BMPs), which could be included as MN PUC Route Permit conditions (Section 1.3.1; Appendix B). These BMPs, incorporated as MN PUC Route Permit conditions, could include:

- minimizing idling of construction vehicles;
- utilizing existing power sources (e.g., grid-supplied power) or clean fuel generators rather than diesel-powered generators;
- ensuring that construction equipment is properly tuned and maintained prior to and during on-site operation;
- developing a project-specific dust control plan, which could include the following additional BMPs:
  - using traffic controls to restrict traffic to predetermined routes
  - maintaining as much natural vegetation as practicable
  - phasing of construction to reduce the area of land disturbed at any one time
  - using temporary mulching, or temporary vegetative (sod) cover, to reduce the need for dust control
  - using mechanical sweepers on paved surfaces where necessary to prevent dirt buildup, which can create dust
  - periodically moistening exposed soil surfaces with adequate water to control dust

Changes in emissions and carbon sink and sequestration resulting from the proposed Project would be similar for all proposed routes and variations. The scale of the ROI is at the region and county level and the location of the proposed routes and variations do not differ substantially enough to result in different impacts for the proposed routes and variations considered, therefore air quality, GHG

emissions, and climate change are not discussed further in Chapter 6 of this EIS.

Construction Impacts

Criteria Pollutants

Construction activities associated with the proposed Project, for all proposed routes and variations, would result in short-term increases in air emissions as a result of the combustion of fossil fuels in construction equipment and vehicles, and from the fugitive dust emissions associated with site ground disturbance. The Applicant would use large equipment to clear trees and other vegetation and to level construction areas. Large cranes and flatbed trucks would be used to place transmission lines and substation components. Helicopters may be used to place lines and structures. Temporary concrete batch plants may be utilized to supply concrete for foundations. Equipment and material deliveries, the removal of waste, and worker activities and commuting would produce indirect emissions on paved and unpaved roads within the ROI. Construction of the proposed Project would take about four years, but activities are assumed not to occur at a single construction location for more than a year. Because specific scheduling and construction documentation have not yet been developed, total emissions of criteria pollutants from construction of the proposed Project cannot currently be quantified. Construction emissions would be dispersed over the ROI during the construction duration, but would be adverse localized and short-term. Potential impacts related to air quality from construction of the proposed Project would be adverse, but localized and short-term and do not vary by proposed route or variation considered, as construction procedures and techniques would be similar in all locations and impacts would be comparable.

The Applicant has proposed a number of avoidance, minimization, and mitigation measures that would reduce construction emissions; these are outlined in Table 2-2.

Climate Change and GHG Emissions

Construction activities for all proposed routes and variations would result in similar short-term increases in GHG air emissions, from the combustion of fossil fuels in equipment and vehicle use as described above. CO_2, CH_4, and N_2O would be emitted from the combustion of fossil fuels. The construction would be adverse, localized and short-term.

During construction, the clearing of the ROW would require clearing of forest lands. Deforestation is another source of CO_2 to the atmosphere, as trees and forest land act as a carbon sink, absorbing CO_2 from the atmosphere and storing it. Removing forests releases most of the stored carbon stock, either through burning or decay. Some forest material from ROW clearing would be used as lumber, paper, or other wood products, which would retain some of the carbon in finished products or in a landfill. In addition, deforestation eliminates future CO_2 capture.

The relative magnitude of the impacts associated with clearing of forested ROW can be assessed by quantifying these potential losses in sequestered carbon and comparing them to total carbon stock along the proposed routes and variations. The loss of future CO_2 capture can be estimated on an annual basis.

The amount of forest removal for the proposed routes and variations is discussed further in Chapter 6 of this EIS. For the purposes of the GHG impact analysis, the resulting loss of carbon stock, or carbon sink has been estimated for the Proposed Orange Route and Proposed Blue Route as those are the only two complete routes and provide the best indication of the scale of the loss of carbon sink for the proposed Project. Loss of carbon sink for all other variations would be proportionally less or more, based on the total area of forest cover being removed by the Proposed Orange Route or Proposed Blue Route section. The loss of carbon sink that results from the removed forest has been estimated using *Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimates for Forest Types of the United States* (Smith et al. 2006, reference (25)). The calculations assume the removal of "Northern Lake States Spruce-balsam Pine" forests that are an average of 55 years old. Carbon sink is defined and reported as the total amount of carbon, in metric tons, and in the equivalent amount of CO_2 in metric tons, calculated using the atomic weight ratio of 12 for Carbon to 44 for CO_2.

The proposed Project will require the removal of all forested areas within the anticipated 200-foot ROW. The Proposed Blue Route would require the removal of approximately 4,829 acres of forest in the anticipated 200-foot ROW. The loss of carbon sink is estimated at 218,731 metric tons carbon, which is the equivalent of 802,013 metric tons of CO_2. The Proposed Orange Route would require the removal of approximately 4,883 acres of forest in the anticipated 200-foot ROW. The loss of carbon sink is estimated at 221,219 metric tons carbon, which is the equivalent of 811,136 metric tons of CO_2. It should be noted that this loss is appropriately not considered as a single year of emissions but

is attributed to the proposed Project separately as a decrease of carbon sink, lost as of the year the proposed Project is completed. The estimate is also overly conservative (higher) as it does not account for the amount of carbon that may remain sequestered as a portion of the cleared timber may be used in wood products (e.g., lumber).

This loss of carbon sink in the anticipated 200-foot ROW can be compared to the total carbon sink along the proposed routes. For the Proposed Blue Route, there are 71,399 acres of forest within 1,500 feet of the anticipated alignment, representing over 3.23 million metric tons of carbon sink, or the equivalent of 11.87 million metric tons of CO_2. For the Proposed Orange Route, there are 72,229 acres of forest within 1,500 feet of the anticipated alignment, representing over 3.27 million metric tons of carbon sink, or the equivalent of 12.01 million metric tons of CO_2. The loss of carbon sink associated with either the Proposed Blue Route or the Proposed Orange Route represents less than 7 percent of the total forest carbon sink within 1,500 feet of the anticipated alignment, and therefore a much smaller percentage of carbon sink in the region.

In addition to the loss of existing carbon sink, removal of forested land eliminates the CO_2 sink that would be provided by continued growth of trees in the forest. Using data from Smith et al. 2006 (reference 25, the annual carbon uptake of live trees in "Northern Lakes State Spruce-balsam Pine" forest are estimated at 0.65 metric tons C/acre-year. This would result in the equivalent loss of approximately 11,500 metric tons CO_2 uptake per year for either the Proposed Blue Route or the Proposed Orange Route. This adverse impact would be long-term.

Operation, Maintenance, and Emergency Repair Impacts

Criteria Pollutants

On-site transmission line operational activities that would result in direct or indirect air emissions, regardless of the proposed route or variation selected, would be limited. Operational emissions would occur from vehicle usage to and from the ROW or site for regular maintenance and landscaping activities, as well as emergency maintenance. Operational activities would be considerably less on an annual basis than the construction activities discussed above. Ionization of air molecules surrounding the conductor ("corona effect") may also produce a small amount of ozone and nitrous oxide (NO_X). These potential operational emissions are expected to be small and would result in limited impacts to air quality and would not affect the attainment status in the region.

The implementation of the proposed Project would allow the Applicant to fulfill obligations under its power purchase agreements (PPA) with Manitoba Hydro. The Applicant is party to a 250 MW PPA, as well as an additional 133 MW Renewable Optimization Agreement with Manitoba Hydro. According to the Applicant, the ability to purchase 383 MW of energy generated at Manitoba Hydro hydroelectric facilities for distribution in Minnesota would allow the Applicant to meet its goals of reducing coal powered electricity generation at its facilities (Minnesota Power 2013, reference (26)). The Applicant has also determined that a new 500 kV transmission tie line with the Manitoba hydroelectric system would not only provide them with additional hydroelectric capacity, but it would also provide an opportunity to optimize and use what would otherwise be excess wind energy from its North Dakota wind facilities. The resulting increase in the use of wind and hydropower and decrease in coal supplied power would greatly reduce criteria pollutant emissions such as SO_2, NO_X, and mercury from the Applicant's energy generation portfolio facilities. It is difficult to quantify the impact of this reduction in criteria pollutant emissions because other factors such as emission control improvements and changes in electricity demand would also have an impact on emission reductions. However, the Applicant's Resource Plan states their goal is to reduce GHG and criteria pollutant emissions through the reduction in the use of coal and the increase in the use of renewable energy. The Applicant has stated that this proposed Project is part of that plan, for that purpose. Therefore, it is reasonable to assume that the Applicant's distribution of low-emission, renewable energy in Minnesota would be a beneficial long-term impact to air quality in the region.

Climate Change and GHG Emissions

Operational GHG emissions would occur for all proposed routes and variations from vehicle usage to and from the site for regular maintenance and landscaping activities as well as emergency maintenance. Operational activities would be considerably less on an annual basis than the construction activities evaluated.

Sulfur hexafluoride (SF_6) may be used in small quantities in substation transformers and other electrical equipment. As a GHG, it has a global warming potential 22,800 times that of CO_2 (EPA 2015, reference (24). SF_6 is only released as a fugitive emission, if equipment is malfunctioning

or during maintenance and repair, and most new equipment requires less SF_6 or none at all (EPA 2015, reference (27)) The Applicant would minimize SF_6 emissions through the BMPs and maintenance, which could be included as MN PUC Route Permit conditions (Section 1.3.1; Appendix B). The EPA has established the SF_6 Emission Reduction Partnership for Electric Power Systems (EPA 2015, reference (28)) to identify and continuously improve the BMPs for SF_6 emission reductions.

The implementation of the proposed Project would allow the Applicant to fulfill obligations under its PPA with Manitoba Hydro. This would allow the Applicant to meet its goals of reducing coal powered electricity generation at its facilities, thereby reducing GHG emissions. It is difficult to quantify the impact this reduction, but it is reasonable to assume that this impact would be a beneficial impact to air quality in the region, and would help Minnesota meet the current GHG reduction goals. While there are no current federal requirements to reduce GHG emissions, it is likely that the final Clean Power Plan legislation would call for some reduction of GHG emissions from large fossil fuel power plants. Once it has been finalized, appropriate actions will be taken to comply.

Climate Change Adaptation

In the Midwest, communities must prepare for increases in precipitation events, droughts, and heat waves. Heavy precipitation events have doubled in the last century, and heat waves are becoming more frequent, as average summer temperatures may increase by 3°F by 2050 and by 10°F by 2100. Increased temperatures would affect agriculture, fisheries, and ecosystems, with impacts on industries from milk production to winter recreation (EPA 2014, reference (20)). The Minnesota Department of Health (MDH) completed the *Minnesota Climate Change Vulnerability Assessment* in 2014 (MDH 2014, reference (29)), identifying the vulnerability of Minnesota residents to the anticipated climate change effects of extreme heat events, air pollution, vector-borne diseases, flooding and flash flooding, and drought. The report concluded that "these climate hazards present major challenges to the health and quality of life of Minnesotans" (MDH 2014, reference (29), page 81).

In a 2013, the Minnesota Interagency Climate Adaptation Team published a report titled *Adapting to Climate Change in Minnesota* (Minnesota Interagency Climate Adaptation Team, 2013). This report defines specific actions each of the cooperating agencies will take to adapt to climate change, and establishes seven priority areas:

- Building resilience to extreme precipitation;
- Implementing best practices that achieve multiple benefits;
- Protecting human health;
- Strengthening existing ecosystems by addressing ongoing challenges and risks;
- Building partnerships with local governments;
- Quantifying climate impacts; and
- Conducting public and community outreach, education, and training (Minnesota Interagency Climate Adaptation Team 2013, reference (30)).

Increased flooding, storm, and heat wave events could increase risks to transmission lines and substations, and require adequate planning and preparation to handle unexpected repairs and contingencies. Heat waves pose a change to electrical transmission and generation systems, as more indoor space is equipped with cooling systems and the systems require more power during heat events. The improved capabilities of the transmission network would reduce the threats of peak overloads. The proposed Project would be designed to adequately withstand expected weather challenges, and proper maintenance and repair plans would also consider future climate changes, as committed to by the Applicant in their proposed measures to minimize environmental impacts in Section 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions.

5.2.1.4 Property Values

This section describes the potential for impacts to individual property values from the proposed Project.

The placement of high voltage transmission lines and associated facilities near human settlements could potentially affect property values. In general, three main factors related to a proposed high voltage transmission line could affect property values:

- The presence of high voltage transmission lines in the viewshed could adversely affect the aesthetics of a property, thereby deterring certain buyers. Potential aesthetic impacts are discussed in Section 5.3.1.1.
- The real or perceived risks associated with EMF may discourage certain buyers. Potential health impacts of EMF are discussed in Section 5.2.2.1.

- High voltage transmission lines structures, when placed in an agricultural field, displace very little farmland. However, they have the potential to interfere with farming operations. Impacts on crop yields and crop choices could affect property values. Potential interference with farming operations is discussed in Section 5.3.2.1.
- In addition to the three main factors that could affect property values, noise emissions from operation of high voltage transmission lines due to the "corona effect" can also affect nearby residences, as discussed in Section 5.2.1.2. The noise impacts from operation of high voltage transmission lines could deter certain buyers.

The ROI for this analysis of property values is 1,500 feet on either side of the anticipated alignment of the transmission line and within 1,500 feet the permanent footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations and permanent access roads). This is the same ROI used in the analysis of the factors (Aesthetics, EMFs, and Agriculture) that could influence property value impacts.

Property Values in the ROI

Proximity to high voltage transmission lines is only one of many interconnected factors that influence property values, so the magnitude of this variable is difficult to isolate. Property values are influenced by the complex interaction of factors specific to each individual piece of real estate as well as local and national market conditions. The relationship between property values and proximity to high voltage transmission lines has been researched over decades, using a variety of methodologies to try to isolate the factor of distance to transmission lines (Appendix J). The Wisconsin Public Service Commission (PSC) (Wisconsin PSC 2000, reference (31) pp. 212-215)) analyzed the findings of approximately 30 papers, articles, and court cases, and reported six observations in its final EIS on the Arrowhead-Weston Electric Transmission Line Project that are generally applicable to properties near transmission lines, including:

- Proximity to a transmission line does not always cause property values to go down. When property values do go down, the potential reduction in value from proximity to a transmission line is in the range of 1 to 14 percent.
- Property value impacts decrease with distance from a line, and impacts are usually greater on smaller properties than on larger ones where distance from the residence to the line is generally less.
- Adverse impacts to property values diminish over time.
- Other amenities, such as proximity to schools or jobs, lot size, square footage of the home and neighborhood characteristics, tend to have a much greater effect on sale price than the presence of a high voltage transmission line.
- The value of agricultural property is likely to decrease if transmission line support structures interfere with farming operations (such as aerial spraying or field irrigation systems). Potential interference with farming operations is discussed in Section 5.3.2.1.
- Impacts on sale price are more frequently observed for properties crossed by or immediately adjacent to a high voltage transmission line, but impacts have been observed for properties farther away.

Weber and Jensen (1978, reference (3)) and Jensen and Weber (1982, reference (4)) investigated property value effects of transmission lines on agricultural land in west-central Minnesota. In the 1978 study, they found no effects on the purchase prices of agricultural land. In the 1982 study, they observed transmission line effects ranging from no effects to a 20 percent reduction in sales price, depending on the level of disruption to farm operations.

Jackson and Pitts (2010, reference (5)) performed a literature review of 17 studies conducted between 1954 and 2009, which investigated effects of transmission lines on property values. The studies employed a variety of techniques, including survey-based studies, multivariate analyses of sales price, and sales price comparisons utilizing techniques other than multivariate analysis. Among the 17 studies reviewed, Jackson and Pitts (2010, reference (5)) observed that the studies generally found no effect or small effects on property values caused by transmission lines. In the few studies that detected decreases in sales price, those effects ranged from two to nine percent, and in a few cases, the sales price actually increased.

Additional detail about research on the relationship between transmission lines and property values is provided in Appendix J.

General Impacts

The Applicant conducted routing studies and public meetings to identify residences and public concerns regarding the proposed Project in order to reduce the potential for impacts on residences (Section 2.3). Further, the Applicant-proposed measures to minimize environmental impacts listed in Table 2-2, reflect the mitigation recommendations discussed above and further reduce any potential impact to property values from construction and operation of the proposed Project.

Potential impacts to property values could be mitigated by reducing aesthetic impacts and agricultural impacts. Choosing routes and alignments that maximize use of existing ROWs or placing the transmission line away from residences and out of agricultural fields could address these concerns, thereby minimizing or avoiding impacts to property values. As described in Section 2.9.2, Land Acquisition, impacts could also be mitigated by utilizing Minnesota Statute, section 216E.12, subdivision 4 (commonly known as the "Buy the Farm" statute), where available, to move residents away from potential property value impacts. Utilizing the "Buy the Farm" statute, landowners with property designated as a "agricultural or nonagricultural homestead, nonhomestead agricultural land, rental residential property, and both commercial and noncommercial seasonal residential recreational property", have the option to require the utility to purchase the contiguous property crossed by a high voltage transmission line greater than 200 kV at fair market value. Additional discussion of relevant mitigation measures are provided in Section 5.2.2.1, Section 5.3.1.1, and Section 5.3.2.1.

Because potential reductions in property values are expected to range from zero to at most 20 percent as a result of operation of the proposed Project, and because potential property value reductions do not vary for proposed routes and variations considered, property values are not discussed further in Chapter 6 of this EIS.

Construction Impacts

Potential impacts to property values resulting from construction of the proposed Project are not expected because of its short-term and localized nature.

Operation, Maintenance, and Emergency Repair Impacts

Potential impacts to property values, if any, resulting from operation, maintenance, and emergency repairs of the proposed Project would be long-term due to aesthetics, EMF, and agricultural impacts. The impacts to property values would be expected to range from no effect to at most a 20 percent reduction,based on conclusions derived from the literature review of relevant studies presented in Appendix J.

5.2.1.5 Electronic Interference

This section describes the potential for electronic interference to occur as a result of the proposed Project.

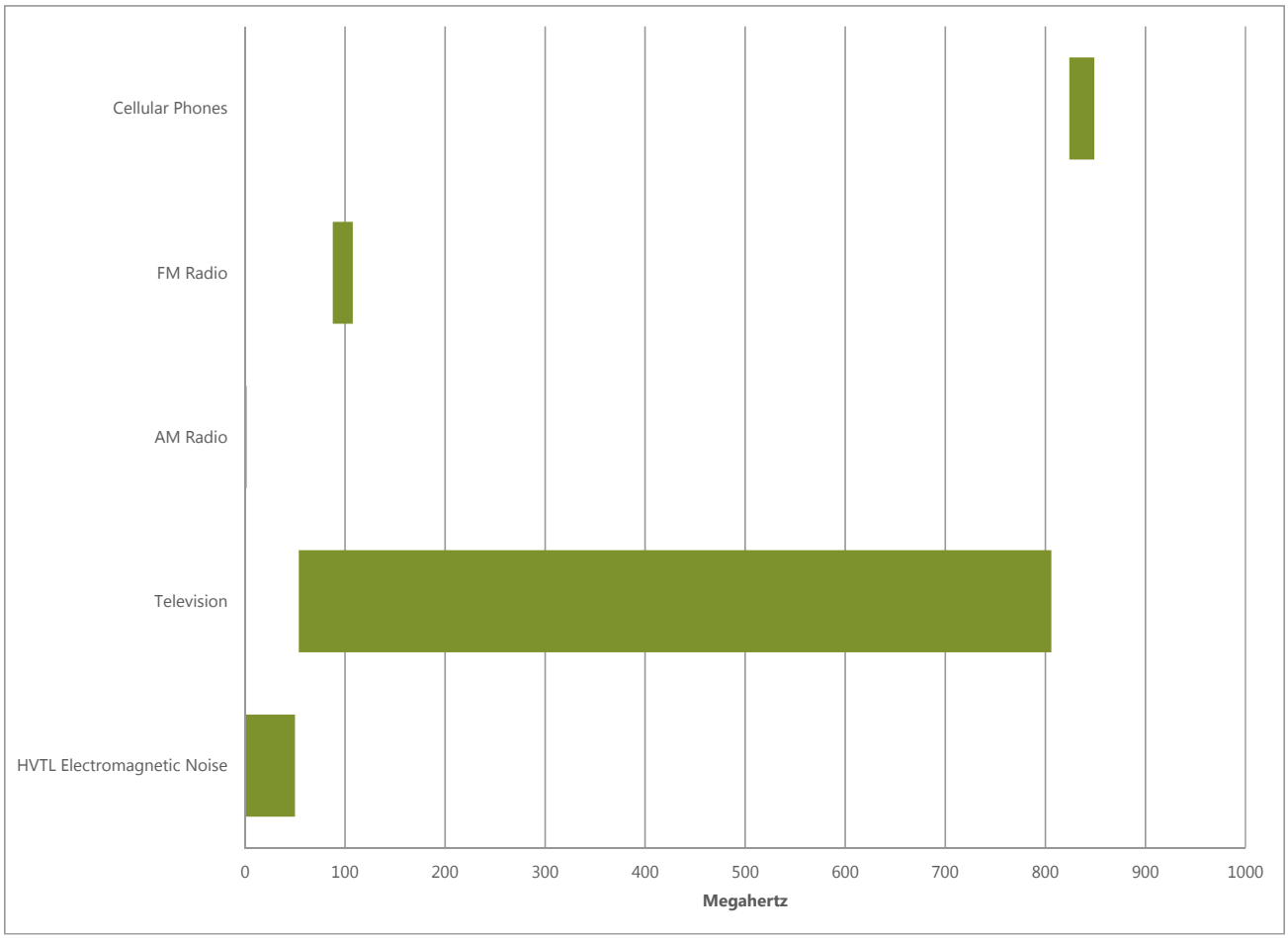
Electronic interference during operation of the proposed Project could result from gap discharges, corona discharges, shadowing effects, reflection effects, and blocking line-of-sight communications.

Gap discharges are caused by spaces between loose hardware and wires. Electrical noise or interference occurs when there is a discharge across the gap. These gap discharges most commonly occur on low voltage distribution lines. Corona on transmission-line conductors can also generate electromagnetic noise at similar frequency bands that are utilized for radio and television signals, which can result in radio and television interference. Corona interference with electromagnetic signals is generally associated with high voltage transmission lines. Shadowing and reflection effects are the result of structures (typically tall buildings) reflecting, scattering, or obstructing the signal. Interference can also result from transmission line structures which block the line-of-sight that is necessary for microwaves to transmit between antennas.

Corona interference from transmission lines causes the greatest disturbance in a relatively narrow frequency spectrum, in the range of about 0.1 to 50 megahertz (MHz) (Arora and Mosch 2011, reference (32)). Because many communication and media signals are transmitted at higher frequencies, impacts to communication signals would be limited. Figure 5-1 compares the spectrum of transmission frequencies for several communication and media signals to the peak intensity disturbance associated with electromagnetic "noise" from high voltage transmission lines. Additional discussion is provided below for each major type of media or communication signal.

The ROI for this analysis of electronic interference is 1,500 feet on either side of the anticipated alignment of the transmission line. This ROI was selected because high voltage transmission line impacts to radio and television interference are generally limited to areas within 100 to 600 feet of a transmission line (Bonneville Power Administration 2011, Appendix E of reference (33)). A conservative approach was

Figure 5-1 Frequencies of Electronic Communications Compared with Frequencies of Electromagnetic Noise Created by Transmission Line



Source(s): Arora and Mosch 2011, reference (32)

taken for this analysis and the ROI was extended to 1,500 feet to assess potential impacts from the proposed Project.

Communication Towers in the ROI

There are no communication towers identified within the ROW and only a limited number (less than three for any proposed route or variation within a variation area) exist within 1,500 feet of the anticipated alignment of the proposed routes and variations for the West Section (Map 5-4), the Central Section (Map 5-11), and the East Section (Map 5-18). Communication towers are identified within 1,500 feet of the anticipated alignment in the West Section for two variation areas (Map 5-4): Roseau Lake WMA Variation Area - Proposed Blue/Orange Route, Roseau Lake WMA Variation 1, and Roseau Lake WMA Variation 2 (two towers identified for each); and Cedar Bend WMA Variation Area - Proposed Blue/Orange Route (two towers) and Cedar Bend WMA Variation (three towers). Within the Central Section, one communication tower is located within 1,500 feet of the anticipated alignment of the C2 Segment Option Variation in the C2 Segment Option Variation Area and the J2 Segment Option Variation in the J2 Segment Option Variation Area (Map 5-11). In the East Section, one communication tower is within 1,500 feet of the anticipated alignment for the Proposed Blue Route and Proposed Orange Route in the Blackberry Variation Area (Map 5-18).

General Impacts

Potential electronic interference impacts are expected to be limited for the proposed Project and would be similar for all proposed routes and variations since there are less than three communication towers within the ROI, and none were identified within the ROW, for the proposed routes and variations within the variation areas. The Applicant has identified mitigation measures that would be implemented (see (Section 2.13) if impacts result from operation of the proposed Project. These Applicant proposed measures could be included as MN PUC Route Permit conditions. Since electronic interference impacts resulting from the proposed Project or variations are expected to be limited and do not vary by proposed route or variation

considered, electronic interference is not discussed further in Chapter 6 of this EIS.

Construction Impacts

Electronic interference is primarily affected by operation of the transmission line and substations and the location of the individual transmission structures. Therefore, potential impacts resulting from construction of the proposed Project are not expected regardless of the route or variation considered.

Operation, Maintenance, and Emergency Repair Impacts

As shown in Figure 5-1, television broadcast frequencies, which occur in the 54 to 806 MHz range, are high enough that they are relatively immune to corona-generated noise. Additionally, digital transmissions are not dependent on waveforms to transfer broadcast content, but rather on packets of binary information, which, in general, are less susceptible to corruption and can be corrected for errors. Satellite television is transmitted in the Ku band of radio frequencies (12,000 to 18,000 MHz) and is likewise immune to corona-generated noise. Both digital and satellite television reception could be affected by multipath reflections (shadowing) generated by nearby towers. An outdoor antenna might be necessary to resolve issues with multipath reflections. Satellite television is susceptible to line-of-sight interference due to transmission line structures. However, reception could usually be restored by moving the affected satellite antenna to a slightly different location. Cable television is a redistributed form of satellite broadcast and is generally not susceptible to interference due to the use of shielded coaxial cable. Cable broadcasts could suffer interference if the satellite broadcast suffers interference (e.g., line-of-sight obstruction).

Another line-of-sight potential impact would be related to Global Positioning System (GPS) navigation on precision agricultural equipment. If the GPS unit satellite signal on agricultural equipment were blocked by a tower, it could disrupt the signal and affect the accuracy of the unit. This effect, however, would be extremely limited for two reasons: 1) GPS satellite signals come from multiple satellites, often up to six or seven satellites, so the obstruction of one signal would not block the others; and 2) the GPS unit would be on a mobile piece of farm equipment that would move beyond the location of the blocked signal to an area that is unobstructed.

Wireless internet and cellular phones use frequencies in the 900 MHz ultra-high frequency range – a range for which impacts from corona-generated noise are not anticipated. If internet service at a residence or business is provided by a satellite antenna, this service could be impacted by a line-of-sight obstruction. As with other satellite reception, any interference due to an obstruction could be resolved by moving the satellite antenna to a slightly different location.

Electromagnetic "noise" from transmission lines is not an issue for microwave communications. However, microwave communication can be physically blocked by taller transmission structures. Microwave pathways can extend as close as 150 feet to the ground, and the transmission line structures for this proposed Project are 100 feet to 150 feet tall; therefore, interference with microwave communications is possible. This potential impact could be avoided during detailed project design on any proposed route or variation by identifying the microwave pathways in the proposed Project area and siting the transmission line structures at locations where they would not interfere with any identified pathways.

Incorporating the Applicant's proposed measures to minimize and mitigate any impacts to television, radio, and communication towers (Section 2.13) are anticipated to avoid electronic interference impacts. It is recommended that once the Applicant finalizes the route and determines the locations of transmission line structures, that they conduct a communication tower study to ensure that impacts are avoided by the proposed Project. These Applicant proposed measures are potential MN PUC Route Permit conditions.

5.2.1.6 Transportation and Public Services

This section describes the potential for transportation and public services impacts in the West, Central, and East sections from the proposed Project.

The ROI for the roadways and railways, public utilities, emergency services, and airports and airstrips is provided in the following sections along with the rationale for the ROI.

Roadways and Railways

This section describes the existing roadway and railway systems in the West, Central, and East sections and the potential impacts on those resources from the proposed Project. This section focuses on federal and state roads that are most likely to be affected by construction and operation of the proposed Project. Transportation systems were identified based on a review of aerial photographs

Table 5-7 Major Roadways in the Project Area

Roadway Name	No. of Lanes	Average No. of Cars/Day	General Direction	Major Towns Crossed	Sections Crossed
Minnesota State Highway 1	2	5-205	W to E	Northome, Effie	Central, East
Minnesota State Highway 6	2	65-75	S to N	None	Central
Minnesota State Highway 11 (Scenic Byway)	2(1)	110-760	W to E	Roseau, Warroad	West, Central
Minnesota State Highway 38 (Scenic Byway)	2	25-500	S to N, W to E	Effie	Central, East
Minnesota State Highway 46	2	90-155	S to N	Northome	Central
Minnesota State Highway 65	2	5-315	S to N	Littlefork, Nashwauk	Central, East
Minnesota State Highway 72	2	100-205	S to N	N/A	Central
Minnesota State Highway 89	2	10-382	S to N	N/A	West
Minnesota State Highway 217	2	25-215	W to E	Littlefork	Central
Minnesota State Highway 308	2	5	S to N	N/A	West
Minnesota State Highway 310	2	35-315	S to N	Roseau	West
Minnesota State Highway 313	2	55-320	S to N	Warroad	West
U.S. Route 2	4(1)	550-1700	W to E	Grand Rapids	East
U.S. Route 71	2(1)	55-385	SW	Littlefork, Big Falls, Mizpah, Northome, Funkley	Central
U.S. Route 169	4	185-590	W to E, NW	Grand Rapids, Taconite, Pengilly	East

Source(s): MnDOT 2013, reference (40)

(1) Number of lanes may vary due to turning lanes

and data from the Minnesota Department of Transportation (MnDOT).

The ROI for the analysis of impacts to roadways and railways includes roadways and railways that exist in the West, Central, and East sections that could be traversed by personnel as a result of construction, operation, maintenance, and emergency repair of the proposed Project. The proposed Project is not expected to have the potential to impact roadways and railways outside these sections.

Roadways and Railways in the ROI

The ROI is primarily rural with scattered pockets of development. The road network largely follows a grid-like pattern in the West Section (Map 5-4). Portions of the Central and East sections have a similar grid pattern of roadways, but much of the road network in these sections follow the natural geography of the area which is primarily defined by the presence of peatlands and lakes in the region (Map 5-11, Map 5-18). Major roadways located in the ROI are summarized in Table 5-7 using information obtained from MnDOT (reference (34)). In general, traffic volumes in the ROI are low. The population density near the community of Grand Rapids is higher than most areas within the ROI and; therefore have higher average numbers of cars per day using the major roadways in the East Section near Grand Rapids.

There is no passenger rail service in the ROI, however, several freight lines are located near the proposed Project (Maps 5-4, 5-11, and 5-18). The Minnesota Northern line is a private freight line that parallels Minnesota State Highway 11 in the West Section and would be crossed by Roseau Lake WMA Variation 1 in the Roseau Lake WMA Variation Area located west of the city of Roseau; the line is abandoned between Roseau and Warroad (Map 5-4) and would be crossed by the Proposed Blue Route, Proposed Orange Route, and Roseau Lake WMA Variation 2 in the abandoned portion of the line. The Canadian National rail line and the private Minnesota, Dakota & Western rail lines pass through the West and Central sections, but are not crossed by any proposed routes or variations (Map 5-4 and Map 5-11). An abandoned freight line that largely parallels U.S. Route 71 is crossed by the Proposed Blue Route and Proposed Orange Route in the Central Section (Map 5-12; freight line follows current location of the Blue Ox Trail). The Burlington Northern Santa Fe Railway and Northern Lines would be crossed by the Proposed Blue/Orange Route in the East Section between Bovey and Marble (Map 5-18; MnDOT 2015, reference (35)).

General Impacts

Due to relatively low existing traffic volumes in the ROI, combined with the Applicant proposed measures specified in Section 2.13, impacts would be short-term and localized. Other mitigation measures the Applicant could implement to further reduce any impacts may include coordinating with local officials to develop a detailed construction and mitigation plan where roadways would be temporarily closed; periodic halting of construction activity to allow queued vehicles to pass; and coordinating with rail line operators to avoid construction during periods when trains are scheduled to pass through the construction area. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Since potential impacts related to transportation and public services would be short- term and localized from construction and operation of the proposed Project and do not vary by proposed route or variation considered, transportation and public services are not discussed further in Chapter 6 of this EIS.

Construction Impacts

Impacts to transportation from the construction of the proposed Project consist of physical damage to roadways and infrastructure from the movement of construction related vehicles, temporary closure of roadways or rail lines, temporary limits on access to private land, and temporary traffic delays resulting from increases in construction vehicle trips.

Vehicles and equipment that would be used for construction of transmission lines (e.g., overhead line cranes, concrete trucks, construction equipment, and material delivery trucks) generally are heavier than lighter passenger vehicles and may cause more damage to road surfaces. Oversized/overweight load permits must be obtained from the MnDOT when size and/or weight limits would be exceeded. Therefore, potential impacts related to transportation from construction of the proposed Project are not expected since MnDOT would ensure that the roads traversed by the oversized/overweight trucks are capable of accommodating those trucks (Minnesota Office of the Revisor of Statutes 2014, https://www.revisor.mn.gov/statutes/?id=169.86). The Applicant would restore the anticipated ROW and all access roads affected by construction. Temporary access roads that would be needed for the proposed Project would be subject to review and approval by highway officials and traffic control measures would be implemented in accordance with the MnDOT Manual on Uniform Traffic Control Devices. The number and location of access roads has not yet been determined, but the typical width would be 16 feet.

Construction of proposed Project components that cross public roadways (i.e., overhead transmission lines) or that would share a corridor with a road (See Maps 5-10, 5-17, and 5-24) may require the access to one or more roadway lanes to be temporarily restricted. This may result in temporary delays in traffic and limiting of access to private roadways and land. Similarly, construction across the two active railways (Minnesota Northern line and Burlington Northern Santa Fe Railway) and one abandoned railroad (an abandoned freight line that largely parallels U.S. Route 71) may require rail traffic to temporarily reduce speed for short periods of time; these restrictions would be expected to last for a few hours to approximately one day. It would be expected that impacts on traffic would occur for a limited amount of time in any particular location.

Construction workers and construction related vehicles using public roadways to access the ROW are likely to have localized adverse impacts on traffic volumes. An average of 120 construction workers would be employed annually during the five years of construction from 2016 through 2020 (University of Minnesota-Duluth 2013, reference (36)). During the course of construction of the proposed Project construction workers would be employed and would be dispersed throughout the project area. Workers would not be concentrated in any one location at a single time and would be traveling to the construction site from different locations. Since trips from construction workers would be dispersed over a large geographic area, the increase in vehicle traffic would represent a small increase over existing traffic volumes at any given time, at a given location, and would be short-term and localized. This increased volume in vehicles could temporarily increase travel time for drivers during peak travel times. In developed areas, construction vehicles could temporarily block public access to streets and businesses.

Some limited short-term roadway impacts could occur, increase in traffic would represent a small increase, and lane restrictions would be temporary. The Applicant's proposed mitigation for potential impacts to roadways and railways are described in Section 2.13 and would include obtaining appropriate oversized/overweight permits and designing the proposed Project and associated road crossings to meet MnDOT guidelines, and obtaining a permit from MnDOT for the use of any state highway ROWs, including following MnDOT's Utility Accommodation requirements. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Operation, Maintenance, and Emergency Repair Impacts

Operation of the proposed Project where the anticipated alignment will cross public roadways or that would share a corridor with a road (see Maps 5-10, 5-17, and 5-24) would be strung overhead with sufficient clearance for cars and trucks. Operation of the proposed Project would result in maintenance vehicles using public roads to access the ROW for maintenance activities. Potential impacts from operation, maintenance, and emergency repairs of the proposed Project would be intermittent (or as-needed), short-term, and localized. Transmission lines that parallel roads could affect future road expansions or realignments because structures placed along the road ROW may need to be moved to preserve a safe distance between structures and the edge of the expanded roadway. Costs associated with the relocation of permitted structures would be the responsibility of the utility owner (MnDOT 2015, reference (37)). Placement of transmission line structures would be coordinated with MnDOT and necessary permits obtained from MnDOT for the use of any state highway ROWs, including following MnDOT's Utility Accommodation requirements.

Severe weather, including high winds, ice and snow storms and tornados, could possibly create safety hazards on any roadways located within the designed fall distance of an overhead transmission line. The fall distance is equal to the height of the structure. Snow and ice accumulation and high winds could increase a structure's weight, making it more susceptible to failure or collapse. The Applicant has proposed Project design standards in Section 2.13 and other measures to minimize environmental impacts which would minimize roadway impacts from operation of the proposed Project. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Airports and Airstrips

This section describes the existing airports in the vicinity of the proposed Project in the West, Central, and East sections as well as applicable federal and state policies and potential impacts to airports from the proposed Project.

The Federal Aviation Administration (FAA) requires notification of construction or alterations that would result in a structure being greater than 200 feet from its base or exceeding the defined slope as established by 14 CFR 77.9 (U.S. Government Publishing Office 2015, reference (38)). Transmission structures for the proposed Project would range in height from approximately 100 feet to 170 feet.

The FAA and MnDOT have each established development guidelines on the proximity of tall structures near public use airports. The FAA has also developed guidelines for the proximity of structures to very high-frequency omni-directional range ground-based navigation systems. FAA Order 6820.10 specifies that overhead transmission lines should be more than 1,200 feet away from a navigational aid to avoid electronic interference. MnDOT has established separate zoning areas applying to land around public airports. The most restrictive safety zones are Safety Zone A and Safety Zone B. Safety Zone A extends from the end of the runway out to a distance equal to two-thirds of the runway length and does not allow any buildings or temporary structures, places of public assembly or transmission lines. Safety Zone B prevents places of public or semi-public assembly such as churches, hospitals or schools within the area that extends from Safety Zone A to an additional distance equal to one-third the runway length (Minnesota Rules, chapter 8800). Both federal and state regulatory obstruction standards only apply to those airports that are available for public use and are listed in the FAA airport directory. Private airports and personal use airports, including airstrips are not subject to FAA or MnDOT regulatory obstruction standards.

Airports in the ROI were identified based on a review of aerial photographs and data from the FAA. The ROI for this analysis of impacts to airports and airstrips includes FAA-registered airports within 20,000 feet of the proposed Project because, as noted above, FAA requires notification of construction or alterations that would exceed a defined slope that, depending on runway length, extends up to 20,000 feet from the nearest runway.

Airports and Airstrips in the ROI

There are several municipal airports and private airstrips located in the West, Central, and East sections. Table 5-8 lists the public and private airports (but not private airstrips) in the ROI along with the length of the longest runway at each airport. In addition to the airports listed in Table 5-8, there is one airstrip located within one mile of the Roseau Lake WMA Variation 1 in the Roseau Lake WMA Variation Area in the West Section, just east of the Roseau River and southeast of Roseau, MN (Map 5-4). The Proposed Orange Route in Pine Island Variation Area, C2 Segment Option Variation in the C2 Segment Option Variation Area, and the Proposed Orange Route in the J2 Segment Option Variation Area in the Central Section each have an airstrip within one mile of the anticipated alignment (Map 5-11). There are no airstrips located within one

Table 5-8 Federal Aviation Administration Airports in the ROI

Section	City	Airport Name	Public or Private Airport	Length of Longest Runway (feet)
West Section	Pinecreek	Piney Pinecreek Border Airport	Public	3,297
	Roseau	Roseau Municipal Airport	Public	4,401
	Warroad	Warroad International Memorial Airport	Public	5,400
	Roosevelt	Erickson Airport	Private	2,300
Central Section	Kelliher	Helblad Airport	Private	2,500
	Waskish	Waskish Municipal Airport	Public	3,700
	Bigfalls	Big Falls Municipal Airport	Public	2,850
	International Falls	Falls International Airport	Public	7,400
	Littlefork	Littlefork Municipal-Hanover Airport	Public	3,000
	Northome	Northome Municipal Airport	Public	3,199
	Bigfork	Bigform Municipal Airport	Public	3,998
East Section	Bigfork	Bigfork Municipal Airport	Public	3,998
	Bigfork	Bolduc Seaplane Base	Private	5,900
	Grand Rapids	Grand Rapids - Itasca County Airport	Public	5,747

Source(s): FAA 2015, reference (45)

Note(s): ROI for Airports includes 20,000 feet on either side of the proposed Project.

mile of the proposed routes or variations in the East Section (Map 5-18).

General Impacts

Of the FAA-airports in the ROI, all are located more than one mile from the proposed routes and variations, meaning they are not within MnDOT Safety Zone A. Given that the exact transmission structure locations are not currently known, and those locations are what would determine the impact on FAA-airports, a final determination on the impact of the proposed Project route on FAA-airports would be determined once a route is selected. Further, as specified in Section 2.13, the Applicant would work with the FAA and MnDOT to ensure that the proposed Project is compatible with all FAA and MnDOT requirements and the Applicant would notify the FAA as required and work with the FAA to meet applicable setback and height requirements. These Applicant proposed measures are potential MN PUC Route Permit conditions. No impacts to FAA-regulated airports are anticipated as a result of construction or operation of the proposed Project, regardless of the route or variation considered; therefore, airports and airstrips are not discussed further in Chapter 6 of this EIS.

Construction Impacts

During construction the Applicant could utilize cranes and helicopters to install proposed Project infrastructure which if close to airports could create additional hazards for aircraft utilizing the airport. There are several FAA-airports within the ROI and the Applicant would need to notify the FAA of any proposed structures that would exceed the FAA's defined slope and site structures so that construction of the proposed Project would not be expected to result in significant impacts to airports and air safety. The final structure height and location will be necessary to confirm that no adverse impacts to FAA-airports will occur as a result of the proposed Project.

Operation, Maintenance, and Emergency Repair

The Applicant would abide by FAA guidelines for public airports; therefore, no impacts on airports due to operation, maintenance, and emergency repair of the proposed Project are expected. Existing FAA airports are located within the ROI of the proposed Project and the Applicant would notify the FAA and MnDOT as required and work with the FAA to meet applicable setback and height requirements.

As discussed in Section 5.3.1.2, the presence of transmission structures could impact the ability of private aircraft employed by farmers to aerially apply pesticides to crops. There is one airstrip located within one mile of the Roseau Lake WMA Variation 1 in the Roseau Lake WMA Variation Area in the West Section (Map 5-4); and three airstrips are located within one mile of the Proposed Orange Route in Pine Island Variation Area, C2 Segment Option Variation in the C2 Segment Option Variation Area, and the Proposed Orange Route in the J2 Segment Option Variation Area in the Central

Section (Map 5-11). As described above, some impacts on private airstrips could occur; however, mitigation could include working with owners of airstrips to site transmission structures and using shorter transmission structures near airstrips to allow for safe takeoff and landing of aircraft. Alignment modifications have already been developed to address landowner concerns with private airstrips as reflected by the Airstrip Alignment Modification in the C2 Segment Option Variation Area.

Public Utilities

This section describes the existing public utilities, including electric, natural gas, and water services in the vicinity of the proposed Project.

Public utilities have been identified based on data from the MN PUC and municipal websites. The ROI for this analysis of impacts to public utilities includes all utilities identified in each geographic section. The proposed Project is not expected to have the potential to impact utilities outside these geographic sections.

Public Utilities in the ROI

A number of electric providers including private companies, cooperatives, and municipal utilities are identified as operating in the ROI, including:

- Roseau Electric Cooperative, Inc. - a cooperative electric utility providing service in much of Roseau County.
- Minnesota Power - providing service in southern and eastern Koochiching County and Itasca County.
- Northstar Electric Cooperative - providing service in eastern Roseau County, and northern Lake of the Woods and Koochiching counties.
- Lake Country Power - providing service in eastern Koochiching County and northern Itasca County.
- North Itasca Electric Co-operative - providing service in southern Koochiching County and northern Itasca County.
- Grand Rapids Public Utilities Commission - providing electric service within Grand Rapids and surrounding towns.

Minnesota Energy Resources provides natural gas to the cities of Roseau, Warroad, and International Falls. Propane delivery is used in many rural areas and is provided by a number of companies including Ferrellgas and Lakes Gas. Municipal public water systems are located in the following communities:

- Badger, Roseau and Warroad in Roseau County;
- Williams in Lake of the Woods County;
- Kelliher in Beltrami County;
- Bigfalls, International Falls, Littlefork, and Northome in Koochiching County; and
- Bovey, Calumet, Cohasset, Coleraine, Grand Rapids, Marble, Nashwauk, and Taconite in Itasca County.

The only location within the ROI where the proposed Project would cross a public water system is in the city of Taconite, which is served by the city of Taconite water district.

Existing 69 kV, 115 kV, 230 kV, and 500 kV distribution and transmission lines in the ROI are shown on Map 5-4, Map 5-11, and Map 5-18.

General Impacts

Public utilities could be impacted by the proposed Project if a gas or water pipeline or electrical lines were physically damaged during construction or if the proposed Project resulted in the disruption of existing services. Mitigation would include working with landowners and utility providers to avoid direct or indirect impacts to public utilities, and if necessary, relocating public utility facilities where appropriate and feasible. Since potential impacts to public utilities as a result of construction or operation of the proposed Project would only be short-term and localized and impacts to public utilities from the proposed Project are not anticipated and impacts to public utilities would be similar regardless of the proposed route or variation considered, potential impacts to this resource are discussed below but not carried through to Chapter 6 of this EIS.

Construction Impacts

Construction of the proposed Project is not expected to result in any long-term impacts to natural gas and water utilities. If a pipeline or other utility is encountered during excavation, an accident could occur and the public and/or workers could be put at risk. However, it is the Applicant's obligation to minimize this risk and they would be required, under state law (Minnesota Statues 2014, Chapter 216D), to call Gopher-State-One-Call 48 hours prior to starting construction to identify the location of buried public utilities and avoid those potential impacts.

The proposed Project could result in disruptions to service where it crosses over existing transmission lines, follows existing transmission line corridors, or crosses small power distribution lines; however, disruptions during construction would be temporary, likely lasting only a few hours, and service would be restored as soon as possible.

Operation, Maintenance, and Emergency Repair Impacts

The proposed Project could result in disruptions to electricity service where it crosses over existing transmission lines, follows existing transmission line corridors, or crosses small power distribution lines should the proposed Project experience equipment failures. The Applicant would mitigate this potential impact by implementing the design measures and separation distances specified in Section 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Emergency Services

This section describes the existing law enforcement, fire, and medical services in the vicinity of the proposed Project.

The ROI for this analysis of impacts to emergency services includes emergency services in each geographic section as emergency services across the region would likely be utilized should an emergency occur at or within the vicinity the proposed Project and construction of the proposed Project may disrupt the ability of emergency services to reach the general public.

Emergency Services in the ROI

Law enforcement in the ROI is provided by the Roseau County Sheriff's Department, Lake of the Woods County Sheriff's Department, Beltrami County Sherriff's Department, Koochiching County Sherriff's Office, Itasca County Sherriff's Office municipal police departments in nearby cites, and the Minnesota State Patrol. In addition, the Red Lake Police Department provides law enforcement on the Red Lake Reservation. Fire services are provided by municipal and volunteer fire departments. The Minnesota Department of Natural Resources (MnDNR) Division of Forestry provides additional fire prevention and protection in state forests (MnDNR n.d., reference (40)).

Emergency medical response services are provided by various ambulance districts in the ROI. Hospitals and medical services are generally concentrated in the incorporated cities in the ROI and include:

- LifeCare Medical Center in Roseau, Altru-Clinic in Warroad
- Littlefork Medical Center in Littlefork, Rainy Lake Medical Center in International Falls
- Grand Itasca Clinic and Hospital in Grand Rapids
- Fairview Mesaba Clinic in Nashwauk, Bigfork Valley Clinic in Bigfork
- Scenic River Health Services in Northome and Big Falls

Heliports are located at the LifeCare Medical Center, Rainy Lake Medical Center, Bigfork Valley Clinic, and Grand Itasca Clinic and Hospital. These heliports serve as landing locations for medical helicopters. In addition to those heliports, the Balsam Volunteer Fire Department noted during the scoping process that medical helicopters have also used their parking lot and recreation field for training exercises as well as emergency trauma patient loading. The Balsam Fire Department is located approximately 1,650 feet west of the Proposed Orange Route and 1,050 feet south of the Balsam Variation in the Balsam Variation Area. At this distance, impacts from the proposed Project to medical helicopter landing areas would not be anticipated.

General Impacts

The proposed Project is not expected to impact emergency services in the ROI due to the ability of existing services to handle the small number of construction workers that would be located in a given area. This does not vary by proposed route or variation considered due to the sharing of emergency resources in the counties and region, emergency services are not discussed further in Chapter 6 of this EIS.

Construction Impacts

Construction of the proposed Project may require temporary closure of roadways; however closures would be coordinated with local jurisdictions to provide for safe access of emergency vehicles. Fires could occur during construction or operations. During construction, fire hazards could result from workers welding, operating motorized construction equipment, smoking, refueling, and operating or parking vehicles in areas with dry vegetation. For incidents involving hazardous material spills, emergency medical issues, or fires that require assistance not provided on site, the local first responder would be the local fire department or district. Local emergency services would respond

to any injuries or fires that might occur during construction and operation of the proposed Project. The proposed project would be expected to require an average of 120 construction workers that would be dispersed over a large geographic area. The existing emergency services would have sufficient capacity to respond to any emergencies that could occur during construction of the proposed Project since there would not be a large concentration of workers in a single location in the proposed Project area that would impose a high demand for available emergency services. Implementation of safety procedures and speed limits near work sites would minimize the need for emergency services.

Operation, Maintenance, and Emergency Repair Impacts

Emergency services could be required during operation, maintenance, and emergency repair of the proposed Project as a result of fires, accidents, or injuries that could occur. Impacts would be similar to those described for construction.

5.2.1.7 Environmental Justice

This section describes the minority and low-income populations within the West, Central, and East sections and the potential for disproportionately high and adverse impacts to those populations from the proposed Project.

Executive Order 12898 and Associated Guidance

Environmental justice refers to a federal policy established by Executive Order 12898 (59 Federal Register 7629) under which federal agencies must identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority or low-income populations. The CEQ's "Environmental Justice: Guidance Under the National Environmental Policy Act" (1997), followed by the EPA's "Final Guidance for Incorporating Environmental Justice Concerns in EPA's NEPA Compliance Analyses" (1998, reference (41)) were developed to provide EPA and other federal agencies, including DOE, a process for identifying environmental justice communities and addressing potential impacts to them. According to these guidance documents, the basic components of an environmental justice assessment should include:

- A demographic assessment of the affected community to identify minority and low-income populations that may be present; and
- An integrated assessment to determine whether any adverse impacts would disproportionately affect minority and low-income populations.

U.S. Census data was used to identify low-income and minority populations. Low-income and minority populations are determined to be present in an area when the minority group or low-income percentage in an affected area exceeds 50 percent or is "meaningfully greater" than in the general population of the larger surrounding area. In this analysis, a difference of 10 percentage points or more was established as the threshold that distinguished whether a minority or low-income group percentage in an ROI census tract was "meaningfully greater" than that group's percentage in the ROI. The following groups are considered to be minorities: Black, not of Hispanic origin; American Indian or Alaskan Native; Asian or Pacific Islander; or Hispanic.

The ROI for this analysis of environmental justice includes the census tracts intersected by the ROWs of the proposed routes and variations (Map 5-3). Census tracts are relatively permanent statistical subdivisions of a county, created for the purpose of collecting statistical data and confirmed or updated every ten years. Populations in census tracts vary from 1,200 to 8,000 people, with an optimum size of 4,000 people, and the geographic size of each census tract can vary widely depending on its population density (U.S. Census Bureau 2012, reference (42)). The census tracts intersected by the ROWs of the proposed routes and variations are the best approximation of the geographic area within which potential disproportionate adverse impacts from the proposed Project could occur. The five counties that contain the census tracts in the ROI are considered representative of the general population in the area surrounding the proposed Project, against which census tract demographic and poverty data can be compared. In this analysis, this five-county region is referred to as the region of comparison (ROC), meaning the general population against which census tract data were compared. Map 5-3 depicts the location of the census tracts in the ROI, as well as the five counties that comprise the ROC, or general population, around the proposed Project.

Environmental Justice for the ROI

This section provides demographic information about the five-county ROC and census tracts in the ROI in the West, Central, and East sections. The demographic information is focused on minority and

low-income populations, which have the potential to be environmental justice communities.

Minority Populations

Table 5-9 identifies the minority population distribution for the combined population in the five-county ROC and in the individual counties that contribute to its composition. Statistics for the state of Minnesota are also included in for comparison. Data for all counties are derived from the U.S. Census five-year estimates from the 2008-2012 American Community Survey and data for the state are from the one-year estimate from the 2012 American Community Survey (U.S. Census Bureau 2012, reference (43), reference (42)).

As illustrated in Table 5-9, most minority groups in the ROC counties comprise less than three percent of the population, with the exception of the American Indian and Alaskan Native group percentage which range from 1.6 to 22.1 percent. Minnesota is home to several American Indian tribes and reservation lands, with some located in Beltrami, Koochiching, and Itasca counties. In the ROC, the American Indian and Alaskan Native population makes up 10.6 percent of the population, compared with 1.9 percent in Minnesota. It should be noted that the proposed routes and variations, including the Applicant's proposed routes, were designed to avoid directly impacting tribal reservation or trust lands. When all racial minority groups are combined, the five-county ROC racial minority population is slightly less than for Minnesota. The Hispanic or Latino ethnicity is not included in the total racial minority population percentage because it can be claimed by a person of any race. The Hispanic or Latino ethnicity is therefore included separately and reflects an ethnic minority. The Hispanic or Latino ethnic minority group in the five-county ROC consists of 1.1 percent of the population.

As stated, the ROI for this analysis of environmental justice includes the census tracts intersected by the ROWs of the proposed routes and variations. The ROI includes 13 census tracts in the five counties (Map 5-3). The minority percentages of the census tracts in the ROI were compared with the five-county ROC to determine if any census tract had meaningfully greater (i.e. ten percentage points or more) minority populations than in the general population. Table 5-10 lists the racial and ethnic demographic statistics of the census tracts, the five-county ROC, and Minnesota.

None of the minority populations for the ROI census tracts listed in Table 5-10 exceed the ROC minority

Table 5-9 Minority Population Composition of Five-County Region of Comparison (ROC) and State of Minnesota

Jurisdiction	Total Population (number of persons)	White %	Racial Minority Populations (%)						Ethnic Minority[2] (%)
			Black or African American	American Indian & Alaskan Native	Asian	Native Hawaiian & Other Pacific Islander	Some Other Race	Total Racial Minority	Hispanic or Latino Ethnicity
State of Minnesota	5,379,139	87.8	6.4	1.9	4.7	0.1	1.6	14.7	4.9
ROC[1]	122,701	89.4	1.0	10.6	1.1	0.2	0.3	13.2	1.1
Roseau County	15,665	95.9	0.5	1.9	2.8	0.0	0.4	5.6	0.8
Lake of the Woods County	4,039	97.0	1.5	1.6	1.4	0.0	0.0	4.5	0.0
Beltrami County	44,652	78.3	1.7	22.1	1.1	0.4	0.3	25.6	1.6
Koochiching Count	13,293	95.8	0.5	4.1	0.4	0.0	0.6	5.6	1.1
Itasca County	45,052	95.6	0.7	4.9	0.6	0.1	0.4	6.7	1.0

Source(s): U.S. Census Bureau 2012, reference (44)

Note(s): Persons may opt to identify with more than one racial minority, therefore, the sum of all racial categories in the table may equal more than 100%.

(1) Region of Comparison (ROC) for the environmental justice analysis includes the five counties traversed by the proposed routes and variations. ROC values are not a simple average of the five ROC counties. The ROC is calculated by dividing the total population for a minority in the five ROC counties by the total population of the ROC counties.

(2) The Hispanic or Latino ethnicity is not included in the total racial minority population percentage as it can be claimed by a person of any race. The Hispanic or Latino ethnicity is therefore included separately and reflects an ethnic minority.

Table 5-10 Minority Population Composition in Census Tracts Traversed by the Proposed Project Routes and Variations, Region of Comparison (ROC), and State

Area	Census Tract	Total Population (number of persons)	White %	Racial Minority Populations (%)						Ethnic Minority[3] (%)
				Black or African American	American Indian & Alaskan Native	Asian	Native Hawaiian & Other Pacific Islander	Some Other Race	Total Racial Minority[1]	Hispanic or Latino Ethnicity
State of Minnesota	NA	5,379,139	87.8	6.4	1.9	4.7	0.1	1.6	14.7	4.9
ROC[2]	NA	122,647	89.4	1.0	10.6	1.1	0.2	0.3	13.2	1.1
Roseau County	9701	4,249	88.6	0.2	4.5	8.2	0.0	0.0	13.0	0.0
	9702	2,153	99.8	0.7	1.3	0.3	0.0	0.0	2.3	0.7
	9703	3,869	96.6	1.2	1.2	1.4	0.0	1.4	5.2	1.2
	9704	3,596	99.4	0.4	0.8	0.4	0.0	0.1	1.7	0.9
Lake of the Woods County	4603	1,628	95.3	1.8	3.3	1.7	0.0	0.0	6.9	0.0
	4604	2,411	98.2	1.3	0.4	1.2	0.0	0.0	2.9	0.0
Beltrami County	4505	1,714	98.8	0.1	1.2	0.0	0.0	0.4	1.6	0.0
Koochiching County	7903	3,070	96.9	0.3	2.9	0.6	0.0	0.0	3.8	0.0
	7905	2,356	95.9	0.3	4.6	0.0	0.0	0.3	5.2	0.8
Itasca County	4801	2,541	97.2	0.3	2.3	0.8	0.0	0.2	3.7	1.3
	4804	3,564	97.2	0.3	2.0	0.6	0.0	0.9	3.8	1.3
	4806	2,569	99.4	0.4	1.2	0.2	0.0	0.0	1.8	0.0
	4810	5,861	97.0	0.3	5.0	1.6	0.1	0.5	7.6	2.2

Source(s): U.S. Census Bureau 2012, reference (44); U.S. Census Bureau 2012, reference (42)

Note(s): Persons may opt to identify with more than one racial minority, therefore, the sum of all racial categories in the table may equal more than 100%.

(1) Due to rounding, % Total Racial Minority may not total the individual race percentages.

(2) ROC values are not a simple average of the five ROC counties. The ROC is calculated by dividing the total population for a minority in the five ROC counties by the total population of the ROC counties.

(3) The Hispanic or Latino ethnicity is not included in the total racial minority population percentage as it can be claimed by a person of any race. The Hispanic or Latino ethnicity is therefore included separately and reflects an ethnic minority.

Table 5-11 2008-2012 Poverty and Income Characteristics of Five-County Region of Comparison (ROC) and State of Minnesota

Jurisdiction	Total Population (number of persons)	% Below Poverty Threshold (%)	Median Household Income (2102 dollars)
State of Minnesota	5,379,139	11.2	$59,126
ROC(1)	122,701	15.3	$45,178
Roseau County	15,665	10.4	$50,620
Lake of the Woods County	4,039	17.7	$41,979
Beltrami County	44,652	20.7	$44,038
Koochiching County	13,293	12.0	$40,167
Itasca County	45,052	12.5	$46,180

Source: U.S. Census Bureau 2012, reference (43)

(1) Region of Comparison (ROC) for the environmental justice analysis includes the five counties traversed by the proposed routes and variations. The ROC estimates are weighted averages calculated from the five counties.

percentage by 10 percentage points or more, which is the defined threshold of significance for potential environmental justice impacts from the proposed Project. The largest minority population in a single census tract is an Asian population that comprises 8.2 percent of Census Tract 9701 (Roseau County), compared with 1.1 percent in the ROC (Table 5-10). In all other instances in which a racial minority percentage in an ROI census tract exceeds the percentage in the ROC, the census tract percentage generally does not exceed the ROC by more than one percentage point. In addition to Census Tract 9701 in Roseau County which has the largest racial minority population, Roseau County Census Tract 9703, Lake of the Woods County Census Tracts 4603 and 4604, and Itasca County Census Tract 4810, have higher Asian percentages than the ROC, though the difference never exceeds more than 0.6 percentage points. In Lake of the Woods (Census Tracts 4603 and 4604) and Roseau (Census Tract 9703) counties, three census tracts have higher black or African American minority percentages than the ROC, although the difference is less than one percentage point. Four census tracts in Roseau (Census Tract 9703), Beltrami (Census Tract 4505), and Itasca (Census Tracts 4804 and 4810) counties have "some other race" percentages that exceed the ROC percentage by no more than 1.1 percentage points. None of the census tracts have a total racial minority population percentage that is larger than the total racial minority percentage in the ROC (Table 5-10). In addition, the percentage of American Indians in each of the census tracts that comprise the ROI is less than in the ROC.

In addition to certain racial groups, ethnic Hispanics or Latinos are considered minority groups for the purpose of environmental justice. Hispanics and Latinos can identify as any race and do not count toward the total racial minority percentage provided in Table 5-10. The percentage of Hispanics or Latinos in the ROC is 1.1 percent, and none of the ROI census tracts have Hispanic or Latino percentages that are significant compared with the ROC. One census tract in Roseau County and three census tracts in Itasca County exceed the ROC Hispanic or Latino percentage composition by 1.1 percentage points or less, which is not enough difference to be considered significant (Table 5-10). Overall, the other racial and ethnic minority statistics did not reveal significant differences between the minority populations in the individual ROI census tracts and the ROC.

Low-Income Populations

Table 5-11 lists the percentage of individuals living below the poverty level and the household median income in the five-county ROC and the contributing five counties. Following federal guidance documents, the percentage of low-income residents in a community can be estimated from the percentage of individuals living below the poverty level, reported by the U.S. Census Bureau (CEQ 1997, reference (45), EPA 1998, reference (41)). Statistics for the state of Minnesota are also included in for comparison.

According to the data in Table 5-11, the percentage of individuals living in poverty ranges from 10.4 to 20.7 percent in the five counties, and all but Roseau County have higher poverty percentages than the state average. The estimated poverty percentage in the five-county ROC is 15.3 percent. The median household incomes of the ROC and the constituent five counties are lower than in Minnesota.[72] The median household income in the ROC is approximately $45,178.

The low-income populations in the ROI census tracts, represented by the percentage living in poverty, were compared with the ROC to determine if any

72 A county with a higher median income than another county may also have a higher poverty percentage; the two statistics measure slightly different economic conditions.

Table 5-12 Percentage of Individuals Below the Poverty Line and Median Household Income in Census Tracts Traversed by the Proposed Project Routes and Variations, Region of Comparison (ROC), and State

Area	Census Tract	Below Poverty (%)	Median Household Income (based on 2012 dollars)
State of Minnesota	NA	11.2	$59,126
ROC(1)	NA	15.3	$45,178
Roseau County	9701	9.9	$50,444
	9702	7.1	$54,113
	9703	14.3	$47,585
	9704	10.5	$50,948
Lake of the Woods County	4603	10	$45,326
	4604	22.8	$41,387
Beltrami County	4505	18.2	$39,628
Koochiching County	7903	4.6	$61,512
	7905	13.9	$39,417
Itasca County	4801	15.2	$40,114
	4804	8.9	$52,052
	4806	8.5	$46,172
	4810	11.7	$42,422

Source(s): U.S. Census Bureau 2012, reference (43)

(1) ROC values are not a simple average of the five ROC counties. The ROC is calculated by dividing the total population for a minority in the five ROC counties by the total population of the ROC counties.

were greater (i.e. ten percentage points or more) than low-income population percentages in the ROC. Table 5-12 lists the percentage of individuals living below the poverty line and the median household income in the census tracts, ROC, and Minnesota.

None of the poverty percentages for the ROI census tracts listed in Table 5-12 exceed the ROC poverty percentage by 10 percentage points or more, which is the defined threshold of significance for potential environmental justice impacts from the proposed Project.

The largest low-income population in a single census tract is 22.8 percent in Census Tract 4604 (Lake of the Woods County), compared with a 15.3 percent low-income population in the ROC (Table 5-12). The only other census tract with a low-income population percentage that exceeds the ROC percentage is Census Tract 4505 (Beltrami County), with 18.2 percent of individuals living below the poverty line. The low-income percentages in the remainder of the ROI census tracts range from 7.1 to 15.2 percent.

Median household income is provided in Table 5-12 with additional detail about the economic conditions in the ROI census tracts and the ROC. The two census tracts (4604 and 4505) already noted for having larger low-income population percentages than the ROC also have lower median household incomes than the ROC. Three other census tracts in Koochiching and Itasca counties have lower median household incomes than the ROC, though these same census tracts have smaller low-income population percentages. The lowest median household income among the ROI census tracts is Census Tract 7905 (Koochiching County), approximately 13 percent less than the ROC median household income. The largest median household income among the census tracts is also in Koochiching County; Census Tract 7903 has a median household income approximately 36 percent greater than the ROC median income.

Subsistence Activities

The proposed Project routes and variations do not directly traverse Red Lake Indian Reservation or any other reservation lands held by the Minnesota Chippewa Tribe (comprised by White Earth, Bois Forte, Leech Lake, Mille Lacs, Grand Portage, and Fond du Lac Bands of Chippewa) and located in the area of proposed Project. However, the proposed routes and variations do cross lands that may be utilized by Red Lake Nation or Minnesota Chippewa Tribe members for subsistence activities. These lands include ceded lands with treaty rights for tribal members and other off-reservation lands (see Section 5.3.1.3 for more information about ceded lands with treaty rights). Members of Red Lake Nation Band of Chippewa Indians and Minnesota Chippewa Tribe engage in subsistence activities on ceded lands with treaty rights in addition to regular commercial activities to provide their basic needs.

Examples of subsistence activities include hunting and trapping, fishing, and gathering of nuts, berries, and vegetation. Subsistence activities not only have practical application but are also culturally and historically significant. Harvested natural resources are used primarily for food and raw materials, but also for medicinal or ceremonial purposes. They may also be used for trading or personal sale. Subsistence activities and the natural resources that support them help ensure that Red Lake Nation and Minnesota Chippewa Tribe members are able to sustain themselves and their families. For example, within the Red Lake Nation reservation, approximately 30.6 percent of the civilian labor force was unemployed as of 2013, and 45.1 percent of individuals were living below the poverty threshold and the median household income was $31,422 (US Census Bureau 2013, reference (46)). In 2013, the population of the Bois Forte Reservation had an 11.8 percent unemployment rate, a 20.4 percent poverty rate, and a median household income of $36,786. The population of the Fond du Lac Reservation and Off-Reservation Trust Land had an 8.3 percent unemployment rate, a 26.4 percent poverty rate, and a median household income of $45,161. The population of the Grand Portage Reservation and Off-Reservation Trust Land and had an 8.3 percent unemployment rate, a 20.2 percent poverty rate, and a median household income of $40,938. The population of the Leech Lake Reservation and Off-Reservation Trust Land had a 5.4 percent unemployment rate, a 25.7 percent poverty rate, and a median household income of $38,739. The population of the Mille Lacs Reservation and Off-Reservation Trust Land had an 8.2 percent unemployment rate, a 25.4 percent poverty rate, and a median household income of $34,865. The population of the White Earth Reservation and Off-Reservation Trust Land had a 6.4 percent unemployment rate, a 25.8 percent poverty rate, and a median household income of $37,043 (U.S. Census Bureau 2013, reference (46)). As such, natural resource procurement is vital to the Red Lake Nation and Minnesota Chippewa Indian populations.

Some of the primary subsistence activities conducted by members of Red Lake Nation or the Minnesota Chippewa Indians are described below.

Hunting and Trapping

Red Lake Nation and Minnesota Chippewa Tribe members may engage in hunting and trapping throughout the ROI. The proposed Project area comprises a variety of MnDNR state lands with varying degrees of hunting and trapping permissions, including WMAs, game refuges, forests, and state parks and recreation areas open to public hunting (MnDNR 2014, reference (47)). Federal lands where some hunting and trapping may be permitted include National WPAs, national forest land, and to a much lesser extent, National Wildlife Refuges. MnDNR publishes hunting and trapping regulations that govern hunting and trapping permissions by all persons, including the Red Lake Nation and Minnesota Chippewa Tribe members, except on the reservation lands and on ceded lands with treaties specific to the Red Lake Band of Chippewa and the Minnesota Chippewa Indians.

A variety of wildlife species are present throughout the project area and could be harvested through hunting and trapping activities including waterfowl (e.g. ducks and geese), non-migratory birds, small game species (e.g. cottontail rabbits, gray squirrels, etc.), Big game species are also hunted in the area but to a lesser extent and include white-tailed deer, moose, and bear. Trapping activities target furbearing animals like fox, badger, mink, and several others.

Fishing

The Red Lake Indian Reservation encompasses a portion of Upper Red Lake and all of Lower Red Lake, the largest lake fully within Minnesota borders. These lakes help sustain the Red Lake Nation Fishery commercial enterprise but are also used by members for subsistence fishing. The Red Lake Nation members fish in several waterbodies and watercourses throughout the ROI, both onshore and in boats and may employ methods besides just rod and reel (e.g. spear fishing). A diverse number of fish are targeted in Minnesota lakes and rivers, but the walleye is the species most associated with Red Lake Nation because of its abundance in Upper and Lower Red Lakes. Other fish species commonly caught include yellow perch, trout, small and large-mouth bass, and bluegill (Red Lake DNR 2015, reference (48)).

Gathering

Gathering activities can refer to hand harvesting of plants, berries, and herbs, and to more labor-intensive activities like harvesting timber. Wild rice is one of the most recognizable wild plants harvested in the state, readily associated with rural Minnesota and local Native American tribes, including the Red Lake Band of Chippewa Indians and members of the Minnesota Chippewa Tribe (MnDNR 2015, reference (49)). Minnesota has the largest acreage of naturally occurring wild rice in the country, and it is largely present in the northern lakes of the state, including in the ROI. Wild rice beds also serve as nesting cover by birds and as staging grounds

for hunters targeting waterfowl. Members of the Minnesota Chippewa Tribe are able to harvest wild rice on certain specified lakes with their tribal identification card, and not the state license required for all other harvesters (MnDNR 2008, reference (50)).

Wild rice grows best in water six inches to three feet deep, and production varies from year-to-year depending on local water conditions. Wild rice productivity can be threatened by changes in local hydrology, water quality, water-based recreation, and shore-based development (MnDNR 2008, reference (50)).

Members of the Red Lake Band of Chippewa Indians and the Minnesota Chippewa Tribe gather a variety of other plants and berries, potentially throughout the ROI and on lands traversed by the proposed Project routes and variations. Plants may be used for traditional and medicinal purposes, and also for building materials. Timber, tree bark, and sweet grass are all used for making traditional items like canoes and baskets. Gathered timber may also be used for home heating and for home construction.

General Impacts to Minority, Low-Income, and Subsistence Populations

None of the census tracts crossed by the proposed Project routes or variations have minority or low-income populations at levels indicating that minority or low-income populations in the designated ROI are significantly different from the general population, represented by the ROC. This indicates that minority or low-income groups would not be exposed to disproportionate impacts from construction, operation, maintenance, and emergency repair of the proposed Project. Furthermore, many of the impacts from construction, operation, and maintenance of the proposed Project on human populations would be short-term and localized.

The potential impacts resulting from the proposed Project on minority or low-income populations would not differ significantly among the proposed routes and variations considered, all of which fall within the ROI counties and the same census tracts. Therefore, environmental justice is not discussed further in Chapter 6 of this EIS.

Construction Impacts on Minority and Low-Income Populations

The majority of human health and environmental impacts from construction of the proposed Project would be localized and short-term, including the limited impacts on air quality, socioeconomics, transportation, and public service, described as part of Human Settlement in Section 5.2.1. None of the construction impacts would have disproportionately high and adverse impact minority or low-income populations in the ROI.

Operation, Maintenance, and Emergency Repair Impacts on Minority and Low-Income Populations

During operation, maintenance, and emergency repairs, human health effects would include impacts from EMFs, implantable medical devices, stray voltage, and induced voltage as described in Section 5.2.2. Minority and low-income populations would not be disproportionately affected by any of these human health or environmental impacts during construction or operation of the proposed Project because the populations living in the ROI do not have disproportionate percentages of minority or low-income residents.

The Applicant has developed avoidance and minimization measures as specified in Table 2-2 which would limit the impacts from construction and operation of the proposed Project on all populations in the general region. One of the primary mitigation measures to further environmental justice is public outreach to minority and low-income communities and tribes. The Applicant mitigation measures are potential MN PUC Route Permit conditions. The Applicant's public outreach efforts to date, while not specific to low-income or minority populations, are summarized in the Applicant's Route Permit Application and Presidential permit application (Minnesota Power 2014, reference (1).

General Impacts on Subsistence

Adverse impacts to subsistence-based economies may occur from the construction, operation, and maintenance, and emergency repair of the proposed Project in areas that traverse off-reservation or treaty lands where Red Lake Nation members engage in subsistence-based activities like hunting and trapping, fishing, and gathering. Adverse impacts may result from access to traditional hunting and gathering areas, a decrease in the acreage of areas available for subsistence activities, fragmentation of habitat, or introduction or spread of invasive species by disturbing the existing landscape and creating new corridors. Since potential impacts to subsistence activities resulting from construction, operation, maintenance, and emergency repair for any proposed route or variation considered do not vary, potential impacts to subsistence are not discussed further in Chapter 6 of the EIS.

Construction Impacts on Subsistence

During the construction period, subsistence activities may be temporarily affected in the construction areas due to access issues. The proposed Project will be able to span major watercourses for all proposed routes or variations, so construction is not expected to impact subsistence fishing or wild rice gathering except for potentially, temporarily, blocking access points for watercourses. Transmission line structures may be constructed in wetlands which could impact wild rice harvests if wild rice is present in those areas. Access for hunting, trapping, gathering, and harvesting of timber would likely be restricted for short periods of time along portions of the proposed Project while construction occurs but would then reopened for hunting and trapping and gathering activities when construction in that area is complete.

During construction, wildlife, including small and large game and waterfowl, may temporarily leave the construction area due to site disturbance activities, thereby reducing the productivity of hunting activities in these areas. Although this could potentially be offset by other wildlife species moving in to the area to take advantage of the habitat change. As discussed in more detail in Section 5.3.4.3, long-term impacts to wildlife species could occur as a result of the loss or conversion of forested or shrub habitat and the fragmentation of that habitat as it's converted to low-stature vegetation in the ROW. Wildlife species previously occupying forested communities in the ROW would be displaced in favor of species that prefer more open vegetation communities. Impacts would be expected to be wide-ranging in areas where new ROW would be created and more localized in situations where an existing ROW is expanded. The introduction and/or spreading of invasive species in locations where clearing occurs could result in long-term impacts to the vegetation composition of the ROW, and potentially influence wildlife activity in those areas affected in such a way that tribal members may be less successful in their hunting and trapping activities. The Applicant, as described in Section 2.11.1.5, will implement regular, frequent cleaning of construction mats on the ROW to avoid the introduction of and minimize the spread of invasive species.

Operation, Maintenance, and Emergency Repair on Subsistence

During operation, vegetation within the ROW would be maintained at a low stature and in some areas the vegetation in and around the ROW would return to a previous or similar state and would support many of the same species targeted by subsistence-based hunting, trapping, and gathering activities. Transmission line structures may be constructed in wetlands which could impact wild rice harvests if wild rice is present in those areas, although with a footprint of 33 square feet per structure, only a very small area of wild rice would potentially be displaced. In other areas, long-term adverse impacts may result from fragmentation of habitat caused by the construction, or from introduction or spread of invasive species by disturbing the existing landscape and creating new corridors. As a result, these areas may not support the same plant and animal species or the same abundance that was present prior to construction of the proposed Project and a long-term adverse impact could occur. However, there would still be a large amount of contiguous non-reservation lands and treaty lands would continue to be managed at the state and federal level to support hunting, fishing, and gathering activities, including subsistence activities by Native Americans like the Red Lake Band of Chippewa Indians and the Minnesota Chippewa Tribe so the changes from the proposed Project are expected to have a minimal impact on subsistence activities.

5.2.1.8 Socioeconomics

This section describes the socioeconomic resources within the West, Central, and East sections and the potential impacts from the proposed Project.

Socioeconomics is concerned with the relationship between economic attributes and the social characteristics of society. In this section, socioeconomic indicators are assessed and analyzed based on the potential construction and operation of the proposed Project. The major determinants of socioeconomic impacts for the proposed Project are the number and duration of workers in the region and the capital expenditures and ongoing revenues generated from the proposed Project.

The ROI for this analysis of socioeconomic impacts includes the counties intersected by the proposed routes and variations. From north to south, the ROI includes the counties of Roseau, Lake of the Woods, Beltrami, Koochiching, and Itasca as the majority of potential socioeconomic effects from the proposed Project would occur in these counties. The ROI counties would experience some economic benefit (for example, in the form of tax revenue), as well as increases in job opportunities from construction of the proposed Project. As a result, competition for construction labor and demand for temporary housing may also increase in these counties. Based on the existing labor force in the region, many workers required during construction of the proposed Project could be hired from ROI

Table 5-13 Population Trends in the ROI

Location	Population Trends					
	Number of Persons				Predicted Percent Change	
	2010	2012 Estimate	2020 Projection	2030 Projection	2010 to 2020	2020 to 2030
State of Minnesota	5,303,925	5,379,139	5,677,582	5,982,601	7.0%	5.4%
Roseau County	15,629	15,665	16,703	17,771	6.9%	6.4%
Lake of the Woods County	4,045	4,039	4,195	4,146	3.7%	-1.2%
Beltrami County	44,442	44,652	47,863	50,757	7.7%	6.0%
Koochiching County	13,311	13,293	13,738	13,758	3.2%	0.1%
Itasca County	45,058	45,052	48,339	48,865	7.3%	1.1%
Total ROI	122,485	122,701	130,838	135,297	6.8%	3.4%

Source(s): U.S. Census Bureau 2010, reference (54), U.S. Census Bureau 2012, reference (43), Minnesota State Demographic Center 2014, reference (55)

counties or other Minnesota jurisdictions nearby. An average of 120 construction workers would be employed annually during the estimated five years of construction. The remaining workers would be hired from other areas in or out of the state of Minnesota and would likely move temporarily near the proposed Project.

Potential impacts on population, employment, taxes and revenues, and housing are analyzed in the remainder of this section. All data are presented at the county and the state levels for comparison. Because the proposed Project is not expected to cause large population changes, further investigation of potential impacts on schools and public services (e.g., police and fire) was not conducted. Investigation of potential impacts on schools was not conducted because impacts on schools is largely determined by population changes (see "Population" heading in this section for more detail). The proposed Project's impacts on emergency services are discussed separately in Section 5.2.1.6.

Socioeconomics in the ROI

This section provides information on population and employment in the West, Central, and East sections.

Population

Table 5-13 provides a population summary for the individual counties in the ROI, the total ROI, and Minnesota. The 2012 population statistic reflects the current population, while the 2010 population and 2020 and 2030 projections illustrate the projected growth trends for the locations. The 2010, 2020, and 2030 populations are spaced in 10-year increments so that the predicted population percent change can be compared from one 10-year increment to the next. Population projections indicate how populations are expected to change in the vicinity of the proposed Project during the proposed Project's lifetime.

The counties in the ROI are largely rural with low overall population densities ranging from 3.1 to 17.8 persons per square mile (U.S. Census Bureau 2010, reference (51), 2012, reference (43)).[73] By comparison, the state of Minnesota has a population density of 67.6 persons per square mile (U.S. Census Bureau 2010, reference (51), 2012, reference (43)). Roseau County, at the northwest end of the proposed Project, is the third most populated county in the proposed Project area with 15,665 residents (2012 estimate). Lake of the Woods is the least populated of the ROI counties, with a population of 4,039. Koochiching County is similarly rural and lightly populated, especially considering its geographic size is almost twice as large as Roseau County; its population is 13,293 (2012 estimate). Beltrami and Itasca have larger populations and encompass more cities and towns than the other counties. Beltrami County has a population of 44,652 and includes Bemidji, a city of approximately 13,485 people. Itasca County has a population of 45,052 and is home to Grand Rapids, a city of approximately 10,865 (U.S. Census Bureau 2012, reference (53)).

Compared with Minnesota's population projections, Roseau and Beltrami are the only two counties projected to maintain a consistent growth rate from 2010 through 2030 (Table 5-13). Growth rates in all of the ROI counties and the state are projected to slow between 2020 and 2030, compared with the growth rates from 2010 to 2020. Only Lake of the Woods County is projected to have a negative growth rate at any point, although the growth rate for Koochiching County is predicted to slow to

73 Population densities were calculated by dividing the 2012 estimated population of each jurisdiction by its land area in square miles, reported in the most recent decennial U.S. Census in 2010.

almost zero between 2020 and 2030. Compared with Minnesota, the ROI's projected growth rate is similar in the first 10-year period (2010 to 2020) but comparatively low in the second 10-year period (2020 to 2030).

General Impacts on Population

No long-term population impacts are expected as a result of construction, operation, maintenance, or emergency repair of the proposed Project for any proposed route or variation considered. Therefore, population is not discussed further in Chapter 6 of this EIS.

Construction Impacts

The Applicant contracted with the Bureau of Business and Economic Research at the University of Minnesota–Duluth's Labovitz School of Business and Economics to study the potential economic impacts of the proposed Project, including indirect and induced job creation (University of Minnesota-Duluth 2013, reference (36)). During construction of the proposed Project, an average of 120 construction workers would be employed annually during the five years of construction from 2016 through 2020 (University of Minnesota-Duluth 2013, reference (36)). These workers would likely move from geographic section to section along the proposed Project route and would be divided into different crews performing different tasks along the corridor. In this scenario, smaller groups of workers would begin to spread out along the ROW, such that in any one year, the average workforce would not all be located in one county. Some workers would likely relocate temporarily to the ROI, but it is assumed that many could be hired locally given the large percentage of construction workers in the area and the number of unemployed (see "Employment" in this section). Because the final route for the proposed Project has not yet been determined by the MN PUC, the estimated percentage of workers that would be hired locally for the construction effort has not been calculated.

In some localized areas of the counties where populations are small, short-term increases in population caused by workers moving temporarily to the region would be noticeable in terms of temporary housing occupancy rates and local spending. However, it is unlikely that construction workers would permanently relocate to the area, particularly because no permanent jobs are expected to be created during operation and maintenance of the proposed Project. Therefore, population levels within ROI are not expected to change over the long-term as a result of construction of the proposed Project.

Operation, Maintenance, and Emergency Repair Impacts

No full-time or part-time workers are expected to be hired during operation of the proposed Project. Maintenance and emergency repairs would be performed by existing contractors. Therefore, population levels within ROI are not expected to change as a result of operation, maintenance, or emergency repairs of the proposed Project.

Employment

Table 5-14 provides a summary of the size and employment status for the civilian labor force in the ROI counties, the total ROI, and Minnesota. Civilian labor force is defined as employed non-military persons 16 years old and over and non-military unemployed persons 16 years old and over who were actively looking for work during the previous four weeks (U.S. Census Bureau 2012, reference (43)). The size of the civilian labor force varies with the population size in each county.

In 2014, approximately 6.1 percent of the ROI labor force was estimated to be unemployed (Table 5-14).

Table 5-14 Civilian Labor Force and Number Employed and Unemployed, 2014 Annual Average

Location	Civilian Labor Force[1]	Employed	Unemployed	Unemployment Rate
	Number of Persons (annual average)			%
State of Minnesota	2,992,649	2,863,378	129,271	4.3
Roseau County	9,167	8,832	336	3.7
Lake of the Woods County	2,373	2,255	118	5.0
Beltrami County	22,309	21,007	1,302	5.8
Koochiching County	6,517	5,946	571	8.8
Itasca County	22,586	21,083	1,503	6.7
Total ROI	62,952	59,123	3,830	6.1

Source(s): Minnesota Department of Employment and Economic Development 2014, reference (56)

(1) Civilian labor force is defined as employed non-military persons ("civilians") 16 years old and over and unemployed civilians 16 years old and over who were actively looking for work during the previous four weeks (U.S. Census Bureau 2012, reference (43)).

Figure 5-2 Annual Unemployment Rate, 2005-2014

Source(s): Minnesota Department of Employment and Economic Development, 2014, reference (56)

Note(s): Unemployment rates not seasonally adjusted.

The unemployment rate varies across the individual counties, and only Roseau County had an unemployment rate lower than Minnesota in 2014. Among the ROI counties, Koochiching County had the highest unemployment rate in 2014, while Itasca County had the highest number of unemployed persons.

Figure 5-2 shows the unemployment rate trends over the last 10 years for the ROI counties and Minnesota. This figure demonstrates how the unemployment rate trends in the ROI counties have been generally consistent with the unemployment changes in Minnesota. One recent exception is the slight rise in unemployment in Koochiching County from 2012 to 2014, during a period when unemployment rates were falling in the other counties and in the state. In the early part of the 10-year period, from 2005 to 2008, unemployment changes in Roseau County moved in directions opposite from the general trends in the remaining counties. All ROI counties and Minnesota had peak unemployment rates in 2009, and unemployment in all jurisdictions has steadily declined since that time, with the exception of Koochiching County, as noted.

Table 5-15 provides the number and percent employed in industry categories established by the U.S. Census Bureau, estimated from the 2008-2012 American Community Survey 5-Year Estimates (U.S. Census Bureau 2012, reference (43)). The leading employing industries within the five ROI counties include manufacturing; retail trade; arts, entertainment, recreation, and accommodation and food services; and educational services and health care and social assistance (Table 5-15). Minnesota shares three of the four highest employing industries in the ROI counties including manufacturing; retail trade; and educational services and health care and social assistance. The percent employment by the construction industry in three of the five ROI counties (Beltrami, Koochiching, and Itasca counties) is higher than for the state (Table 5-15). Employment in Roseau County is notable for its large percentage of workers employed in the manufacturing industry compared to the other ROI counties and the state. Beltrami, Koochiching, and Itasca counties are similar

Table 5-15 Percent Employment by Industry for ROI Counties based on the 2008-2012 American Community Survey 5-Year Estimates

Industry	Minnesota	Roseau County	Lake of the Woods County	Beltrami County	Koochiching County	Itasca County
	Percent					
Agriculture, forestry, fishing and hunting, and mining	2.4	4.4	8.8	2.8	3.9	4.4
Construction	5.6	4.2	3.7	7.1	7.0	8.8
Manufacturing	13.7	41.1	18.3	7.4	19.3	11.2
Wholesale trade	3.0	1.5	4.7	2.0	1.5	1.7
Retail trade	11.6	9.0	12.4	13.1	10.6	11.6
Transportation and warehousing, and utilities	4.6	3.1	2.5	4.7	6.3	5.4
Information	2.0	1.0	0.6	1.9	1.0	0.9
Finance and insurance, and real estate and rental and leasing	7.2	2.7	1.7	3.3	6.5	4.4
Professional, scientific, and management, and administrative and waste management services	9.5	2.4	1.3	5.3	4.9	6.6
Educational services, and health care and social assistance	24.4	17.3	11.7	32.1	21.2	27.0
Arts, entertainment, recreation, and accommodation and food services	8.1	7.1	22.4	11.1	8.8	10.0
Other services, except public administration	4.5	3.5	6.7	3.7	3.0	3.6
Public administration	3.4	2.7	5.2	5.4	5.9	4.4

Source(s): U.S. Census Bureau 2012, reference (43)

to the state in that the educational services and health care and social assistance combined industry employs the largest percentage of workers.

General Impacts on Employment

During construction, employment impacts in the ROI are expected to be minor and beneficial, both for the local construction workforce and for the service sectors that support construction. During operation, the proposed Project would not employ any new workers and would not impact local employment rates. This forecast would not change substantively among any combination of proposed routes or variations, because the distances between them are not great enough to result in different labor pools during the hiring of construction workers and related contractors. Since employment impacts resulting from the proposed Project are not expected to be long-term and do not vary by proposed route or variation considered, employment is not discussed further in Chapter 6 of this EIS.

Construction Impacts

During construction, an average of 120 construction workers would be employed annually during the five year construction period from 2016 through 2020. In the peak year of construction, the proposed Project would directly employ approximately 213 workers (University of Minnesota-Duluth 2013, reference (36)). Some skilled workers may need to be hired outside the ROI, while other construction jobs could be filled locally from existing labor pools. For example, in some of the most recent data estimates by the state and the U.S. Census Bureau, the ROI counties were estimated to have approximately 3,830 unemployed workers and 4,018 construction workers (Minnesota Department of Employment and Economic Development 2014; reference (56); U.S. Census Bureau 2012, reference (43)). Although these numbers would change before the start of construction, their magnitude indicates that there is currently a sufficient labor pool in the ROI to supply the number of construction workers required for the proposed Project. Because the final route for the proposed Project has not yet been determined by the MN PUC, the estimated percentage of workers that would be hired locally for construction has not been calculated.

In addition to direct jobs, the proposed Project would create approximately 18 indirect jobs and 24 induced jobs, for a total of 42 additional jobs supported annually above construction jobs. In

this case, indirect jobs are those created in related construction support industries as a result of spending by the proposed Project. Induced jobs result from additional household expenditures by workers directly or indirectly employed by the proposed Project. During the peak year of construction, a total of 73 indirect and induced jobs are anticipated to be added in industries serving the proposed Project construction or the workers, themselves. Some of the sectors expected to see higher employment rates include food services; architectural, engineering, and related services; and private hospitals (University of Minnesota-Duluth 2013, reference (36)).

The indirect and induced jobs would likely be spread across the ROI counties and could largely be filled by the local workforce because the majority of the indirectly supported jobs would be service-oriented and not highly specific (University of Minnesota-Duluth 2013, reference (36)). The variety of workers spread across employment industries in the ROI indicates there would be a sufficient workforce in the area (Table 5-15).

The employment impacts of the proposed Project during construction, while mainly short-term, are expected to be beneficial. Impacts would accrue locally because there is an existing labor supply in the ROI that can fill some of the direct, indirect, and induced jobs created by the proposed Project, and also regionally, as certain workers are hired from neighboring counties and the state. The new job opportunities in the ROI counties during the period of construction (five years) would be a beneficial impact, as would the potential increase in employment rates.

Operation, Maintenance, and Emergency Repair Impacts

No new full-time or part-time workers are expected to be hired to operate, maintain, or perform emergency repairs on the proposed Project. Maintenance and emergency repairs would be performed by existing firms and contractors. Therefore, operation, maintenance, and emergency repairs of the proposed Project are not expected to have an impact on employment in the ROI.

Taxes and Revenue

Property taxes in Minnesota are established and levied at the local level and primarily administered at the county level. Local property tax jurisdictions include cities, counties, townships, schools, and special taxing districts (Minnesota Revenue Department 2015, reference (57)). In Minnesota, local governments derive the majority of their funding from property taxes and state and federal grants (Association of Minnesota Counties 2010, reference (58)). According to preliminary property tax reports, counties collected approximately $2.75 billion in property taxes in 2014 (Minnesota Revenue Department 2015, reference (57)). As is the case for other local jurisdictions, property taxes are the largest source of revenue for most Minnesota counties, ranging from 30 to 50 percent of total revenue (Association of Minnesota Counties 2010, reference (58)).

In Minnesota, the corporate franchise tax applies to the profits of businesses taxed under subchapter C of the Internal Revenue Code. A business that transacts business or owns property in the state, regardless of its state of incorporation, is typically subject to the state's corporate franchise tax. In fiscal year 2014, Minnesota collected $1.3 billion in corporate franchise taxes (Minnesota Revenue Department 2015, reference (59)).

General Impacts on Taxes and Revenue

The proposed Project would be expected to have beneficial economic impacts in the ROI. The estimated tax and revenue impacts of the proposed Project would not differ according to the route or variation considered, because the values considered in this analysis are derived from estimated investment and spending on the proposed Project, regardless of its location. Taxes would be collected at the local, county, and state levels and tax rates would be set independently in each jurisdiction. Since the estimated tax and revenue impacts from the proposed Project would not vary according to proposed route or variation considered at this level of analysis, taxes and revenue are not discussed further in Chapter 6 of this EIS.

Construction Impacts

As previously stated, the Applicant contracted with the Bureau of Business and Economic Research at the University of Minnesota–Duluth's Labovitz School of Business and Economics to study the potential economic impacts of the proposed Project (University of Minnesota-Duluth 2013, reference (36)). At that time, the potential route options were more numerous and passed through nine counties, including the five ROI counties that contain the current proposed routes and route variations. Although the study considered the economic infrastructure and inter-industry relationships among nine counties rather than in five counties, the estimated dollar amounts are still indicative of the magnitude of spending triggered

by implementation of the proposed Project, for any proposed route and variation that might be selected.

The study estimated tax revenues, gross output, and value-added spending (reported in 2013 dollars) resulting from development and construction of the proposed Project. During the five year construction phase, the proposed Project would generate approximately $26.5 million in state and local taxes through compensation, business, household, and corporation taxes (University of Minnesota-Duluth 2013, reference (36)). Combined with taxes paid at the state and local level during the development (pre-construction) phase, the total state and local taxes generated by the proposed Project during pre-construction and construction would be approximately $28 million (University of Minnesota-Duluth 2013, reference (36)).

Direct expenditures by the Project on goods and services required to sustain construction would total approximately $591.7 million. This direct spending would generate additional indirect and induced spending, resulting in total "output" spending of $839.0 million in the counties surrounding the proposed Project routes and variations.[74] Output spending represents the value of local production required to sustain implementation of a development. In addition, the proposed Project would serve as an economic stimulus, resulting in "value-added" spending. Value-added spending measures the enhanced spending on wages, rents, interest, and profits in the local community that is attributed to implementation of the proposed Project (University of Minnesota-Duluth 2013, reference (36)). Direct value-added spending by the proposed Project during construction would total approximately $246.4 million. Combined with indirect and induced value-added spending, the total effect of direct, indirect, and induced value-added spending is estimated to be $379.3 million (University of Minnesota-Duluth 2013, reference (36)).

During construction, spending impacts from the proposed Project would be short-term, beneficial, and regional, for all proposed routes and variations. These economic impacts would result from direct and indirect activities associated with the proposed Project, as described above. Tax revenue impacts would be short-term, beneficial, and regional, accruing at the state and local level. It is not known what portion of the estimated taxes, output, and value-added spending would accrue to each county in the ROI, but the increases in estimated dollar amounts in the region as a whole indicate that spending and tax revenues in the ROI would be expected to be beneficial.

74 Indirect spending measures increased spending by industries supporting the proposed Project, and induced spending is a measure of increased consumer spending by workers.

Operation, Maintenance, and Emergency Repair Impacts

During the operation, maintenance, and emergency repair phase of the proposed Project, tax and other revenue impacts would be long-term, beneficial, and regional for the proposed routes and variations. The tax and revenues impact would generate revenue streams at the local, county, and state levels during the estimated lifespan of the proposed Project. For estimation purposes, it can be assumed that the proposed Project's estimated $591.7 million capital construction costs would be equivalent to the proposed Project's total value, against which property taxes would be levied in the local jurisdictions crossed by the proposed Project for the portion that falls within their boundaries. Other direct economic impacts would include hiring existing local or regional firms and contractors to periodically maintain or repair the transmission line. Some Minnesota Power customers would directly benefit from implementation of the proposed Project by having access to a new source of power, and the northern Minnesota region would benefit generally from the increased transmission capacity and enhanced power reliability.

Indirectly, the proposed Project's effect of increasing capacity and reliability of the regional utility service could support and potentially stimulate economic growth in the region. The increased power supply could benefit local businesses and public service providers and could permit expansion of the local economic base.

Housing

This section contains an inventory of temporary housing in the ROI counties that could potentially be available to (non-local) workers hired during construction of the proposed Project. The most likely housing types for temporary workers are hotels, motels, and RV campgrounds with "full" hookups, meaning hookups for water, electric, and sewer utilities. A list of all hotels, motels, and RV campgrounds were compiled from a web-based inventory maintained by Explore Minnesota Tourism Council, a publicly funded promotion entity (Explore Minnesota 2015, reference (60)). The inventory identifies accommodations in the state of Minnesota and within certain mile distances from any city in the state. The accommodations list can be filtered by category (e.g. hotel/motel or campground) and by amenities (e.g. campground electricity hookup).

Workers would seek accommodations near different geographic sections of the proposed Project, depending on where they were working at a given time during the construction period. The West, Central, and East sections were used for the housing analysis (Map 4-1). The temporary housing supply in each section was determined by inventorying temporary accommodations within a reasonable commuting distance of a centrally located town or towns within each section. A reasonable commuting distance was considered to be 50 miles or less, so that worker commutes would not generally exceed one hour. The towns and radial distances from each town were selected to avoid double counting of accommodations near each town. Table 5-16

Table 5-16 Temporary Housing Supply within Commuting Distance of Proposed Routes and Variations by Geographic Section of Proposed Project

Within commuting distance of	Hotels/ Motels (#)	RV campgrounds with full hookups (#)
West Section	12	20
Central Section	57	126
East Section	39	74
Total	108	220

Source(s): Explore Minnesota 2015, reference (60)

provides a summary of the hotels/motels and RV campgrounds available in the West, Central, and East sections.

The temporary housing supply within the West Section was approximated by hotels/motels and campgrounds within 50 miles of Roseau and 10 miles of Baudette. Housing in the area encompassed by these two "circles" was considered reasonable commuting distance from the proposed routes and variations in the West Section. The area includes at least 12 hotels/motels and 20 RV campgrounds with full hookups (Table 5-16; Explore Minnesota 2015, reference (60)). The temporary housing supply within the Central Section was approximated by hotels/motels and campgrounds within 50 miles of International Falls and 50 miles of Bemidji. The area includes at least 57 hotels/motels and 126 RV campgrounds with full hookups (Table 5-16; Explore Minnesota 2015, reference (60)). The temporary housing supply within the East Section was approximated by hotels/motels and campgrounds within 50 miles of Grand Rapids, near the proposed terminus of the proposed Project. The area includes at least 39 hotels/motels and 74 RV campgrounds with full hookups (Table 5-16; Explore Minnesota 2015, reference (60)).

The inventory of the temporary housing supply would not vary with the different proposed routes or variations because they are not distant enough from each other to draw on geographically distinct housing supplies. All maintenance and emergency repairs would be conducted by locally and/or temporarily contracted service providers. An inventory of permanent housing in and near the ROI was not conducted because no permanent workers are expected to be hired during operation of the proposed Project; therefore, permanent housing demand in the ROI would not be expected to increase.

General Impacts on Housing

Given the available temporary housing supply in each geographic section of the proposed Project, the short-term construction period, and the short-term shifts at any one location as workers move across the route, impacts to temporary housing would not be expected. No new full-time or part-time workers are expected to be hired to operate, maintain, or perform emergency repairs on the proposed Project, so no workers are expected to require housing once operation commences. Since potential impacts related to housing are not expected from construction and operation of the proposed Project for any proposed route or variation considered, housing is not discussed further in Chapter 6 of this EIS.

Construction Impacts

In the West Section, the temporary housing supply is small, but could be sufficient to house skilled laborers and other non-local workers hired temporarily during construction. If all 213 workers employed during the peak construction period were hired from out of town and moved temporarily to the West Section simultaneously, they could feasibly be housed among the 12 hotels and motels and 20 RV campgrounds with full hookups that currently serve the region. More likely, some workers would be hired locally and would not need temporary housing, and not all workers employed during the peak would be stationed in the West Section concurrently. In the Central and East Sections, the temporary housing supply is larger than in the West Section and would be more than sufficient to house construction workers. As stated, the maximum number of workers that would move to any geographic section temporarily would be 213 workers. Because the average number of workers annually employed for construction of the proposed Project would be 120 workers and the workers would not typically all be working in one geographic section at the same time, the average number of workers moving to a

geographic section would be expected to be much less. Some construction workers would be hired locally and would not require temporary housing (see "Employment" heading in this section for more detail). Even if all workers were hired from outside the region and required temporary housing near the proposed routes and variations in each geographic section, there would be sufficient housing capacity.

Short-term beneficial impacts would result in localized economic benefits to proprietors of the hotels, motels, and RV campgrounds rented by temporary workers. Adverse impacts during construction, if any, would be short-term high occupancy rates that prevent visitors to the region from staying in their preferred accommodations, though this is not likely given the available temporary housing supply.

Operation, Maintenance, and Emergency Repair Impacts

No new full-time or part-time workers are expected to be hired to operate, maintain, or perform emergency repairs on the proposed Project, so no workers are expected to require housing once operation commences.

Natural Resource-Based Economies

As described in Section 5.2.1.7, the proposed routes and variations do not cross Red Lake Indian Reservation or any other reservation lands held by the Minnesota Chippewa Tribe. However, the proposed routes and variations do cross lands that may be utilized by tribal members for subsistence and natural resource-based economic activities. These lands include ceded lands with treaty rights for Red Lake Nation and Minnesota Chippewa Tribe members and other off-reservation lands (see Section 5.3.1.3 for more information about ceded lands with treaty rights). Members of Red Lake Nation tribe of Chippewa Indians engage in subsistence activities on ceded lands with treaty rights in addition to commercial activities to generate income.

Based on data from the five-year estimates calculated by the U.S. Census Bureau from the 2009-2013 American Community Survey, the estimated unemployment rate in Red Lake Nation was 30.6 percent compared with Beltrami county (county in which the greatest population of the Red Lake Nation is located; 11.8 percent) and the state (7.1 percent) (U.S. Census Bureau 2013, reference (46)). The estimate for median household income in the Red Lake Nation was approximately 36.1 percent less than Beltrami County's, and both were considerably less than the state of Minnesota's median earnings estimate. According to U.S. Census Bureau estimates for 2013, the median household income in the Red Lake Nation communities was $31,422, compared with $43,231 in Beltrami County and $59,836 in Minnesota. The per capita income in Red Lake Nation was approximately half the per capita income in Beltrami County and one-third the per capita income in the state. The percentage of the Red Lake Nation residents living below the poverty threshold was estimated to be 45.1 percent, compared with 21.9 percent in Beltrami County, and 11.5 percent in Minnesota. Subsistence activities, which are not captured in employment and earnings statistics, supplement Red Lake Nation members' needs to varying extents and are discussed in more detail in Section 5.2.1.7.

Some tribal member rely on subsistence activities to supplement earnings and income and help meet their basic needs. Red Lake Nation members engage in hunting, gathering, and harvesting of other natural resources on their reservation lands as well as on other lands, including state forest lands, federal forest land, and U.S. Fish and Wildlife Service (USFWS) interest lands. More information on the Red Lake Nation's treaty rights for hunting, gathering, and other activities on lands outside the reservation is discussed in Section 5.3.1.3. The natural resources on lands outside the reservation help supplement and sustain the subsistence-based and natural resource-based economic activity conducted by Red Lake Nation members. Some of these lands and waterbodies are crossed or are adjacent to the proposed routes and variations, and thus potential impacts to these natural resource-based economies could occur.

Member of the Red Lake Band of Chippewa Indians have developed several commercial enterprises based on procuring and selling natural resources from the Reservation lands as well as treaty lands. These commercial-oriented activities include, but are not limited to, wild rice harvesting, plant and berry gathering, commercial fishing, and timber harvesting. Red Lake Nation has established several eponymous businesses that provide goods derived from natural resources:

- Red Lake Farms, Inc., (also known as Red Lake Nation Foods) produces and sells cultivated wild rice in addition to foods made from locally gathered resources. Additional food products include wild fruit jellies, jams, and syrups, batter mixes, popcorn, herbal tea, handmade birch bark baskets, and jewelry and gifts. The company sells its products both to retailers and directly to individuals through its websites (Red Lake Nation Foods 2015, reference (61)).

- Red Lake Nation Fishery, Inc., harvests and processes walleye and other freshwater fish caught wild by tribal members. The fish are sold online and in stores in several states around the U.S. Red Lake Nation Fishery first started operations in 1919, and by 1929, the Red Lake Walleye was known around the country (Red Lake Fishery 2015, reference (62)).
- Red Lake Forest Projects, Inc., sells products made from timber harvesting (Red Lake Nation 2015, reference (63)).

General Impacts on Natural Resource-Based Economies

Construction or operation of the proposed Project could potentially impact the economic activities of Red Lake Nation, chiefly by impacting the availability of natural resources used for natural resource-based economies. Potential direct and indirect impacts include the following:

- Removal of natural resources, e.g. timber, or of wildlife habitat;
- Degradation of the quality of natural resources or habitat left in place;
- Limitation of access to habitats or resources; and
- Indirect impacts on natural resources-based commercial enterprises or subsistence-based trade economies that result from change in quantity or quality of natural resources and habitats.

Construction Impacts on Natural Resource-Based Economies

One of the primary socioeconomic activities affected by construction of the proposed Project would be timber harvesting. Currently, Red Lake Nation members harvest timber on forest land crossed by the proposed routes and variations. In the short-term, the initial timber removal from the ROW may create some positive impacts for members of Red Lake Nation participating in either timber harvesting or forest products enterprises by boosting activity in those industries. In the long-term, the permanent timber removal in the ROW may cause a localized adverse impacts by taking those areas out of timber production. The multiple routes and variations that constitute the alternatives of the proposed Project would result in different amounts of removed forestland. None of the alternatives, however, are expected, to remove forestland in amounts that would preclude ongoing timber harvesting in the area, given the amount of surrounding forest in the region (see discussion of forestry in Chapter 6).

As discussed in Chapter 6, the Project has been designed to avoid placement of transmission line structures within water bodies or other watercourses. Therefore, no direct impacts to lakes or streams where fishing occurs are anticipated. During construction of the proposed Project, access to certain waterbodies areas could potentially be limited due to construction near waterbodies. These impacts would be of localized and short-term, and would not cause impacts to the overall level of commercial fish harvesting by Red Lake Nation.

Transmission line structures may be constructed in wetlands which could impact wild rice harvests if wild rice is present in those areas. Similarly, structures may be placed in environments that support the growth of wild berries and other herbs collected by Red Lake Nation members for subsistence or commercial purposes. Construction activities may temporarily restrict access to these gathering areas. Because of the temporary nature of construction activities, and because no construction activities will take place on reservation lands where much of the land-based food products are hand harvested, construction of the proposed Project is not expected to cause long-term adverse impacts on the overall food harvest levels for subsistence or commercial activities.

Operation, Maintenance, and Emergency Repair Impacts on Natural Resource-Based Economies

Operation of the proposed Project could potentially cause minor, long-term impacts to timber harvesting by permanently converting existing forested areas to low-stature vegetated areas in the ROW of the proposed Project. Any previously forested area in the proposed Project's 200-foot ROW would not be viable areas for timber harvesting for the life of the proposed Project. The proposed Project's different routes and variations would result in differing amounts of cleared forest but none of which are expected to have an adverse impact on timber harvest levels given the amount of surrounding forest in the region (see discussion of forestry in Chapter 6).

The proposed Project would not adversely impact commercial fishing because the proposed Project has been designed to avoid placement of tower structures in any waterbodies or watercourses. However, structures could be placed in wetlands, potentially impacting the availability of natural resources like wild rice although the with a footprint

of 33 square feet per structure, only a very small area of wild rice would potentially be displaced.

Other potential impacts to the natural resources that support subsistence-based and natural resource-based economies include fragmentation of habitats or introduction or spread of invasive species by disturbing the existing landscape and creating new corridors. The spread of invasive plant species could outcompete vegetation that Red Lake Nation gathers for commercial sale. These impacts are expected to be adverse, localized, and potentially long-term.

5.2.1.9 Recreation and Tourism

This section describes the existing recreation and tourism resources in the vicinity of the proposed Project routes or variations.

Recreational uses have been identified by reviewing of aerial photographs and data from the Minnesota Department of Natural Resources (MnDNR). The ROI for this analysis of impacts to recreation includes county, state, and federal parks and forests, state Scientific and Natural Areas (SNAs), state trails, scenic byways, and snowmobile and water trails that are located within 1,500 feet of the anticipated alignment of the transmission line and within 1,500 feet of the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites. This ROI was identified because recreation features within these areas are most likely to experience direct or indirect impacts from the proposed Project.

Recreation and Tourism in the ROI

The region is primarily rural with recreation opportunities available in several state parks and state forests. Services such as restaurants and hotels, for tourists visiting the parks and forests, are concentrated in the nearby communities and population centers.

State forests in the ROI include the Lost River, Beltrami Island, Lake of the Woods, Pine Island, Smokey Bear, Red Lake, Big Fork, Koochiching, and George Washington (Map 5-5, Map 5-12, and Map 5-19). Recreational opportunities in these state forests include camping, hunting, birdwatching, hiking, canoeing/kayaking, picnicking, horseback riding, snowmobiling, boating, and fishing. State forests are managed by the MnDNR Division of Forestry. The forests are open year round, however hunting is only allowed during appropriate seasons (MnDNR 2015, reference (64)).

State parks include the Hayes Lake and Zippel Bay, Big Bog State Recreation Area, Franz Jenve, Scenic State Park, McCarthy Beach, and Hill-Annex Mine (Map 5-5, Map 5-12, and Map 5-19). These parks offer opportunities for wildlife and bird watching, hiking, mountain biking, cross country skiing, snowmobiling, camping, fishing, and swimming. The state parks are managed by the MnDNR and are open year round (MnDNR 2015, reference (65)). Additionally, the Taconite State Trail is used for hiking, horseback riding, and mountain biking and would be crossed by the proposed Project route in the central part of the East Section (Map 5-19).

Scenic byways include Minnesota State Highway 11 (Waters of the Dancing Sky Scenic Byway), Minnesota State Highway 38 (Edge of the Wilderness Scenic Byway) near Effie, and Minnesota State Highway 46 (Avenue of the Pines Scenic Byway) near Northome. There are also several snowmobile trails located throughout the ROI that would be crossed by the proposed routes and variations. Recreational uses are shown on Map 5-5, Map 5-12, and Map 5-19. Many of the recreational activities are seasonally dependent, with snowmobiling and skiing occurring in the winter months, and boating, canoeing/kayaking, and swimming occurring in summer months.

General Impacts on Recreation and Tourism

Impacts to recreation and tourism due to construction of the proposed Project are expected to be short-term and localized in nature, lasting only for the duration of construction. Once constructed, the proposed Project components, such as the overhead transmission line, could have long-term direct and indirect aesthetic impacts in the ROI as a result of obstruction of scenic views or detracting from the setting of nearby recreational activities. Potential impacts from the proposed Project could result in long-term indirect impacts to recreation and tourism. While potential impacts to recreation and tourism could be long-term, they would not vary by proposed route or variation considered, as the proposed Project would be expected to cross state forests and have a similar impact wherever it is visible; therefore, recreation and tourism are not discussed further in Chapter 6 of this EIS.

Impacts from Construction

Direct impacts on recreation and tourism due to construction of the proposed Project are expected to be short-term and localized in nature, lasting only for the duration of construction. Impacts may

include increased noise and dust in the proposed Project area, which could detract from nearby recreational activities, discourage tourism, and could affect the setting of non-motorized recreational activities as well as displace wildlife during hunting season. These effects would cease once construction was completed. Construction of proposed Project components across rivers or snowmobile trails could temporarily disrupt recreational users of these amenities. Overall, these impacts may result in a temporary reduction in the number of tourists visiting the ROI and money spent at local businesses. However, construction workers would be expected to visit state forests and parks and would likely stay at local hotels or campsites during construction, potentially off-setting the reduction in tourists. These effects would cease once construction was completed and tourists would be expected to return to the area.

Mitigation measures could include conducting the construction activities during off peak-seasons when fewer recreational users are present or providing alternative routes around the construction zone. Once construction has been completed, these areas would again be available for outdoor recreational uses. Therefore, construction of the proposed Project is not expected to result in ongoing or long-term impacts to recreation and tourism.

Impacts from Operation, Maintenance, and Emergency Repairs

Once constructed, proposed Project components, such as the overhead transmission line, could have long-term direct and indirect aesthetic impacts in the ROI that may obscure views of, or from, scenic vistas and detract from the setting of nearby recreational activities. Potential aesthetic impacts of the proposed Project are discussed in Section 5.3.1.1.

Most recreational activities (e.g., hiking, snowmobiling, mountain biking, bird watching, etc.) can be done safely in transmission line ROWs, but certain activities are not recommended and could result in public safety hazards. Activities to be avoided include flying kites or model planes near transmission lines and building fires under transmission lines (Bonneville Power Authority 2007, reference (66); Great River Energy n.d., reference (67)). In addition, hunting activities in close proximity to a transmission line increases the risk for shooting insulators or conductors which can break wires and cause an electrical discharge arc (Great River Energy n.d., reference (67)).

Implementation of proper signage and restricted access to the proposed Project transmission line routes and variations, substation, and compensation facilities would reduce the potential for public health and safety hazards from recreational activities.

5.2.2 Public Health and Safety

Transmission line projects have the potential to impact public health and safety during construction, operation, maintenance, and emergency repairs. Within this section, public health and safety includes EMF, implantable medical devices, stray voltage, induced voltage, intentional destructive acts, and environmental contamination.

Potential public health and safety impacts during construction of a transmission line include construction site accidents and encountering contaminated soils and groundwater. During operations, the potential health and safety impacts from a transmission line could potentially involve an increase in EMFs, stray voltage, induced voltage, intentional destructive acts, electrocution hazards, potential aircraft accidents during inspections or due to potential collisions with new transmission lines, and potential hazardous materials spills at the proposed Blackberry Substation and 500 kV series compensation station. Further discussion of each type of impact as it relates to the proposed Project is provided below.

5.2.2.1 Electric and Magnetic Fields

This section describes EMFs and potential impacts to public health and safety from the proposed Project.

EMFs are invisible areas of energy produced by the movement of electrons and are produced by power lines, wiring, and electrical appliances (National Cancer Institute 2014, reference (68)). Naturally occurring EMFs are caused by the earth's weather and geomagnetic field and mainly occur in the form of static fields, which can induce currents in moving and rotating objects (National Institute of Environmental Health Sciences (NIEHS) 2002, reference (69)). Human-made EMFs are caused by electrical devices and are characterized by their wavelength, amplitude (strength), and the frequencies at which they alternate, that is, the rate at which the fields change direction each second. All alternating current (AC) electrical lines in the United States have a frequency of 60 cycles per second or 60 Hertz (Hz). EMFs at this frequency level are known as extremely low frequency EMFs. Electric fields are produced by voltage and increase in strength as the voltage increases (NIEHS 2002, reference (69)). Electric field strength is measured in kilovolts per meter (kV/m), and the strength of an electric field decreases rapidly as the distance from

the source increases. Electric fields are easily shielded or weakened by most objects and materials, such as trees or buildings.

Magnetic fields result from the flow of electrical current (measured in amps) moving through wires or electrical devices. The strength of a magnetic field is proportional to the electrical current, and is typically measured in milliGauss (mG). As with electric fields, the strength of a magnetic field decreases rapidly as the distance from the source increases. Unlike electric fields, however, magnetic fields are not easily shielded or weakened by objects or materials (NIEHS 2002, reference (69)).

Overhead transmission and distribution lines produce both electric and magnetic fields. At a distance of 300 feet and at times of average electricity demand, the magnetic fields from electric transmission lines could be similar to typical background levels found in most residences. The distance at which the magnetic field from the transmission line becomes indistinguishable from typical background levels differs depending on the type of transmission line. At substations, in general, the strongest EMF results from the transmission lines entering and leaving the facility. The strength of the EMF from equipment within the substations, such as transformers, reactors, and capacitor banks, decreases rapidly with increasing distance. Beyond the substation fence or wall, the EMF produced by the substation equipment is typically indistinguishable from background levels (NIEHS 2002, reference (69)).

A U.S. government study conducted by the EMF Research and Public Information Dissemination Program determined that most people in the United States are on average exposed daily to magnetic fields of two mG or less (NIEHS 2002, reference (69)). Typical magnetic field strengths near common office and home sources are shown in Table 5-17.

A concern related to EMF is the potential for adverse health effects due to EMF exposure. In the 1970s, epidemiological studies indicated a possible association between childhood leukemia and EMF levels. Since then, various types of research have been conducted to examine EMF and potential health effects, including animal studies, epidemiological studies, clinical studies, and cellular studies. Scientific panels and commissions have reviewed and studied this research data (Appendix K). In general, these studies concur that:

- Based on epidemiological studies, there is an association between childhood leukemia and EMF exposure. There is no consistent association between EMF exposure and other diseases in children or adults.
- Laboratory, animal, and cellular studies fail to show a cause and effect relationship between disease and EMF exposure at common EMF levels. A biological mechanism for how EMF might cause disease has not been established.
- Because a cause and effect relationship has not been established, despite an association between childhood leukemia and EMF exposure, there is uncertainty as to the potential health effects of EMF and no methodology for estimating health effects based on EMF exposure.

Animal scientists have also investigated the potential effects of EMF exposure to livestock. Mammals share similar biochemical mechanisms and physiologies as humans, and the potential effects of EMF exposure have been discussed in animal science literature. Large four-legged animals such as cattle, bison, horses, swine, and sheep are exposed to EMFs in grazing or pasture lands with transmission lines, and in barns and pens. The areas of interest and economic importance that have been studied most intensively are dairy cow productivity (milk production), a sensitive indicator of overall health, reproductive success, morbidity and mortality, weight gain, and health indicators from veterinary treatment records. Lee (1996, reference (70)) provided a concise review of a number of studies with long-term exposures of livestock to 50- or 60-Hz transmission line EMF. Results from a number of controlled, long-term studies on milk

Table 5-17 Typical Sources of Magnetic Fields

Source	Distance from Source:			
	0.5 foot	1 foot	2 feet	4 feet
	Typical Magnetic Fields (mG)			
Air Cleaners	180	20	3	-
Copy Machines	90	20	7	1
Florescent Lights	40	6	2	-
Computer Displays	14	5	2	-
Hair dryers	300	1	-	-
Baby Monitor	6	1	-	-
Microwave Ovens	200	4	10	2
Vacuum Cleaner	300	60	10	1
Color Televisions	N/A	7	2	-

Source(s): NIEHS 2002, reference (69)

production, animal health, reproductive success, behavior, growth, and immune system function were consistent in finding no effects for several species, with most studies showing no influence from the transmission line.

Appendix K provides further detailed background about EMF health impact research on humans and livestock.

EMF Standards

There are currently no federal regulations for allowable electric or magnetic fields produced by transmission lines. A number of states, including Minnesota, have developed state-specific regulations (Table 5-18), and a number of international organizations have adopted standards for EMFs (Table 5-19).

The MN PUC established a standard that limits the maximum electric field under transmission lines to 8 kV/m. All transmission lines in Minnesota must meet this electric field standard. Since no quantitative standard has been established for magnetic fields in Minnesota, the MN PUC has also adopted a prudent avoidance approach in routing transmission lines and, on a case-by-case basis, considers mitigation strategies for minimizing EMF exposure levels associated with transmission lines.

The ROI for the analysis of EMF includes a 600-foot buffer (300 feet from the anticipated alignment) along the proposed routes and variations within the West, Central, East sections, as well as the proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations. When the proposed transmission line routes are collocated with existing transmission lines, the ROI

Table 5-18 Limits on Electric and Magnetic Fields Near High Voltage AC Transmission Lines for Various States

State	Area where limits applies	Field	Limit
Florida	Edge of ROW	Electric	2 kV/m (lines ≤ 500 kV)
		Magnetic	150 mG (lines ≤ 230 kV 200 mG (>230 kV - ≤ 500) 250 mG (>500 kV)
	On ROW	Electric	8 kV/m (≤230 kV) 10 kV/m (>230 kV - ≤ 500) 15 kV/m (>500 kV)
Minnesota	On ROW	Electric	8 kV/m
Montana	Edge of ROW(1)	Electric	1 kV/m
	Road crossings	Electric	7 kV/m
New Jersey	Edge of ROW	Electric	3 kV/m
New York	Edge of ROW	Electric	1.6 kV/m
		Magnetic	200 mG
	Public road crossings	Electric	7 kV/m
	Private road crossings	Electric	11 kV/m
	On ROW	Electric	11.8 kV/m
Oregon	On ROW	Electric	9 kV/m

Source(s): National Institute of Environmental Health Sciences 2002, reference (69)

(1) May be waived by landowner

Table 5-19 International Electric and Magnetic Field Guidelines

Organization	Electric Field (kV/m)		Magnetic Field (mG)	
	General Public	Occupational	General Public	Occupational
Institute of Electrical and Electronics Engineers	5	20	9,040	27,100
International Commission on Non-ionizing Radiation Protection	4.2	8.3	2,000	4,200
American Conference of Industrial HygienistsACGIH	-	25	-	10,000/1,000(1)
National Radiological Protection Board	4.2	-	830	4,200

Source(s): International Commission on Non-ionizing Radiation Protection

(1) For persons with cardiac pacemakers or other medical electronic devices.

Table 5-20 Predicted Electric Field Strength at Maximum Operating Voltage for Scenario 1: Stand-alone 500 kV Transmission Line

Proposed Project Structure Type	Maximum field within ROW (kV/m)	Maximum at edge of ROW (kV/m)	Maximum at 300 feet from Anticipated Alignment (kV/m)
500 kV Guyed Delta tower	6.41	1.33	0.08
500 kV Guyed V and Self-Supporting towers(1)	7.03	2.33	0.10

Source: Power Engineer 2013, reference (12), Power Engineer 2014, reference (13)

(1) The Applicant has assumed electric fields from self-supporting lattice structure as equivalent to electric fields from guyed V-structures.

Table 5-21 Predicted Electric Field Strength at Maximum Operating Voltage for Scenario 2: Paralleling Existing Transmission Lines

Proposed Project Structure Type	Maximum field within ROW (kV/m)	Maximum at edge of ROW (kV/m)	Maximum at 300 feet from Anticipated Alignment (kV/m)(1)
Proposed 500 kV paralleling existing 500 kV Line(2)			
500 kV Guyed Delta	6.46	1.36	1.73
500 kV Guyed V- and Self-Supporting towers(3)	7.06	2.36	1.76
Proposed 500 kV paralleling existing 230 kV Line(4)			
500 kV Guyed Delta	6.43	1.34	0.19
500 kV Guyed V- and Self-Supporting towers(2)	6.91	2.33	0.22
Proposed 500 kV paralleling one existing 115 kV Line(5)			
500 kV Guyed Delta t	6.42	1.39	0.08
500 kV Guyed V- and Self-Supporting towers(2)	7.02	2.38	0.10
Proposed 500 kV paralleling two existing 115 kV Lines(6)			
500 kV Guyed Delta	6.41	1.65	0.08
500 kV Guyed V- and Self-Supporting tower (2)	7.05	2.58	0.10
Proposed 500 kV paralleling existing 115 kV and 230 kV Line(7)			
500 kV Guyed Delta	6.43	1.34	0.42
500 kV Guyed V- and Self-Supporting towers(2)	7.03	2.32	0.45

Source(s): Power Engineer 2013, reference (12); Power Engineer 2014, reference (7)

(1) 300-foot comparison distance is based on modeling analysis in Appendix I of the Presidential permit Application (Minnesota Power 2014)

(2) Existing 500 kV D602F transmission line (self-supporting tower structures). For this analysis, the Applicant calculated electric field intensity up to 400 feet from the anticipated alignment. Results are reported at 300 feet for comparison purposes.

(3) The Applicant has assumed electric fields from Self-Supporting lattice tower as equivalent to electric fields from guyed-V structures.

(4) Existing 230 kV 83L transmission line (H-Frame structures).

(5) Existing 115 kV 28L tap (H-Frame structures).

(6) Existing 115 kV 62L and 63L transmission lines (H-Frame structures).

(7) Existing 115 kV 28L and 230 kV 83L transmission lines (H-Frame structures).

has been expanded to a buffer of 800 feet wide (400 feet from the anticipated alignment of the proposed transmission line). The ROI was determined based on standard methodologies for EMF measuring and modeling that factors into account standard attenuation distances for these fields.

The Applicant modeled and calculated EMF with structure configurations that may be used for the proposed Project. They analyzed two transmission line configuration scenarios at the maximum operation voltage: stand-alone 500 kV transmission line (i.e., not paralleling an existing transmission line) and the 500 kV transmission line paralleling existing 500 kV, 230 kV, and 115 kV transmission lines. These two scenarios were evaluated under numerous cases involving different types of structures (self-supporting lattice, guyed delta, and guyed V-towers) operating at different currents. The results obtained

Table 5-22 Predicted Magnetic Feld Strengths for the Proposed Project

Proposed Project Structure Type	Maximum within ROW, mG	Maximum at edge of ROW, mG	Maximum 300 feet from Anticipated Alignment, mG
Proposed 500 kV Transmission Line (stand-alone)			
500 kV Guyed Delta tower	258.11	52.94	6.31
500 kV Guyed V tower(1)	292.51	88.54	10.13
Proposed 500 kV Transmission Line paralleling existing 500 kV Transmission Line(2)			
500 kV Guyed Delta tower	241.73	85.62	72.94
500 kV Guyed V tower(1)	285.52	94.58	51.72
Proposed 500 kV Transmission Line paralleling existing 230 kV Transmission Line(3)			
500 kV Guyed Delta tower	254.23	145.25	14.11
500 kV Guyed V tower(1)	290.47	89.86	17.98
Proposed 500 kV Transmission Line paralleling one existing 115 kV Transmission Line(4)			
500 kV Guyed Delta tower	258.39	52.83	6.27
500 kV Guyed V tower(1)	294.02	88.45	10.08
Proposed 500 kV paralleling two existing 115 kV Lines(5)			
500 kV Guyed Delta tower	265.47	71.22	12.58
500 kV Guyed V tower(1)	303.11	105.83	9.13
Proposed 500 kV paralleling existing 115 kV and 230 kV Line(6)			
500 kV Guyed Delta tower	246.59	76.69	44.78
500 kV Guyed V tower(1)	286.56	93.26	48.30

Source(s): Power Engineer 2013, reference (12); Power Engineer 2014, reference (7)

(1) The Applicant has assumed electric fields from Self-Supporting lattice tower as equivalent to electric fields from guyed V-structures.
(2) Existing 500 kV D602F transmission line (self-supporting tower structures). For this analysis the Applicant calculated electric field intensity up to 400 feet from the anticipated alignment. Results are reported at 300 feet for comparison purposes.
(3) Existing 230 kV 83L transmission line (H-Frame structures).
(4) Existing 115 kV 28L tap (H-Frame structures).
(5) Existing 115 kV 62L and 63L transmission lines (H-Frame structures).
(6) Existing 115 kV 28L and 230 kV 83L transmission lines (H-Frame structures).

under each scenario and the corresponding field plots are presented in Appendix I.

EMF in the ROI

As mentioned in Section 5.2.1, there are no residences, churches, schools, daycares, or nursing homes within the ROW of the proposed routes and variations within the West, Central, or East sections, but there are a limited number of residences within the ROI (four or fewer with the exception of the Cedar Bend WMA Variation which has up to 16 residences). There are also a limited number of non-residential structures (e.g., farm structures and animal sheds) that are within the ROI. Based on the model results in Table 5-20, Table 5-21, and Table 5-22, electric fields range from a low of 0.08 kV/m at 300 feet from the anticipated alignment to a high of 7 kV/m directly underneath the transmission line, all of which are below the 8 kV/m standard for Minnesota. Correspondingly, magnetic fields range from a low of 6 mG at 300 feet from the anticipated alignment to a high of 95 mG at the edge of the ROW, which are far below the guidelines listed in Table 5-18 and Table 5-19.

General Impacts Resulting from EMF

In all cases, predicted magnetic fields for the proposed Project are below regulatory guidelines for magnetic fields used in other states and internationally (Table 5-18 and Table 5-19). Predicted average magnetic field levels at the edge of the anticipated 200-foot ROW for all scenarios are less than 200 mG (Table 5-22). Therefore, potential public health and safety impacts associated with magnetic fields would not be expected, regardless of the proposed route or variation or structure type considered since residences and businesses are located outside of the ROW in all instances. Since EMF impacts resulting from the proposed Project are expected to be below regulatory thresholds and do not vary by proposed route or variation considered, EMF is not discussed further in Chapter 6 of this EIS.

Construction Impacts

There would be negligible EMF impacts during construction of the proposed Project because construction equipment typically generates low levels of EMF, which is only generated by the occasional use of electric and/or electronic devices. Potential EMF exposure effects from electric and electronic devices during construction would be infrequent and within the same range of typical magnetic levels described in Table 5-17.

Operation, Maintenance, and Emergency Repair Impacts

Table 5-20 and Table 5-21 summarize the predicted intensity of electric fields (kV/m) calculated under the following two main operational scenarios analyzed by the Applicant:

- **Scenario 1: Stand-alone 500 kV Transmission Line.** EMF from the proposed Project transmission line structures only. EMF was predicted for three types of structures: guyed Delta tower, guyed V-tower, and self-supporting tower at an operating current level of 2,000 amperes.
- **Scenario 2: 500 Kv Transmission Line Paralleling Existing Transmission Lines.** EMF from the proposed 500 kV transmission line operating in parallel with the following existing 500 kV, 230 kV, and 115 kV transmission lines:
  - 500 kV D602F transmission line (guyed Delta, guyed V, and self-supporting structures),
  - 230 kV 83L transmission line (H-Frame structures),
  - 115 kV 28L tap (H-Frame structures),
  - 115 kV 62L and 63L transmission lines (H-Frame structures), and
  - 115 kV 28L and 230 kV 83L transmission lines (H-Frame structures).

As shown in Table 5-17 and Table 5-18, electric field levels for the proposed Project are anticipated to be less than the MN PUC's 8 kV/m standard.

Predicted magnetic field levels depend on anticipated currents (amps) on the transmission line, which in turn depend on the electric load served by the transmission line now and into the future. The larger the expected current flow, the higher the predicted magnetic field. The Applicant has modeled magnetic field levels for the two main operational scenarios that considered the proposed types of structures, and whether the proposed 500 kV transmission line would be installed stand-alone or located in a shared corridor with an existing transmission line. Predicted magnetic fields from a total of six cases were calculated at average and peak current levels. The average levels for these scenarios are the current levels experienced for most hours of the year; peak levels are current levels for limited hours of the year when current levels are projected to be higher due to system loading and electrical generation in the proposed Project area, among other factors.

The Applicant's modeled magnetic fields for the proposed Project's primary structure types are shown in Table 5-22. Detailed modeling results for the various structure types and transmission line scenarios are provided in Appendix I.

For the proposed Project's primary structure types, the maximum predicted magnetic field, modeled at one meter above ground, is calculated to be 303 mG at a distance of 18.8 feet from the anticipated alignment for the proposed Project when the 500 kV transmission line is paralleling two 115 kV lines (Table 5-22). Because magnetic field strength drops off exponentially with distance, predicted levels fall below 100 mG at the edge of the ROW, and below 50 mG by 300 feet from the anticipated alignment. As shown in the detailed data in Appendix I, predicted magnetic fields strength would vary depending on the configuration of the shared corridor when the proposed transmission line parallels existing lines.

The predicted electric field and magnetic field levels for the proposed Project scenarios would not exceed the MN PUC's 8 kV/m standard and other state and international standards on magnetic fields. EMF levels are predicted based on the proposed Project components rather than the surrounding environment; therefore, EMF levels within the ROW would remain below the Minnesota standard regardless of the proposed route or variation considered.

5.2.2.2 Implantable Medical Devices

This section describes the potential impacts to implantable medical devices from the proposed Project.

Electromechanical implantable medical devices, such as cardiac pacemakers, implantable cardioverter defibrillators (ICDs), neurostimulators, and insulin pumps may be subject to interference from EMFs, which could mistakenly trigger a device or inhibit

it from responding appropriately (Public Service Commission of Wisconsin 2009, reference (72)).

The ICD manufacturers' recommended threshold for modulated magnetic fields is 1 Gauss (G). Since 1 G is five to ten times greater than the magnetic field likely to be produced by a high voltage transmission line (Public Service Commission of Wisconsin 2009, reference (72)), research has focused on electric field impacts. A 2004 Electric Power Research Institute report states that sensitivity to electric fields was reported at levels ranging upwards from 1.5 kV/m, particularly for older (unipolar) pacemakers; some modern (bipolar) units are immune at 20 kV/m. Medtronic and Guidant, manufacturers of various implantable medical devices, have indicated that electric fields below 6.0 kV/m are unlikely to affect most of their devices (Electric Power Research Institute 2004, reference (7)).

Scholten (2005, reference (6)) conducted a theoretical study evaluated the risk for a patient with a unipolar cardiac pacemaker under worst-case and real-life conditions under a high voltage overhead power line. This study concluded that beneath high voltage overhead lines, a life-threatening situation for cardiac pacemaker patients is very unlikely; however, an interference between the implant and the electromagnetic fields cannot be excluded. Definitive conclusions about the real risk can be drawn only by conducting additional studies with pacemaker patients (Scholten 2005, reference (6)).

The ROI for this analysis of impacts to implantable medical devices is the same as the ROI for EMF, which includes a 600-foot buffer (300 feet from the anticipated alignment) along the proposed routes and variations within the West, Central, East sections, as well as the proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations. When the proposed 500 kV transmission line route parallels existing transmission lines, the ROI is expanded to a buffer of 800 feet wide (400 feet from the anticipated alignment). The ROI was determined based on standard methodologies for EMF measuring and modeling and factors into account standard attenuation distances for these fields.

Implantable Medical Devices in the ROI

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

General Impacts

Potential impacts related to implantable medical devices as result of EMF are not expected as a result of construction or operation of the proposed Project and do not vary by proposed route or variation considered. Since potential impacts related to EMFs are not expected from construction, operation, maintenance, and emergency repairs of the proposed Project (see discussion below) for any route or variation considered, implantable medical devices are not discussed further in Chapter 6 of this EIS.

Construction Impacts

There would be negligible impacts to implantable medical devices during construction of the proposed Project because construction equipment typically generates low levels of EMF, only generated by the occasional use of electric and/or electronic devices. Potential EMF exposure effects from electric and electronic devices during construction would be infrequent and within the same range of typical EMF levels described in Table 5-17 .

Operation, Maintenance, and Emergency Repair Impacts

The maximum predicted electric field strength for the proposed Project is 7.06 kV/m within the anticipated 200-foot ROW (Appendix I). This electric field strength is above the 6.0 kV/m interaction level for modern and older pacemakers. Electric field strength levels decrease with distance, however, and maximum levels at the edge of the ROW are anticipated to be less than 2 kV/m, and, in most instances, less than 1 kV/m. In the event that a cardiac device is affected, the effect is typically a temporary asynchronous pacing (i.e., fixed rate pacing), and the device returns to its normal operation when the person moves away from the source of EMFs (Public Service Commission of Wisconsin 2009, reference (72)). Electric field levels are predicted based on the proposed Project components rather than the surrounding environment and electric field levels within the ROW would remain below the Minnesota standard regardless of the proposed route or variation considered. Accordingly, potential impacts to implantable medical devices and their users from operation, maintenance, and emergency repair of the proposed Project are not expected regardless of the proposed route or variation considered.

5.2.2.3 Stray Voltage

This section describes the potential for stray voltage impacts from the proposed Project.

Electrical systems that deliver power to end-users, and electrical systems within the end-user's business, residence, farm, or other buildings are grounded to the earth for safety and reliability reasons. The grounding of these electrical systems results in a small amount of current flow through the earth as a result of the neutral wiring network of a farm and/or the electric power delivery system (Reinemann 2008, reference (73)). Stray voltage can arise from neutral currents flowing through the earth via ground rods, pipes, or other conducting objects, or from faulty wiring or faulty grounding of conducting objects in a facility. Therefore, stray voltage could exist at any business, residence, or farm which uses electricity, independent of whether there is a transmission line nearby. Factors that could influence the intensity of stray voltage include wire size and length, the quality of connections, the number and resistance of ground rods and the current being grounded.

With respect to agriculture, stray voltage is defined by the U.S. Department of Agriculture (USDA) as a small voltage (less than 10 volts) measured between two points that can be contacted simultaneously by an animal (Wisconsin Public Service 2011, reference (74)). For example, this effect is experienced when livestock come into contact with two metal objects between which a voltage exists, such as feeders, water troughs, or stalls, thereby causing a small current to flow through the livestock. The direct effect of animal contact with electrical voltage can range from mild behavioral reactions indicative of sensation, to involuntary muscle contraction (or twitching), to intense behavioral responses indicative of pain (Reinemann 2008, reference (73)). The indirect effects of these behaviors can vary considerably depending on the specifics of the contact location, level of current flow, body pathway, frequency of occurrence, and other factors related to the daily activities of the animals. Common situations of concern in animal environments include the following (Reinemann 2008, reference (73)):

- Animals avoiding certain exposure locations that may result in reduced water or feed intake if painful exposure occurs while accessing watering or feeding devices or locations;
- Difficulty of moving or handling animals in areas of annoying voltage/current exposure; and
- Release of stress hormones produced by contact with painful stimuli.

Studies have been conducted to investigate the potential direct physiological effects that may be produced at stray voltage levels above those that produce behavioral changes. Research has also been conducted to describe the potential effects that may result from the animal's exposure to voltage/current below levels which may produce sensation and behavioral response. A detailed literature review and synthesis of research findings on the impact of stray voltage on farm operations is provided in Appendix L. These studies have found, through different controlled and field experiments, that sensitive dairy cows may experience mild behavioral modifications at current levels exceeding 2 milliamps and 1 to 2 volts. However, aversion and metabolic changes in livestock would require substantially higher voltage and current exposures than those predicted (Reinemann 2008, reference (73)).

Low levels of AC voltage on the grounded conductors of a farm wiring system are a normal and unavoidable result of operating electrical farm equipment. In other words, some levels of stray voltage will always be found on a farm using electricity. The issue of concern involves stray voltage that occurs at a level that negatively affects an animal's behavior, health, and more specifically, production. Field research shows that cow contact current is often dependent on both on- and off-farm electrical power systems. A common on-farm source of stray voltage is the inappropriate interconnection of equipment grounding conductors with the neutral conductors of the farm wiring system. Mitigation of stray voltage can be achieved through a variety of proven and acceptable methods, such as additional grounding or the installation of an equipotential plane (Public Service Commission of Wisconsin 2013, reference (72)).

Several state agencies have conducted scientific and technical reviews and held public hearings on stray voltage issues. These scientific and technical reviews have found that stray voltage can be caused by a combination of on-farm and off-farm sources. Therefore, state regulations have focused on compliance with the National Electric Safety Code (NESC) and the National Electrical Code, as well as with implementation of good management practices.

MN PUC assembled a team of Science Advisors to study farmers' claims that electric currents in the earth from electric distribution systems caused behavior, health, and production problems in cows in the state. In its Final Report, the Science Advisors reached three conclusions:

- There is no credible scientific evidence to verify the specific claim that currents in the earth or associated electrical parameters such as voltages, magnetic fields, and electric currents

are causes of poor health and milk production in dairy herds.

- At the present time, there is no basis for altering the MN PUC approved standards by which electric utilities distribute power onto or in the vicinity of individual dairy farms.
- There are many well-documented non-electrical factors that are known and accepted by the scientific community and by most farmers as well, to cause dairy cow health and production problems. Among the most noteworthy stressors is poor nutrition, poor cow comfort and hygiene, and low or no use of vaccinations and related preventive veterinary practices. Those who want to improve performance of dairy herds should always address these factors.

As mentioned above, stray voltage can be caused by a combination of on-farm and off-farm causes. One off-farm contributor to stray voltage is the operation of transmission lines in close proximity and parallel to a distribution line (Public Service Commission of Wisconsin 2013, reference (72)). To minimize the likelihood of stray voltage occurrences, utilities sometimes propose to relocate paralleling distribution lines further away from the transmission line. Additionally, some agencies require the utility to conduct pre-construction and post-construction testing of potentially impacted farms and lines (Public Service Commission of Wisconsin 2013, reference (72)).

The ROI for this analysis of stray voltage includes the anticipated 200-foot ROW for the proposed routes and variations within the West, Central, East sections, as well as the proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations. This ROI is based on the location of the transmission line and proximity to existing parallel distribution lines is the potential source of impact.

Stray Voltage in the ROI

There are no residences or businesses within the ROI, however there are non-residences (e.g., farm structures and animal sheds) present within the ROI as described in Section 5.2.1.1.

General Impacts

Stray voltage impacts are not anticipated as a result of construction, operation, maintenance, and emergency repair of the proposed Project because the proposed Project would not parallel a new or existing distribution line. However if there is not proper grounding or wiring on any distribution system or at a nearby business, residence, or farm, these currents could result in potential stray voltage impacts. In those instances where transmission lines could induce currents on inadequately grounded distribution circuits, mitigation measures for stray voltage may be required by. These mitigation measures would involve the use of phase cancellation, increased transmission-to-distribution separation, neutral isolation (i.e., decoupling the distribution neutral system from the farm neutral system), and improved grounding.

Potential impacts related to stray voltage are not expected from construction, operation, maintenance, and emergency repair of the proposed Project for any proposed route or variation considered, therefore stray voltage is not discussed further in Chapter 6 of this EIS.

Construction Impacts

Potential impacts resulting from stray voltage are not expected to occur during construction as stray voltage only occurs during operation when the transmission line has been energized.

Operation, Maintenance, and Emergency Repair Impacts

There are no residences or businesses within the ROI but non-residences (e.g., farm structures and animal sheds) are present within the ROI. The proposed 500 kV transmission line would not directly connect to businesses, residences, or farms in the area, therefore no impacts due to stray voltage are anticipated from operation of the proposed Project. However, all proposed routes and variations would at some point parallel existing distribution lines, so in those locations additional currents could occur on the distribution line in the immediate area of the paralleling. These currents are not anticipated to cause stray voltage impacts in the proposed Project area where proper grounding exists on the current distribution system. However, if there is not proper grounding or wiring on the distribution system or at a nearby residence, business, or farm, these currents could result in potential stray voltage impacts. The location and extent of areas without proper grounding or wiring is not currently known. A thorough investigation and engineering analysis would provide a determination of whether a distribution line is operating according to its intended design and an estimate of the magnitude of neutral-to-earth voltage reduction from each of these measures.

5.2.2.4 Induced Voltage

This section describes the potential for induced voltage impacts from the proposed Project.

The electric field from a transmission line can couple with any object able to conduct electrical energy that is in close proximity to the transmission line, such as a vehicle or a metal fence. This conductive coupling can induce a voltage on the object, with the magnitude of this voltage depending on factors which include the weather, object shape, size, orientation, and location along the ROW. The alternating magnetic fields created by transmission lines could also induce currents on conductive objects.

If the objects upon which a voltage is induced are insulated or semi-insulated from the ground and a person touches them, a small current would pass through the person's body to the ground. This might be accompanied by a spark discharge and mild shock, similar to what could occur when a person walks across a carpet and touches a grounded object or another person.

The main concern with induced voltage is the current flow (amps) through a person to the ground. Most shocks from induced current are considered more of a nuisance than a danger, but to ensure the safety of persons in proximity to a transmission line, the NESC requires that any discharge be less than 5 mA. In addition, the MN PUC's electric field limit of 8 kV/m is designed to prevent serious hazard from shocks due to induced voltage under transmission lines.

The ROI for this analysis is the same as the ROI described for EMF which includes a 600-foot buffer (300 feet from the anticipated alignment) along the proposed routes and variations within the West, Central, East sections, as well as the proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations. When the proposed transmission line routes are collocated with existing transmission lines, the ROI has been expanded to a buffer of 800 feet wide (400 feet from the anticipated alignment). The ROI was determined based on standard methodologies for EMF measuring and modeling the factors into account standard attenuation distances for these fields.

5.2.2.5 Induced Voltage in the ROI

There are existing high voltage transmission lines present within portions of the ROI that could cause induced voltage issues within the ROI. However there are no residences or businesses present within the ROI, so public safety issues from induced voltage in the ROI is likely minimal. In locations where there is no high voltage transmission lines present, induced voltage is not likely to occur at present.

General Impacts

Potential impacts from construction of the proposed Project related to induced voltage are not expected. Provided objects are effectively grounded, no impacts due to inducted voltage are anticipated from operation, maintenance, or emergency repair of the proposed Project. However, for metallic objects where effective grounding is more difficult to achieve, impacts such as mild shock could occur. This would be expected to occur in limited instances where a person is standing on the ground and touching ungrounded machinery, such as farming activities or conducting recreational activities (e.g. hunting, snowmobile use, ATVs), while directly under a transmission line. The primary means of minimizing this potential impact is to avoid exiting and entering machinery directly under a line and adhering to MN PUC and NESC standards related to electric field limit and line to ground clearances. As such, potential impacts from induced voltage are not expected to be significant. Since potential impacts from induced voltage are expected to be limited, and they do not vary by proposed route or variation considered, induced voltage is not discussed further in Chapter 6 of this EIS.

Construction Impacts

Potential impacts resulting from induced voltage are not expected to occur during construction as induced voltage impacts only occur during operation when the transmission line has been energized.

Operation, Maintenance, and Emergency Repair Impacts

For objects that the Applicant can ensure are effectively grounded (i.e., stationary objects), no impacts due to inducted voltage are anticipated from operation of the proposed Project. However, for metallic objects where effective grounding is more difficult to achieve (e.g., machinery that is movable and operated directly under a transmission line) impacts could occur, such as a mild shock. Such impacts could occur only if a person was standing on the ground and touching the machinery while directly under a transmission line. The primary means of minimizing this potential impact is to avoid exiting and entering machinery directly under a line. The Applicant would be required to ensure that the proposed Project is constructed and operated to meet NESC standards and the MN PUC's electric field limit; including meeting or exceeding the recommended NESC line to ground clearances,

which based on the Applicant's preliminary design criteria, minimum ground clearance for the conductors is estimated to be 40 feet. As a result of the MN PUC and NESC requirements, no impacts due to induced voltage from the proposed Project are anticipated regardless of the route or variation considered.

5.2.2.6 Intentional Destructive Acts

This section describes the potential for intentional destructive acts within the West, Central, and East sections of the proposed Project.

Physical damage to electricity infrastructure has previously occurred in the United States as criminal acts that would be defined as terrorist activity in the U.S. Code (18 U.S.C. 2331 and 2332). Especially in the aftermath of the terrorist attacks that occurred on September 11, 2001, terrorism has become a greater concern and increased security awareness has occurred throughout the electrical transmission industry and the nation. The North American Electrical Reliability Corporation (NERC) has identified vandalism and other malicious acts as one of the causes of outages and risks to the bulk power system in North America (NERC 2013, reference (75)). In the late 1970s, a series of attacks to electrical infrastructure caused $7 million of damage to power lines in Minnesota (Kemp 2014, reference (76)). More recently, three recent attacks to a high voltage transmission line were reported in Arkansas and are under investigation by the Federal Bureau of Investigation (Blinder 2013, reference (77)).

Energy transmission has become increasingly reliant on computer-based control systems that operate and monitor energy infrastructure allowing another method for intentionally destructive acts. The following points were extracted from a DOE-sponsored report through the Energy Sector Control Systems Working Group (Energy Sector Control Systems Working Group 2012, reference (78)) addressing cyber security threats to energy delivery systems:

- "Because the private sector owns and operates most of the energy sector's critical assets and infrastructure, and governments are responsible for national security, securing energy delivery systems against cyber threats is a shared responsibility of both the public and private sectors."
- "Smart technologies (e.g., smart meters, phasor measurement units), new infrastructure components, the increased use of mobile devices, and new applications are changing the way that energy information is communicated and controlled while introducing new vulnerabilities and creating new needs for the protection of consumer and energy market information."
- "Adversaries have pursued progressively innovative techniques to exploit flaws in system components, telecommunication methods, and common operating systems found in modern energy delivery systems with the intent to infiltrate and sabotage them."

In 2013, President Obama issued an Executive Order 13636 announcing, among other things, a public private partnership in preparing for cybersecurity threats against critical infrastructure.

The ROI for this analysis of intentional destructive acts includes the anticipated 200-foot ROW for the proposed routes and variations within the West, Central, East sections, as well as the proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations. This ROI is based on the location of the proposed Project infrastructure that could be affected by intentional destructive acts.

Intentional Destructive Acts in the ROI

There are not any specific sources of information regarding recent acts of terrorism specific to the proposed Project area or the ROI; however, incidents of intentional destructive acts, alleged to be sabotage, have occurred to high voltage transmission lines for a long period of time including in Minnesota.

General Impacts

While the likelihood for intentional destructive acts to the proposed Project is difficult to predict, it is unlikely that such acts would occur based on past experience along the thousands of miles of electrical transmission lines in the U.S. A more likely scenario would typically involve mischievous or criminal acts of theft or vandalism, which would generally pose lower safety risks. Although some theft or vandalism is considered possible, related health and safety impacts to workers or the public from the proposed Project are not expected and do not vary by proposed routes or variation considered, therefore intentional destructive acts are not discussed further in Chapter 6 of this EIS.

Since potential impacts as a result of intentional destructive acts for the proposed Project are not expected and do not vary by proposed route or variation considered, intentional destructive acts are not discussed further in Chapter 6 of this EIS.

Construction Impacts

Equipment theft is a growing concern that can be very costly to construction projects. According to the National Insurance Crime Bureau, between $300 million to $1 billion a year is lost nationwide to the theft of construction equipment (National Insurance Crime Bureau 2012, reference (79)). A 2008 industry research study commissioned by LoJack Corporation and the National Insurance Cribe Bureau showed that 71 percent of equipment owners have experienced the theft of equipment in the previous year (LoJack 2012, reference (80)). According to this study, the types of equipment most frequently stolen are light utility work trucks and trailers, loaders, skid steers, and generators/air compressors/welders. Theft of tools, equipment, and construction materials is a relatively common occurrence at large sites, especially when spread across large geographic areas where security is more difficult to maintain. Impacts could result in schedule and cost delays to the construction effort.

Operation, Maintenance, and Emergency Repair Impacts

The transmission line, proposed Blackberry Substation, and 500 kV series compensation station could be subject to physical attacks and cyber attacks. The proposed Blackberry Substation and the 500 kV series compensation station would be fenced which would provide a level of protection against physical attacks; however the transmission line and structures are unfenced and therefore are more vulnerable to attacks. As a result of these attacks on the proposed Project, power outages could occur.

Although it is not possible to predict whether acts of terrorism or sabotage events would occur or the nature of such events if they did occur, the potential exists for events involving terrorism, sabotage, or criminal mischief that could result in health and safety impacts to workers and members of the public and power outages. In general, the proposed Project presents no greater target for intentional destructive acts than any other high voltage transmission lines or power plants in the U.S.

5.2.2.7 Environmental Contamination

This section describes the potential for environmental contamination impacts from the proposed Project.

Environmental contamination can be a concern during construction: (a) spills may cause contamination during construction, and (b) excavation may lead to discovery of existing contamination. If existing soil or groundwater contamination is encountered during construction, it could also create a safety and health concern as construction workers and the nearby public could be exposed to contaminated soils. If the spills or contamination are significant enough, they could be regulated under federal laws, such as the Resource Conservation and Recovery Act (42 U.S.C. 6901) or the Comprehensive Environmental Response, Compensation and Liability Act (42 U.S.C. 9601).

Hazardous materials and hazardous waste are defined by 49 CFR 171.8 and 42 U.S.C. Section 6903, respectively. Examples of hazardous materials include liquid fuels, solvents, oils, lubricants, and hydraulic fluids. Examples of hazardous wastes include spent hazardous materials and by-products from their use. Special hazards are regulated under 15 U.S.C. Chapter 53 and include asbestos-containing material, polychlorinated biphenyls (PCBs), and lead-based paint.

Improper management of hazardous materials and wastes can threaten the health and well-being of humans and wildlife species, botanical habitats, soil and sediment, and water resources. In the event of a release of hazardous materials or wastes, the extent of environmental contamination would vary based on the type and quantity of the contaminant and the type of soil or sediment, topography, and water resources. The Applicant is developing a Spill Prevention, Control, and Countermeasures (SPCC) Plan, which is required by the Oil Pollution Prevention regulation (3 U.S.C. 2702-2761; 40 CFR 112.3).

A SPCC plan is required to prevent discharge of oil into navigable waters of the United States, and is required if the aboveground storage capacity for the substance is greater than 1,320 gallons and there is a reasonable expectation of a discharge into navigable waters of the U.S. As described in Section 2.13, the Applicant would develop their SPCC plans for Project substations that meet the criteria per 40 CFR 112. These Applicant proposed measures are potential MN PUC Route Permit conditions.

If contamination is identified unexpectedly during construction activities, the construction would be discontinued in that location until further evaluation of the conditions is performed. The presence of contamination must be immediately reported to the property owner so the owner can make an evaluation as to whether the contamination must be reported to the Minnesota Duty Officer per Minnesota Statute, section 115.061.[75]

75 Additional guidance is also provided in MPCA Cleanup fact sheet #1.01 – February 2009 at http://www.pca.state.mn.us/index.php/view-document.html?gid=2807

Table 5-23 MPCA's "What's in my Neighborhood" Listed Sites in the Proposed Project Area

County	MPCA Site Name	Type	Status	Description	Nearest Project Route	Section	Approximate Distance to Anticipated Alignment (feet)
Roseau	U.S. Customs Building	Leak Site	Inactive	Fuel Oil 1 & 2 release Site closure: June 2001 No offsite contamination	Border Crossing Hwy 310 Variation in Border Crossing Variation Area	West	400
	Mende Auto Body & Muffler	Hazardous Waste Site	Active	Small to Minimal Quantity Generator	Proposed Blue/Orange Route in the Roseau Lake WMA Variation Area	West	1,735
	Ray Horner Farm	Feedlot	Active	Registered feedlot with 10 or more animal units (AU)	Proposed Blue/Orange Route in the Roseau Lake WMA Variation Area	West	1,720
	Knudson Brothers Farm Inc.	Tank Site	Inactive	Tank Data not available	Cedar Bend WMA Variation in the Cedar Bend Variation Area	West	660
	Quentin Grittner Farm	Feedlot	Active	Registered feedlot with 10 or more animal units (AU)	Roseau Lake WMA Variation 1 in the Roseau Lake WMA Variation Area	West	1,285
	Skoglund Farm	Feedlot	Active	Registered feedlot with 10 or more animal units (AU)	Roseau Lake WMA Variation 1 in the Roseau Lake WMA Variation Area	West	476
	Nelson Residence	Leak Site	Inactive	Petroleum tank release. Site closure: May 2013	Roseau Lake WMA Variation 1 in the Roseau Lake WMA Variation Area	West	1,900
	Harvey Johnson Farm	Feedlot	Active	Registered feedlot with 10 or more animal units (AU)	Border Crossing 500kV Variation in the Border Crossing Variation Area	West	2,094
Lake of the Woods	Williams Dump Site	Investigation and Cleanup	Inactive	State Assessment Site Unpermitted Dump Site closure: June 1978	Beltrami North Central Variation 4 in the Beltrami North Central Variation Area	West	116
	Calvin Carson Farm	Feedlot	Active	Registered feedlot with 10 or more animal units (AU)	Beltrami North Central Variation 4 in the Beltrami North Central Variation Area	West	1,226
	Northstar Electric Cooperative	Hazardous Waste Site	Active	Small to Minimal Quantity Generator	Proposed Blue Route in the Pine Island Variation Area	Central	812
	MNDOT Truck Station	Leak Site (1504)	Inactive	Gasoline release. Groundwater cont. Closure date: 09/26/1995 Remaining soil contamination Offsite contamination unknown	Proposed Blue Route in the Pine Island Variation Area	Central	812
	Petal Pushers	Leak Site	Inactive	Diesel; Gasoline Leaded Release. Closure date: 02/23/2001 R emaining soil contamination Offsite contamination unknown	Proposed Blue Route in the Pine Island Variation Area	Central	812
Koochiching	Northome Modified Sanitary Landfill	Investigation and Cleanup	Active	State Assessment Site SA 7935 (Active) Unpermitted Dump Site REM04735 (Inactive)	J2 Segment Option Variation in the J2 Variation Area	Central	680
	Northome Modified Sanitary Landfill	Solid Waste	Inactive	Landfill Closed (SW-225). Owned by MPCA. Groundwater Monitoring Data.	J2 Segment Option Variation in the J2 Variation Area	Central	680
	Northome Modified Sanitary Landfill	Industrial Stormwater Permit	Inactive	Industrial SW Permit Termination: 03/17/2000	J2 Segment Option Variation in the J2 Variation Area	Central	680
	Northome Modified Sanitary Landfill	Industrial Stormwater Permit	Active	ISW No Exposure Exclusion. Effective Start: 12/15/2010	J2 Segment Option Variation in the J2 Variation Area	Central	680

County	MPCA Site Name	Type	Status	Description	Nearest Project Route	Section	Approximate Distance to Anticipated Alignment (feet)
Itasca	Loman Dump	Investigation and Cleanup	Active	State Assessment Site SA 7925 (Active) Unpermitted Dump Site REM04478 (Inactive)	J2 Segment Option Variation in the J2 Variation Area	Central	62
	Balsam Lake II Dump	Investigation and Cleanup	Active	State Assessment Site SA 7858 (Active) Unpermitted Dump Site REM03558 (Inactive)	Proposed Orange Route in the Balsam Variation Area	East	530
	Balsam Store	Tank Site	Inactive	Last site inspection: 05/05/2014 Field Citation MPCA - Closure date: 07/15/14	Proposed Orange Route in the Balsam Variation Area	East	1,710
	Former Balsam Store	Leak Site	Inactive	Diesel; Gasoline, Unleaded release Site Closure: 09/12/2014 Contaminated Soils Remaining Offsite Contamination	Proposed Orange Route in the Balsam Variation Area	East	2,012
	Former Balsam Store	Tank Site	Inactive	Last tank removal: 11/16/1998 Last site inspection: 04/08/1999	Proposed Orange Route in the Balsam Variation Area	East	2,012
	Rhunde Media	Leak Site	Inactive	Fuel Oil 1 & 2; Gasoline release. Site closure: 12/31/1997 Unknown soil and offsite contamination	Proposed Blue/Orange Route near Taconite	East	2,078
	Bray Lake Outlying Canister	Solid Waste	Active	Permit-by-Rule landfill. Facility permit: 10/24/2010 Inspection: 09/24/2010	Proposed Blue Route in the Balsam Variation Area	East	1,312
	Bray Lake Demolition & Disposal	Solid Waste	Active	Open Landfill. Facility permit: 08/06/2008 Last routine inspection: 07/17/12	Proposed Blue Route in the Balsam Variation Area	East	1,600
	MNDOT District 1b Deer Lake	Hazardous Waste Site	Active	Small to Minimal Quantity Generator	Proposed Blue Route in the Pine Island Variation Area	Central	775
	Wamp Lake Dump	Investigation and Cleanup	Inactive	State Assessment Site SA 7862 (Inactive) Unpermitted Dump Site REM05349 (Inactive)	Effie Variation in the Effie Variation Area	East	1,834
	Reckinger Solid Waste Site	Solid Waste	Inactive	Permit-by-Rule landfill.	East Bear Lake Variation in the East Bear Lake Variation Area	East	1,710
	Balsam Elementary School	Leak Site	Inactive	Fuel Oil 1 & 2 release. Site closure: 01/02/2004 Contaminated Soils Remaining	Balsam Variation in the Balsam Variation Area	East	610
	Iron Range Sanitary Landfill	Investigation and Cleanup	Active	State Assessment Site SA 7864 (Active) Unpermitted Dump Site REM04283 (Inactive)	Balsam Variation in the Balsam Variation Area	East	2,074
	Iron Range Sanitary Landfill	Solid Waste	Inactive	Landfill Closed. Owned by MPCA. Groundwater Monitoring Data (EDA - 2764).	Balsam Variation in the Balsam Variation Area	East	2,074
	Iron Range Sanitary Landfill	Industrial Stormwater Permit	Active	ISW No Exposure Exclusion. Effective Start: 12/15/2010	Balsam Variation in the Balsam Variation Area	East	2,074

Source: MPCA 2015, reference (81)

The proposed Project would be located in predominately agricultural, wetland, and forested areas with a relatively dispersed population. Although mining is a regional economic activity in the proposed Project area, no active mining operations that could pose existing public health and safety hazards have been identified in the proposed Project footprint.

The ROI for this analysis of environmental contamination includes environmental contamination sites within 4,000 feet (2,000 feet on either side) of the anticipated alignment and proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations. Construction and maintenance of any transmission line involves the use of hazardous materials and the generation of waste. If handled improperly, the public and/or the surrounding environment could be adversely affected. For all the proposed routes and variations, soil would be disturbed and, as a result, any existing contaminated soil or groundwater could be mobilized. In this case, a 2,000-foot radius was used to be conservative and to gain a comprehensive view of the potential for contamination near the proposed routes and variations. The use of 2,000 feet provides a sufficient margin to identify potential existing contamination that exists where excavation could occur as part of the proposed Project.

Environmental Contamination in the ROI

Table 5-23 summarizes the list of registered potentially contaminated sites located within 2,000 feet from the proposed routes and variations, based on a review of MPCA's "What's in My Neighborhood" database. More detail about each of the sites listed in Table 5-23 is presented in Appendix M. The potentially contaminated sites for the West Section (Map 5-4), Central Section (Map 5-11), and East Section (Map 5-18) are labeled as "hazardous wastes", "investigation and cleanup", "tanks and leaks", or "multiple activities".

There are four active investigation and cleanup sites within approximately 2,000 feet from the proposed routes and variations (Table 5-23). These sites are former unpermitted dump sites currently under State Assessment (SA) status and are primarily located in the J2 Segment Option Variation Area in the Central Section (Map 5-11) and the Balsam Variation Area in the East Section (Map 5-18). In addition to these investigation and cleanup sites, three active hazardous waste sites have been identified within 2,000 feet; all these sites are registered small to minimal quantity generators located in the West and Central sections (Table 5-23).

The only environmental contamination site located within a proposed ROW is the Loman Dump found within the J2 Segment Option Variation in the J2 Segment Option Variation Area in the Central Section (Map 5-11). The MPCA database also registers seven inactive leak sites in the West, Central, and East sections of the proposed Project area; these sites were under investigation for fuel oil or gasoline releases with the potential for soil and groundwater contamination. Even though all of these leak sites have been closed and registered as inactive, five of the seven sites indicate remaining or unknown presence of soil or offsite contamination.

General Impacts

Only one contaminated site has been identified within a proposed ROW (J2 Segment Option Variation in the J2 Segment Option Variation Area). If the record provided information that the proposed Project would impact known contaminated sites, the MN PUC could require - as special condition to the Route Permit - that the Applicant conduct an investigation of potentially contaminated sites within the ROW and 250 feet from the final permitted route in order to ensure that construction of the proposed Project does not disturb contaminated soils or groundwater.

As part of its SPCC, the Applicant would develop procedures to maintain a clean substation facility and to prevent mishandling of materials should a spill of potentially hazardous materials occur. In addition, the SPCC would detail spill prevention and response procedures for construction. Implementation of this plan would reduce, but not eliminate, the potential that spills could occur. Spills of hazardous materials or fuels that occur during construction or operations would be limited due to the anticipated quantities and adherence to the SPCC plan.

Potential impacts related to environmental contamination from the proposed Project are limited and do not vary by proposed route or variation considered, therefore environmental contamination is not discussed further in Chapter 6 of this EIS.

Construction Impacts

Construction of the proposed Project would involve soil disturbance as part of excavation activities. If existing soil or groundwater contamination is encountered during construction, it could create a safety and health concern as construction workers and the nearby public could be exposed to contaminated soils. The greatest potential for disturbing contaminated soils would result from constructing structures and foundations

for the proposed Blackberry Substation, series compensation station, and regeneration locations.

Health and safety risks could be minimized with the implementation of a plan for training construction workers about the protocols appropriate to undertake when contamination is unearthed and identified. If any contaminated soils or groundwater are encountered during construction of the proposed Project, the contaminated material would need to be managed in accordance with state and federal regulations. If these measures are taken the potential adverse impact would be short-term and localized.

In addition, accidental spills of oils or lubricants from construction equipment during construction activities have the potential occur. The Applicant would implement a SPCC plan, including industry-specific BMPs related to environmental contamination in order to avoid potential impacts on public health and safety and the environment as described in Section 2.12 and 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Operation, Maintenance, and Emergency Repair Impacts

During operations, spills of oil immersed transformers at the proposed Blackberry substation could occur as well as diesel gas spills at the 500 kV Conversion Station if a back-up generator is needed. Implementation of the SPCC and spill prevention and control BMPs as specified in Section 2.13 would avoid and minimize impacts resulting from operation of the proposed Project. These Applicant proposed measures are potential MN PUC Route Permit conditions.

5.2.2.8 Worker Health and Safety Considerations

This section describes the potential for worker health and safety impacts from the proposed Project.

The most recently available data for fatalities and injuries in the industries that would be involved in the proposed Project was published by the Bureau of Labor Statistics of the U.S. Department of Labor. The industries include the construction of transmission and communication lines and related structures. These data show that these industries have the highest rate of incidents; comprising approximately 45 percent of the reported cases for fatalities and occupational injuries (Bureau of Labor Statistics 2014, reference (82); 2014, reference (83); 2014, reference (84); 2014, reference (85)).

Regulations

The proposed Project would be required to comply with the Occupational Safety and Health Administration (OSHA) standards (29 CFR Parts 1910 and 1926), which (1) provide regulations for safety in the workplace, (2) regulate construction safety, and (3) require a Hazard Communication Plan to identify and inventory all hazardous materials for which material safety data sheets would be maintained. OSHA's standards also require employee training in safe handling of said materials.

The construction contractor would develop various plans, including activity-specific Health and Safety Plan (HASPs) and an Emergency Contingency Plan, to ensure construction activities for the proposed Project are conducted in a safe manner. The HASPs would include such things as the following:

- requirements for minimum construction distances from residences or businesses and requirements for temporary fencing around staging, excavation, and laydown areas during construction;
- requirements for minimum construction buffers (temporary aquatic exclusion areas) for recreational uses on the lake, such as boating;
- provisions for worker protection as required under the NESC and OSHA 29 CFR Part 1926, Safety and Health Regulations for Construction; and
- provisions for railroad safety training and for general worker protection, as required under the NESC and OSHA 29 CFR Part 1926, Safety and Health Regulations for Construction.

The ROI for worker health and safety is 1,500 feet from the anticipated alignment and includes the anticipated 200-foot ROW, proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations as these are the locations where workers would be present for Construction, operation, maintenance, and emergency repairs.

Worker Health and Safety Considerations in the ROI

The presence of workers within the ROI would depend on the anticipated schedule for construction and future operations, maintenance, and repair of the proposed Project components.

General Impacts

Impacts to worker health and safety resulting from the proposed Project would be anticipated to be similar across the proposed Project's routes and variations, and substation and compensation locations as construction activities would be similar in all locations. Since potential impacts related to worker health and safety from the proposed Project do not vary by proposed route or variation considered, worker health and safety is not discussed further in Chapter 6 of this EIS. The Applicant would comply with federal, state, and local regulatory requirements regarding occupational health and safety and implement BMPs to safeguard the workers and the public from transmission line construction and operational hazards.

Construction Impacts to Worker Health and Safety

Accidents that could occur at the proposed Project construction sites would include heavy equipment and commuting vehicle accidents, electrocution, personal accidents (e.g., slips, trips, and falls), hazardous materials spills, construction-induced fires, and accidents due to the use of watercraft, aircraft, or driving equipment across the ice in winter. Specific health and safety risks for large-scale construction projects involving electrical components, working at height, and operating heavy machinery could include:

- falls from working at height
- crush injuries in excavation work
- slips and trips
- cuts and scrapes from sharp tools or construction materials or debris
- receiving injuries from hand tools and/or rotating machinery
- electrocution
- being struck by falling objects
- manually lifting heavy loads
- bad working positions, possibly in confined spaces
- being struck or crushed by a workplace vehicle
- inhalation of dust
- handling of rough materials
- exposure to dangerous substances (chemical and biological)
- working near, in, or over water
- hearing damage from loud noises
- sustaining injuries as a result of an on-road or off-road accident involving a motor vehicle or construction equipment

In order to minimize these potential impacts, the Applicant would comply with all applicable OSHA requirements. The Applicant would implement standard construction, mitigation, and operation and maintenance practices developed from experience with past projects as well as industry-specific BMPs, as specified in Section 2.13. These practices would be based on the specific construction design, prohibitions, maintenance guidance, inspection procedures, and other activities involved in construction of the proposed transmission line, substation, and conversion station facilities as specified in the Route Permit. Compliance with OSHA's standards for occupational health and safety along with implementation of BMPs would avoid and minimize impacts on workers' health and safety resulting from the construction and operation of the proposed Project, regardless of the route or variation considered since construction and operation procedures would be similar for the entire proposed Project.

Operation, Maintenance, and Emergency Repair Impacts

Under normal operating conditions, public safety hazards associated with the proposed Project include electrical shocks. These can occur from working and recreating under or near transmission lines. Electrical shocks can occur from touching transmission structures or other metallic objects near power lines. These result from voltage induced from the power line into nearby metal objects. The severity of the shock would reflect the voltage of the power line, the distance from the conductor, the size and length of the object, its orientation to the line, and how well the object is grounded (Bonneville Power Authority n.d., reference (66)).

Another potential worker safety hazard associated with the proposed Project could be arc flashes. Arc flashes occur when electricity from a high voltage line travels between conductors through the air and is commonly defined as "a luminous bridge formed in a gap between two electrodes". These can be initiated through accidental contact, equipment which is underrated for normal operational conditions, contamination or tracking over insulated

surfaces, deterioration or corrosion of equipment and, or parts, as well as other causes (General Electric, n.d., reference (86)). These occur in normal conditions but also can be caused by smoke from fires (Bonneville Power Authority n.d., reference (66); and Great River Energy n.d., reference (67)). Arc flashes can produce intense heat and light. If individuals get too close to energized power lines without touching them an arc of electricity can form between the power line and the person and result in serious burns (Great River Energy n.d., reference (67)). While rare, the potential for impacts due to arc flashes from the proposed Project would be further minimized by restricting or controlling access to the transmission line.

Although there are no means of preventing lightning strikes, safety measures, including shield wires, are incorporated into transmission line design to prevent flashovers or power surges due to lightning strikes. A shield wire is a conductor connected directly to the top of a transmission structure to protect conductors from a direct lightning strike, minimizing the possibility of power outages. These measures would decrease the likelihood of the adverse effects of lightning strikes. The Applicant would use protective devices to safeguard workers and the public from transmission line operational hazards, including the use of shield wires, circuit breakers, and relays.

5.3 Route Specific Impacts to West Section

The West Section contains 15 alternatives as follows: the Proposed Blue Route, the Proposed Orange Route (which are combined in the West Section), four variations within the Border Crossing Variation Area, two variations in the Roseau Lake WMA Variation Area, one variation within the Cedar Bend WMA Variation Area, two variations within the Beltrami North Variation Area, and five variations in the Beltrami North Central Variation Area. Impacts that are unique to a specific alternative within the West Section are described below.

5.3.1 Human Settlement

5.3.1.1 Aesthetics

This section describes the aesthetic, or visual, resources within the West Section and the potential impacts from the proposed Project.

Aesthetic, or visual resources, are generally defined as the natural and built features of a landscape that may be viewed by the public and contribute to the visual quality and character of an area. Aesthetic resources form the overall impression that an observer has of an area or its landscape character. Distinctive landforms, water bodies, vegetation, and human-made features that contribute to an area's aesthetic qualities are elements that contribute to an area's visual character. Visual quality is generally defined as the visual significance or appeal of a landscape based on cultural values and the landscape's intrinsic physical elements (Smardon, R.C. et al 1988, reference (87)).

Visual sensitivity is a measure of viewer interest and concern for the visual quality of the landscape and potential changes to it. Visual sensitivity is determined based on a combination of viewer sensitivity and viewer exposure. Viewer sensitivity varies for individuals and groups depending on the activities viewers are engaged in, their values and expectations related to the appearance and character of the landscape, and their potential level of concern for changes to the landscape. High viewer sensitivity is typically assigned to viewer groups engaged in: recreational or leisure activities; traveling on scenic routes for pleasure or to or from recreational or scenic areas; experiencing or traveling to or from protected, natural, cultural, or historic areas; or experiencing views from resort areas or their residences. Low viewer sensitivity is typically assigned to viewer groups engaged in work activities or commuting to or from work U.S. Department of Transportation (USDOT) 1981, reference (88); U.S, Forest Service (USFS) 1974, reference (89)).

Viewer exposure varies for any particular view location or travel route depending on the number of viewers and the frequency and duration of their views. Viewer exposure would typically be highest for views experienced by high numbers of people, frequently, and for long periods. Other factors, such as viewing angle and viewer position relative to a feature or area, can also be contributing factors to viewer exposure.

The ROI for this analysis of impacts to aesthetics is 1,500 feet from the anticipated alignment of the transmission line and within 1,500 feet from the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites. Potential aesthetic resources included within the ROI are residences, historic architectural sites, state trails, county parks, state parks, state forests, state forest campgrounds, national forests, scenic byways, national parks, snowmobile trails, water access points, and state water trails.

The 1,500 foot ROI for aesthetic resources was identified because the proposed Project is most likely to be visible within this near-foreground distance zone and views of the proposed Project from aesthetic resources within this distance zone have the greatest potential to result in visual impacts for sensitive viewers (USFS 1974, reference (89); USFS 1995, reference (90); Bureau of Land Management 1986, reference (91); FHWA 1981, (88)).

Visual Character of West Section

The existing landscape character provides the context for assessing the effects of changes to the landscape. Major components of landscape character that define the appearance of the landscape include landform, water, vegetation, and human or cultural modifications. Descriptions of these elements are based on ecological subsections developed by the MnDNR and the USFS as part of an ecological classification system (ECS) (MnDNR 2015, reference (92)) in combination with observations of human or cultural modifications to the landscape. The ecological subsections for the West Section are shown on Map 5-2 and described in more detail in Section 5.3.4.2.

The West Section is comprised of two ecological subsections, the Aspen Parklands and the Agassiz Lowlands. The Aspen Parklands subsection is found in the western portion of the West Section and is considered a transitional landscape between prairies to the west and forest provinces to the east. The landform is generally flat with few areas of low topographic relief. Streams, wetlands, ponds, and small lakes are scattered throughout the area. Vegetation is a mosaic of prairie, brushland, woodland, and peatlands, and forests are common. The Agassiz Lowlands subsection occurs over most of the central and eastern portions of the West Section and is also generally flat with some low sand ridges. Streams, wetlands, ponds, and lakes are fairly common. Vegetation consists of extensive peatlands in low-lying areas and upland forests of aspen and birch or jack pine in the higher sand ridge areas. Peatlands consist of a mosaic of black spruce or tamarack forests, meadows, and fens.

The northern portion and much of the south-central and eastern areas of the West Section are forested. Several state forests, including the Lost River, Beltrami Island, and Lake of the Woods, are located within or adjacent to variation areas in the West Section (Map 5-5). Lake of the Woods State Forest occupies the northeast part of the West Section and the Roseau River, which runs south to north through the western portion of the West Section, is the primary stream in the area. Much of the western and central portions of the West Section consist of agricultural fields, mostly row crops, pastures, and hay fields, lined by drainage ditches laid out in rectilinear patterns. Human settlement is sparse throughout the section and consists of scattered rural residences, often with associated farm buildings, and a few small towns. Several transmission lines run through the West Section and several tall communication towers also are scattered through the area (Map 5-4). Views in agricultural areas of the section are expansive due to the flat landscape and open fields. Views in forested areas tend to be more enclosed and limited due to screening by the trees.

The number of residences within 500 feet and 1,000 feet of the anticipated alignment and the number of historic architectural sites within one mile of the anticipated alignment are provided in Section 6.2. No state trails, county parks, state parks, state forest campgrounds, national forests, national forest parks, water access points, or water trails were found within 1,500 feet of the proposed routes or variations in the West Section.

General Impacts

General impacts on existing aesthetic resources may be caused by construction and operation of the proposed Project and could include short-term and long-term impacts. Impacts on aesthetics are assessed based on the extent of changes to landscape character and scenic quality, the level of contrast introduced by the proposed Project, its proximity to viewers, and the visual sensitivity related to views of the proposed Project.

Impacts on aesthetic resources in the West Section due to construction or operation of the proposed Project would result from changes to existing views of the landscape by viewers with high visual sensitivity (i.e., people with high interest and concern for the visual quality of the landscape and changes to it, such as residents from the vicinity of their homes or people engaging in recreation or leisure activities). Aesthetic impacts may include a substantial change to the landscape character (e.g., from rural, agricultural, or natural to more developed or industrial-appearing) or reduction in scenic quality (e.g., crossing through a scenic vista or other area considered to be of high scenic quality or value). Aesthetic impacts would be determined based largely on the level of increased contrast produced by the proposed Project as viewed by sensitive viewers. Aesthetic impacts are likely to be greatest for views of the proposed Project in the foreground distant zone (i.e., up to about 0.5 miles from the proposed Project), but impacts can also

be substantial for views from greater distances. According to a recent study on the visibility of transmission lines in western landscapes by Sullivan et al. (2012, reference (93)), 500 kV lattice transmission structures were determined to be noticeable to casual observers at up to 10 miles and strongly attracted attention at up to 3 miles. To further characterize the potential impacts in the West Section, photographs were taken and simulations created for the location where the proposed Project crosses Waters of the Dancing Sky Scenic Byway (State Route 11) in the West Section (Viewpoint 04a in Appendix N). Further discussion of the potential aesthetic impacts of the proposed Project on that aesthetic resource is included in Section 6.2.2.1.

Construction Impacts

Short-term impacts on existing aesthetic resources may occur primarily during the construction phase. Short-term impacts could result from ROW clearing, temporary construction access roads, temporary construction areas, and vehicle and equipment operations for transmission line construction. Some construction phase activities, such as access road construction and placement of temporary construction areas (e.g., construction yards, staging and laydown areas, pulling and tensioning sites) would involve grading and removal of vegetation which would later be restored following construction. Some access roads would be wider during construction to accommodate larger construction vehicles, thereby resulting in a greater impact during construction than operation. Likewise, some access roads would be temporary and fully restored at the end of construction. ROW clearing may also involve removal of vegetation in some areas that would later be restored. Short-term aesthetic impacts could result from contrast created by vegetation removal; grading that noticeably alters existing landforms; and materials, equipment, vehicles, structures, fences, and other elements that would be present during construction.

Vehicle and equipment operations may produce visible dust during land-clearing operations and from traveling on unpaved existing and new roadways. Overhead line cranes may be visible above the transmission line structures due to their height. Ground-level activities such as ROW clearing and site preparation require equipment such as bulldozers, excavators, loaders, and dump trucks. Foundation and structure construction activities require large delivery vehicles and concrete trucks. The local increase in general vehicle traffic could be a source of visual impact, depending upon the number of trips to a specific location. On-site parking could be noticeable during construction if certain sites require a larger number of workers and, consequently, their vehicles. Nighttime lighting for construction or safety and security in construction areas may also result in short-term aesthetic impacts. Although construction-related aesthetic impacts would be temporary, the severity of these impacts would depend not only on the contrast produced by the construction activities, but also on the visibility and proximity of these to viewers and the sensitivity of the viewers to changes in the landscape's character and quality.

Operation, Maintenance, and Emergency Repair Impacts

Long-term impacts on aesthetic resources may occur primarily during operation of the transmission line and would occur over the life of the proposed Project. For transmission lines, their vertical and geometric form and line and regular linear spacing often result in strong contrast with the mostly horizontal lines of flat terrain and the rounded, natural forms and lines of forested areas. Where present, these structures often are silhouetted against the sky above the horizon line, which draws viewer attention and increases their contrast in open landscapes. The presence of other structures of similar form nearby tends to somewhat reduce their level of contrast. However, increased numbers of structures, especially when they stand higher or have a different form or color, may add to the texture of structures and increase contrast. New transmission structures introduced into the landscape where other tall, vertical structures are not present would tend to be dominant and create strong contrast in the landscape. Where a new transmission line is adjacent to or very near an existing transmission line of similar type and height, or where other tall structures (e.g., communication towers) are common features, the new structures are more likely to be co-dominant with the existing ones and produce less contrast.

In addition to their form, line, and texture, transmission lines may also produce strong contrast due to the reflectivity of conductors or color or finish of structures, especially if they have a shiny, metallic galvanized finish. Changes to landform and vegetation for access roads, pads, and ROW-clearing may be visible but generally would not be noticeable in mostly flat landscapes with sparse vegetation; however, there may be exceptions to this for foreground views where the transmission line traverses areas with dense vegetation and/or varied terrain. Aesthetic impacts could be substantial where a ROW is cleared or expanded through a forested area and creates a strong linear and/or rectilinear pattern that contrasts strongly with predominantly natural forms and lines of the characteristic landscape. Depending on their design and where

they are sited, other elements of the proposed Project, such as the substation, series compensation station, and regeneration stations, may also result in aesthetic impacts. In addition to contrast produced by their form, line, color, and texture, lighting associated with these proposed Project elements could potentially result in long-term aesthetic impacts due to introducing new sources of nighttime lighting where it did not previously exist or substantially increasing the amount or intensity of lighting in some areas. The transmission line itself is not likely to result in any long-term aesthetic impacts due to lighting because the structures would not exceed 200 feet in height and would therefore not be subject to FAA requirements for safety lighting and no other lighting for the transmission line is proposed. As with short-term aesthetic impacts, the severity of long-term aesthetic impacts would depend not only on the contrast produced by the transmission line, but also on its visibility and proximity to viewers and the sensitivity of the viewers to changes in the landscape's character and quality.

The potential impacts of the proposed routes and variations on aesthetic resources in the West Section are discussed in Section 6.2.2.1. Applicant proposed measures to avoid, minimize, or mitigate impacts on aesthetic resources are summarized in Section 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions.

5.3.1.2 Land Use Compatibility

This section describes existing land uses within the West Section of the proposed Project and the potential impacts to that resource from the proposed Project.

There are large areas of state forest located throughout the entire project area and a patchwork of federal land interests (mostly USFWS interests) in the West and Central Sections. Applicable national, state, and local land use and zoning policies are described in this section. Other land use categories for areas outside of federal or state lands were identified based on a review of aerial photographs and data from the United States Geological Survey (USGS) National Landscape Conservation System (NLCS) Gap Analysis Program (GAP).

The ROI for this analysis of land use includes land within 1,500 feet on either side of the anticipated alignment of the transmission line and within 1,500 feet of the footprint of the proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites. This ROI includes the anticipated 200-foot ROW and adjacent lands that would be impacted by construction and operation of the proposed Project.

Land Use Compatibility in the West Section

The West Section is located in Roseau and Lake of the Woods counties in areas that are primarily rural with sparse development. The West Section encompasses the towns of Roseau and Warroad in Roseau County, and the towns of Roosevelt and Williams in Lake of the Woods County.

The predominant land uses in the West Section are state forest land, state fee lands, federal interest (USFWS) lands, and agriculture. There is also a large number of Red Lake Reservation parcels located throughout the West Section. The various land uses along the proposed routes and variations are shown in Map 5-5.

As shown in Map 5-5, there is a patchwork of USFWS interest lands located throughout the West Section, including some that are leased to the State of Minnesota. The West Section also contains the Lost River State Forest, Beltrami Island State Forest, and Lake of the Woods State Forest. In 2013, the USFWS and the MnDNR released a joint comprehensive land use management plan for the Beltrami Island Land Utilization Project, an area that is approximately the same as the Beltrami Island State Forest (MnDNR 2015, reference (94)).

The State forest land consists primarily of undeveloped forest and swampland and is concentrated in the northwest and southeast areas of the West Section. A number of recreation opportunities are present in the state forests which are discussed in more detail in Section 5.2.1.9. The state forests are managed by the MnDNR Division of Forestry which also provides fire protection and promotes conservation and recreational use of the state's forests. State fee lands are managed by MnDNR and include Minnesota School Trust Lands that generate revenue from the sale of mineral leases, timber sales, surface leases, utility licenses, easements, the sale of land, and state forest campground fees, the revenues are then provided to Minnesota's public schools (MnDNR 2015, reference (95)). There are numerous types of state lands in the West Section, including Consolidated Conservation lands (con-con), Other - Acquired Tax Forfeit and Volstead, Trust Fund, and Federal - State Lease.

Developed and urban land uses make up small portions of the West Section and these uses are concentrated in the cities of Roseau and Warroad.

Some scattered residences, airstrips, and airports are scattered throughout the West Section (Section 5.2.1.6).

The West Section is primarily composed of rural, unincorporated communities; therefore, no local township land use plan or ordinances were identified. Relevant elements of county comprehensive plans and ordinances are described below. A MN PUC Route Permit would supersede all local zoning, building, or land use regulations; including local, county, and regional regulations (Minnesota Statutes, section 216E.10, however, the Route Permit does not preempt other state or federal permits. Any route crossing state lands or waters would require a license to cross as required under Minnesota Statutes, section 84.415 and Minnesota Rules, chapter 6135. Regulations covering the granting of permits for rights-of-way across USFWS interest lands (including easements) are promulgated in 50 CFR 29.21 and 29.22.

The **Roseau County Floodplain Management Ordinance** allows for utility transmission lines as a conditional use for Floodway Districts and General Flood Plain Districts. Transmission lines would be considered a permitted use in the Flood Fringe District if allowed by local zoning or if they are not considered a public nuisance when no local zoning exists. Conditional uses may not cause an increase in the stage of a 100-year or regional flood or cause an increase in flood damages in the reaches affected (Roseau County 2001, reference (96)).

The **Lake of the Woods County Comprehensive Plan** does not include any direct policies regarding transmission lines. The plan identifies land uses along the proposed routes and variations to consist primarily of forest and wetlands and identifies some land near the proposed route and variations as appropriate for future rural development. Rural development is described as industrial, commercial, tourism, residential, or other uses appropriate to the site's characteristics and neighborhood character. The plan describes the future land uses as a guide for the county and would not preclude construction of transmission lines and associated facilities. The plan recognizes that land use patterns are likely to be modified by changes in land ownership, economic activity, and changes in state or local policy (Headwaters Regional Development Commission 2000, reference (97)).

The **Lake of the Woods County Zoning Ordinance** identifies utility transmission lines as allowable in all non-shoreland areas and shoreland areas with the exception of Natural Environment Lakes, which specifically includes Winter Road Lake in the West Section. The Natural Environment Lakes shoreland area includes land extending 1,000 feet from the ordinary high water level. The nearest route or variation would be Variation 2 within the Beltrami North Central Variation Area, located approximately 5,000 feet from the Winter Road Lake, therefore the Lake of the Woods County zoning ordinance would not preclude construction of the proposed Project (Lake of the Woods County 2011, reference (98)).

Minnesota Forest Resource Strategies is an action plan developed by the MnDNR that identifies threats, opportunities, and strategies for the state's forests. The plan does not address specific land uses and does not preclude construction of transmission lines within state forests, however, fragmentation of state forest lands as a result of a new transmission line ROW is identified as a threat (MnDNR 2010, reference (99)).

The Beltrami Island Land Utilization Project Comprehensive Conservation Management Plan is a joint plan between MnDNR and the USFWS providing guidance on management of the 86,000 acres of federally owned land. The plan indicates that new construction of pipeline or transmission lines are not likely to be approved in the area (MnDNR 2013, reference (94)).

General Impacts

Section 6.2 summarizes the potential impacts of the proposed routes and variations on land use in the West Section. Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on land use. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Construction Impacts

Construction of the transmission line and associated facilities would result in temporary disturbances to land uses within the ROW and surrounding area. Disturbances related to construction activities would include limiting property access due the presence of construction work areas and equipment. These disturbance impacts related to construction activities would be temporary during the duration of construction.

Operation, Maintenance, and Emergency Repair Impacts

Operation, maintenance, and emergency repairs of the proposed Project would result in long-term impacts on land use within the ROW and surrounding area. The proposed Project would limit future land uses within the ROW for the lifespan of

the proposed Project. The Applicant would acquire easement rights for the ROW that would limit uses or activities that would interfere with operation or maintenance of the transmission line and would clear all woody vegetation and brush within the ROW, resulting in long-term change in land cover for forest or shrub land. This conversion from forest land in state fee areas where timber can no longer be harvested would result in a reduction of revenues to the School Trust Land program. Agricultural land uses would continue to be allowed in the ROW, but the presence of transmission structures may prevent some farm equipment from accessing land (Section 5.3.2.1). The presence of transmission structures would impact the ability of private aircraft, including those used for agricultural purposes to travel near the ROW. This might require aircraft to alter their travel patterns and require farmers to find alternate methods for application of pesticides to crops.

5.3.1.3 Cultural Values

This section describes the cultural values within the West Section and the potential impacts to cultural values from the proposed Project.

Cultural values are shared beliefs or attitudes that define what is acceptable or unacceptable, important or unimportant, right or wrong, workable or unworkable and provide a framework for unity and sense of identity for a community, region, or people.

The ROI for this analysis of cultural values in the West Section includes Roseau and Lake of the Woods counties which are crossed by the proposed routes and variations. The proposed Project is not expected to have the potential to impact cultural values outside these areas.

Cultural values are assessed based on a review of the available literature (discussed below) and a review of the comments provided during Public Scoping Meetings in the proposed Project area.

Cultural History

The proposed Project is located in an area dominated by both Euro-American and American Indian residents, with differing cultural values. The Euro-American residents of this area of northern Minnesota are largely of Protestant German and Scandinavian descent, and these northern European based communities may still identify with those ethnic heritage. Many of these counties suffered particularly badly in the Great Depression. They are predominantly populated by older, primarily white, mostly conservative people with incomes generally lower than the national average.

In the book, *Our Patchwork Nation*, authors Dante Chinni and James Gimpel used U.S. Census data to analyze the entire United States county by county and provide a list of 12 distinct types of communities that comprise the nation (Chinni and Gimpel 2010, reference (100)). In Chinni and Gimpel's analysis, Roseau and Lake of the Woods counties are identified as "Emptying Nest" type communities. Emptying nest counties are generally not densely populated, and mostly consist of strings of small towns.

The Euro-American population in the project area has been described by journalist Colin Woodard as part of a large region he called "Yankeedom." (Woodard 2012, reference (101)). According to Woodard, the values of the region can be described as middle-class, comfortable with local government regulation, and with a general belief that government should be used for improving the lives of its citizens.

The West Section includes agricultural areas, particularly in Roseau County. The more agricultural communities of the West Section appear to have cultural values that relate to the economic activities of agriculture, tourism, and manufacturing. Common themes mentioned on the websites of regional cities and business communities stress hard work, optimism, and appreciation of the natural world. The major values within the region include pragmatism, appreciation, and use of natural resources, individualism, political and social conservatism, community pride, and economic well-being (Minnesota Power 2014, reference (1)).

Public comments provided during EIS scoping raised concerns related to avoiding impacts to agricultural land, an indication of the value placed on preservation of agricultural life. In addition, concerns were raised specifically relating to possible visual and environmental impacts, implying cultural values of visual aesthetics of the landscape and sustained environmental conditions. Another common concern of the public comments was possibly decreasing home or land values, something that would be an understandable concern for people living on fixed incomes. This would imply valuing a certain standard of living and quality of life (DOE and DOC-EERA 2014, reference (102)).

Before Euro-American settlement, the proposed Project area was long inhabited by numerous American Indian tribes. Presently, different bands of the Anishinabe (also known as Ojibwe or Chippewa), the most prominent tribe in the area, retain authority over seven reservations within northern Minnesota. Most of the Ojibwe or Chippewa people live on land their ancestors settled before the coming

of Europeans. This traditional homeland (and its resources contained within it) was immense and continues to be regarded as a gift from the Great Spirit to the Anishinabe people; a gift that belongs to all tribal members.

In the early 1700's, this area was largely occupied by Dakota tribes. By the mid-1700s, however, Anishinabe hunting, trapping and trading forays evolved into migration and the eventual dispersion into the area. This shift, which spanned many generations, brought the Anishinabe—driven by opportunities in the west and Iroquois raids—from the region near Sault St. Marie, Michigan, and Lake Huron into northern Minnesota. The Anishinabe to the north and south of Lake Superior evolved somewhat different economies and cultures as a result of different environments and trade relations (Meyer 1992, reference (103)). By the late 1700s, Anishinabe bands replaced the Dakota villages on the lake and stream sites in northern Minnesota. The Dakota largely moved to the prairies of the Minnesota and Missouri rivers.

Ceded Territory Areas

Beginning in 1837, the U.S. government and the Anishinabe entered into a complex series of treaties and agreements with the federal government ceding territory to the U.S. (see inset in Map 5-6.) Four of these treaties include ceded territory potentially crossed by the proposed Project:

- **Treaty of 1855** (Mississippi, Pillager, Winnibigoshish Bands) - Ceding territory in north central Minnesota west of 1854 Treaty border.
- **Treaty of 1863** (Red Lake, Pembina Bands at Old Crossing) - Ceding territory on western Minnesota border along the Red River to the Canadian border and into Dakota Territory. This treaty was subsequently modified in 1864.
- **Treaty of 1866** (Mississippi Band) - Ceding territory at Canadian Border west of 1854 Treaty Border, near Lake Vermillion, establishing Bois Forte Reservation.
- **Nelson Act of 1889** (and subsequent agreements with the Red Lake Band) - Ceding territory between west 1855 Treaty boundary and east 1863 Treaty Boundary.; and defined White Earth, Leech Lake, Nett Lake (Bois Forte), Grand Portage, Fond du Lac, and Mille Lacs Band members living on reservations as a single group of people.[76]

The first of these treaties, the 1855 Treaty, involved three Anishinabe Bands (the Mississippi, Pillager, and Lake Winnibigoshish). It covers an area in the Central and East sections of the proposed Project area. Eight years later, the Red Lake Band and Pembina Bands entered into the Treaty of 1863. This treaty is also known as the "Old Crossing Treaty." In that treaty, the Red Lake Band ceded 11 million acres of rich farm land along the Red River of the North in Minnesota and North Dakota to the U.S. The 1866 treaty ceded territory around Lake Vermillion established the Bois Forte Reservation at Nett Lake and Deer Creek (Itasca County). The Lake Vermilion sections of the Bois Forte lands were later defined in an 1881 Executive Order. Then, in 1889, in the treaty establishing the current Red Lake Reservation boundaries, the Red Lake Band ceded another 2.9 million acres referred to as the "Act for the Relief and Civilization of the Chippewa."

Finally, in addition to these four treaties and agreements with the U.S., the Red Lake Band ceded a western section of Red Lake Reservation in the Treaty of 1902. Under this treaty, the Red Lake Band ceded a 256,152 acre area to the U.S. known as the "Western Townships." This treaty area is located west of the proposed Project area, but it involved the Red Lake Band so it is also summarized here for purposes of completeness.

Indian Reservations within the Proposed Project Area

As a result of these treaties, there are two federally recognized Indian tribes with reservations in the proposed Project area: the Red Lake Band and the Bois Forte Band. The larger of these is the Red Lake Band of Chippewa, who hold more than 840,000 acres of land, most of which is located within two large contiguous areas around Upper and Lower Red Lake, but whose holdings also include hundreds of small parcels spread throughout the counties in the Central Section. Both of these reservations are shown in Map 5-13, which shows the Central Section of the proposed Project area. The total Red Lake reservation area is larger than the state of Rhode Island, and Red Lake itself is the largest fresh water lake in the country wholly contained within one state. Because the Red Lake Reservation is located in the Central Section of the proposed Project area,

76 Two years following the passage of the Indian Reorganization Act of 1934 which provided for the incorporation of tribal governments, these Bands incorporated as the Minnesota Chippewa Tribe.

additional background on the Red Lake Band is provided in Section 5.4.1.3.

The Bois Forte Band has also lived in northern Minnesota for centuries. The Bois Forte Reservation consists of three parts. The largest sector is at Nett Lake in St. Louis and Koochiching counties, which is home to the majority of Bois Forte Band members and the Band's Tribal Government Offices. The smallest sector is the Vermilion Reservation, located near the city of Tower on Lake Vermilion in St. Louis County. The only part of the Bois Forte Reservation within the project area is the 23,000 acre Deer Creek sector in Itasca County. No tribal members currently live there. Because the Bois Forte community lies completely in the Central and East sections of the project area, it is discussed more fully in Section 5.4.1.3.

The complex history of the area's treaties and the parties involved in them is outside the scope of this EIS. In general, however, the history of these treaties involved plans for allotting reservation land to individual families so as to replace the concept of shared ownership of Anishinabe people with a new system of private property. Starting with the Treaty of 1855, the treaties were intended to help Anishinabe people to be farmers on individually-owned plots of land; however, the Red Lake Band never accepted allotment. An example of the difference in historical cultural values between the Red Lake Band and Euro-Americans is provided in Section 5.4.1.3.

The Anishinabe tribes' hunting, gathering, and fishing rights in these ceded areas is the subject of a complex, ongoing legal dispute. This analysis of cultural values and the impacts of the proposed Project do not address these ongoing legal issues, but acknowledges and discusses the tribes' on-going interest in these rights that they retained in sections of the project area that are located within the ceded territory but outside of reservation boundaries.

As noted in Section 1.2.4, the NHPA (54 U.S.C. 306108) and Executive Order 13175 requires federal agencies to consult on a government-to-government bases with Indian Tribes that may be affected by the proposed Project. DOE requested initiation of Section 106 Consultation under the NHPA for the proposed Project in a November 19, 2014 letter to the Minnesota SHPO. DOE initiated its government-to-government tribal consultation efforts in a June 27, 2014 letter to potentially affected tribes, and has held consultation meetings in the proposed Project area in northern Minnesota. DOE's on-going consultation aids in identifying cultural values that the Anishinabe tribes ascribe to the area, its resources, and what the possible effects would be to the held values from construction and operation of the proposed Project.

General Impacts

Impacts to cultural values can be minimized primarily through corridor sharing with existing transmission infrastructure. Where existing infrastructure is present, impacts to the values addressed in Section 5.3.1.3 are likely to be marginal.

Although some permanent impacts to cultural values may be felt on a local basis, particularly where transmission lines run close to communities whose values are at odds with the presence of new, large infrastructure projects, at a county-wide or regional level no conflict with cultural values is anticipated. Since communities within the West Section are fairly homogenous, the proposed routes and variations considered are anticipated to have similar impacts on cultural values. These impacts are limited and do not vary by proposed route or variation considered; therefore, cultural values are not discussed further in Chapter 6 of this EIS.

Pragmatism and Quality of Life

The people living in this area tend to value pragmatism as seen by their concern for maintaining a certain standard of living. The Applicant has indicated that data gathered through their public engagement efforts suggests that there is a general understanding of the need for the proposed Project but that the local benefits of the proposed Project, in the form of tax payments to county government, may not be perceived as a direct benefit (Minnesota Power 2014, reference (1)). If there is no perceived direct benefit in terms of better, more reliable energy to the communities, or if area residents sense it would inhibit their economic life in relation to tourism, agriculture, or decreasing land values, and inadequate compensation for use of their land, there could be adverse effects on the cultural values of pragmatism and quality of life. Such impacts are more closely linked to the proposed Project as a whole, and are unlikely to vary with the particular route that is permitted.

Natural Resource Appreciation and Use

The proposed Project would have direct effects on a number of natural resources and visual aesthetics to varying degrees, depending on the final route selection. Potential impacts related to natural resources and aesthetic from the proposed Project are discussed further in Chapter 6 and Chapter 7 of this EIS. Impacts to natural resources and aesthetics may be a proxy for the potential impacts to the cultural or traditional values tied to natural resource

appreciation and use. However, given the broad region over which these values are held and the difficulty in quantifying impacts to cultural values, measureable differences in impacts to cultural values at the community or regional scale are not expected across the various proposed routes and variations evaluated in this EIS.

Individualism and Community Pride

The values of individualism and community pride are tied to the overall quality of life experienced by the area's residents. The basic elements of the community that are sources of community pride include a shared sense of the natural beauty of the area, access to the natural environment, and tourism. The proposed Project would allow local residents to continue their overall individual economic and social activities, and access to the natural environment and tourism is not expected to be permanently negatively affected by the proposed Project. An impact on the sense of beauty of the natural environment could occur in areas where a proposed route or variation is closest to occupied areas. Potential impacts related to aesthetics from the proposed Project are discussed further in Chapter 6 of this EIS.

Economic Well-being, Quality of Life, and Standard of Living

As discussed above, the proposed Project would have a beneficial, short-term, direct impact on the local economy during construction. As discussed further in Chapter 6 of this EIS, there should be no lasting adverse impacts on economic activities related to hunting, fishing, hiking, snowmobiling, and other recreational activities where local businesses provide services to tourists for income. Therefore, no indirect effects on economic well-being, quality of life, and standard of living are anticipated.

Construction Impacts

General impacts to cultural values from the proposed project are discussed above. The construction phase of the proposed Project is not expected to result in impacts to cultural values cultural values held by Euro-Americans or American Indian tribes.

Operation, Maintenance, and Emergency Repair

General impacts to cultural values from the proposed project are discussed above. Operation, maintenance, and emergency repair are not expected to result in impacts to cultural values held by Euro-Americans or American Indian tribes.

5.3.2 Land-Based Economies

Constructing and operating the proposed Project could potentially affect land-based economies in the proposed Project area. Transmission lines and associated structures are a physical, long-term presence on the landscape, which could prevent or otherwise limit use of the land for other purposes. When placed in an agricultural field, transmission line structures have a relatively small footprint, yet they could potentially interfere with farming operations. In addition, tall trees are not allowed in transmission line ROWs, a restriction that could affect forestry operations along the ROW. Finally, transmission line structures have the potential to affect access to mineral resources if they are placed in areas where mineral resources are present.

5.3.2.1 Agriculture in the West Section

This section describes the agricultural resources within the West Section and the potential impacts from the proposed Project.

Agriculture is defined as the cultivation of plants and animals for sustaining and enhancing human populations. For the purposes of this analysis, impacts to agriculture were assessed by evaluating impacts to four farmland types: prime farmland, prime farmland if drained, farmland not classified as prime farmland, and farmland of statewide importance.

Prime farmland is protected under the Farmland Protection Policy Act (FPPA) of 1981 and can be described as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides and labor" (7 CFR, section 657.5 (a) (1)). The land could be cropland, pasture, rangeland or other land, but not urban built-up land or water. The FPPA is intended to minimize the conversion of farmland to nonagricultural uses. The Act also ensures that Federal programs are administered in a manner that, to the extent practicable, would be compatible with private, state, and local government programs and policies to protect farmland. The implementing procedures of the FPPA and Natural Resources Conservation Service (NRCS) require Federal agencies to evaluate the adverse effects (direct and indirect) of their programs on prime farmland and farmland, and to consider alternative actions that could avoid adverse effects. According to the FPPA, this evaluation is not applicable to non-Federal activities on private or non-Federal lands where Federal assistance for farmland conversion is not requested (7 CFR Part

658). Therefore, the FPPA is not applicable to the proposed Project.

Agriculture is one of the more minor land-based economic resources in the West Section. In 2010 cash receipts for agricultural operations were approximately $102 million in Roseau County and approximately $10 million in Lake of the Woods County (MDA 2012, (100)). Principal crops in Roseau and Lake of the Woods counties include sugar beets and wheat (Ye 2014, reference (105)). Farmers in the West Section raise livestock, including hogs and pigs, broiler or other meat-type chickens, cattle and sheep (USDA 2012, reference (106)). The following sections describe potential route-specific impacts to farmland, organic farms, livestock, aerial spraying, irrigation system and precision farming practices.

The ROI for this analysis of impacts to agriculture includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations. This ROI was selected based on an expectation that, given the construction activities proposed, the majority of impacts on agriculture would likely be limited to this area.

Farmland

Agricultural land in the West Section includes lands designated as prime farmland, prime farmland if drained, farmland not classified as prime farmland, and farmland of statewide importance. As noted above, prime farmland is defined as land that has the best combination of physical and chemical characteristics for producing crops and is also available for this use. Farmland of statewide importance includes other land that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops.

Potential impacts to prime farmland, prime farmland if drained, farmland not classified as prime farmland and farmland of statewide importance from the proposed Project are discussed in Chapter 6 of this EIS. Strategies for avoiding, minimizing, or mitigating potential impacts to these types of farmlands are similar to those described below for all agricultural lands.

Organic Farms

While the presence of a high voltage transmission line on or near an organic farm would not directly affect a farm's organic certification, special construction and maintenance procedures would need to be followed to avoid impacts to these farms. Herbicides, pesticides, or other substances prohibited by the USDA National Organic Program could not be used on or near the organic farms, and construction vehicles would need to be cleaned prior to entering organic farms to prevent tracking offsite soil or plant material onto the farm.

Since potential impacts related to organic farms are expected to occur if special special construction and maintenance procedures are followed and do not vary by proposed route or variation considered, organic farms are not discussed further in Chapter 6 of this EIS.

Livestock

Hog, poultry, cattle, and sheep farms are located in the West Section. Livestock operations could be temporarily affected during construction of the proposed Project. Construction activities could temporarily disrupt livestock access to pasture lands and disturb livestock with construction noise. In addition, poultry could be sensitive to disease caused by pathogens introduced by offsite soils.

Though no stray voltage impacts are anticipated as a result of the proposed Project, stray voltage could be of concern to livestock farmers, particularly on dairy farms, due to its potential impacts to milk production and quality. Stray voltage is discussed further in Section 5.2.2.3. Induced voltage also may be of concern to livestock farmers, for farms with buildings near a transmission line that would require grounding of the metal components of the building. No impacts due to induced voltage are anticipated from the proposed Project if effective grounding is implemented. Induced voltage is discussed further in Section 5.2.2.4. Since potential impacts related to livestock are expected to be limited and do not vary by proposed route or variation considered, livestock are not discussed further in Chapter 6 of this EIS.

Aerial Spraying

Transmission line structures could potentially affect the coverage and effectiveness of aerial spraying. Structures could limit the ability of aerial applicators to reach specific areas of fields, by limiting those areas where applicators could safely fly. Since potential impacts related to aerial spraying are expected to be limited from the proposed Project and do not vary by proposed route or variation considered, aerial spraying is not discussed further in Chapter 6 of this EIS.

Irrigation Systems

Transmission line structures in agricultural fields could potentially impede the use of irrigation

systems, either by necessitating reconfiguration of an irrigation system to accommodate structures or by reducing crop revenue because all or a portion of a field could not be irrigated. No known center-pivot or other irrigation systems have been identified in the West Section; therefore, impacts to irrigation systems are not anticipated and mitigation would not be required. If an irrigation system is encountered during construction of the proposed Project, procedures specified in the Agriculture Impact Mitigation Plan (AIMP) would be implemented to minimize disruption of the system (Appendix O). Further discussion of the AIMP can be found in Section 2.13 and is a potential MN PUC Route Permit condition. Since potential impacts related to irrigation systems are not expected from the proposed Project and do not vary by proposed route or variation considered, irrigation systems are not discussed further in Chapter 6 of this EIS.

Precision Farming Systems

Precision farming involves the use of GPS and, more recently, real-time kinematic (RTK) GPS in farm machinery, allowing the machinery to be directed more accurately and maximize a farm's efficiency. Transmission lines have the potential to interfere with RTK and standard GPS used for precision farming. Further discussion on interference can be located in Section 5.2.1.5. If interference with electronic devices, including precision farming systems, does occur and is caused by the presence or operation of the transmission line, Route Permits issued by the Commission require permittees to take those actions which are feasible to restore electronic reception to pre-project quality (Appendix B). Since potential impacts related to precision farming systems are not expected from the proposed Project and do not vary by proposed route or variation considered, precision farming systems are not discussed further in Chapter 6 of this EIS.

General Impacts

Potential impacts to agriculture associated with projects of this nature could be either short-term or long-term and are discussed generally below. Chapter 6 of this EIS assesses impacts on agriculture using USDA NRCS, Soil Survey Geographic (SSURGO) database Farmland Classification mapping to identify areas of prime farmland, prime farmland if drained, and farmland of statewide importance within the ROW.

Agricultural land uses would continue to be allowed in the ROW, but the presence of transmission structures may prevent some farm equipment from accessing land. Impacts to agricultural operations could be mitigated by prudent routing (i.e., by selecting routes that avoid agricultural fields by following existing infrastructure ROWs, field lines and property lines). Where structures are placed in fields, impacts could be mitigated by not placing structures diagonally across fields, but rather parallel to existing field lines or spanning fields if diagonal crossings are necessary.

Impacts to agricultural lands could also be minimized by limiting the removal of crops to only those necessary for construction and on-going safe operation of the line. Additionally, the Applicant, in collaboration with the MDA would prepare an Agricultural Impact Mitigation Plan (AIMP) for the proposed Project. The AIMP identifies measures that the Applicant would take to avoid, mitigate, or provide compensation for agricultural impacts that could result from constructing and operating the project. The AIMP specifies procedures for repairing damaged drain tile, alleviating compaction, and removing construction debris. Compliance with the AIMP is not a permit condition in the MN PUC's generic route permit template, but has been included as a permit condition for other high voltage transmission line projects (Appendix B). Further discussion on the AIMP can be found in Section 2.13.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. These activities could limit the use of fields or could affect crops and soil by compacting soil, generating dust, damaging crops or drain tile, or causing erosion. Project construction activities would typically be limited to the transmission line ROW. Short-term impacts in agricultural lands are estimated as 0.92 acres per structure location.

Construction activities would result in long-term impacts to agriculture by the physical presence of transmission line structures and associated facilities in crop, pasture, or other agricultural lands. For the transmission line itself, the footprint of the structure proposed for the project is 33 square feet. The impact of such structures, however, could be greater than their footprint since they could impede the use of farm equipment and irrigation systems and interfere with aerial spraying. These physical impacts could result in lost farming income or decreased property values (Section 5.2.1.4). In addition, stray voltage could affect livestock if facilities are not properly wired/grounded (Section 5.2.2.3).

Impacts from Operations, Maintenance, and Emergency Repairs

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation that would not interfere with the transmission line. Maintenance and emergency repair activities could result in direct impacts on farmlands from the removal of crops, localized physical disturbance, and soil compaction caused by equipment. Maintenance and emergency repair-related impacts on farmland would be short-term and more localized than construction-related impacts.

5.3.2.2 Forestry

This section describes the forestry resources within the West Section and the potential impacts from the proposed Project.

Forestry resources are defined as forest lands and their associated harvestable products, including but not limited to, trees, saplings, seedlings, logs, brush, and slashing.

The ROI for this analysis of impacts to forestry includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations.

The EIS assesses impacts on forestry resources using MnDNR Division of Forestry, state forest boundaries and USFWS Interest mapping to identify areas of state forests and USFS national forest lands within the ROW.

This ROI was selected based on an expectation that, given the construction activities proposed, the majority of impacts on forestry would likely occur within this area.

Forestry in the West Section

The West Section includes a mix of agricultural and forested lands. State-owned forest lands, including the Beltrami Island, Lost River, and Lake of the Woods state forests, are managed by the MnDNR. The MnDNR Forestry Timber Sales Program manages timber harvesting on state-owned forest lands, which provides a source of funding for public services in Minnesota. Roseau and Lake of the Woods Counties are among Minnesota's top 20 timber harvest counties, each producing more than 50,000 cords annually (MnDNR 2011, reference (107)).

General Impacts

Potential impacts to forestry resources associated with transmission line projects could be either short-term or long-term.

Impacts to timber harvesting operations could be mitigated by prudent routing (i.e., by selecting routes that avoid forest lands by following existing infrastructure ROWs, access road ROWs, and property lines). ROW maintenance could be managed to reduce impacts on forestry resources. For example, leaving small fruiting trees and shrubs and using mechanical versus chemical vegetation management could help mitigate the loss of forestry resources. In addition, increasing the time between line maintenance in forested areas could result in harvestable products. Finally, elevated spanning, in areas with high elevations, could reduce forest clearing.

Due to the possibility of permanent tree removal in forest lands, potentially significant impacts to forestry resources are expected as a result of construction and operation of the proposed Project, depending on the route or variation considered. Adverse, long-term, and regional impacts to forestry resources are expected and are considered significant in nature by the MnDNR. The estimated loss in public revenue from timber harvesting is currently unknown. Potential impacts related to forestry from the proposed Project are discussed further in Chapter 6 of this EIS.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. Construction activities could limit timber harvesting efforts, affect timber stands and soil by compaction, damage trees, or cause erosion. Project construction activities would typically be limited to the transmission line ROW. As mentioned above, short-term impacts are estimated as 0.92 acres per structure location. Long-term impacts to forestry resources would be caused by the clearing of trees and physical presence of transmission line structures and associated facilities in forest lands. As mentioned above, for the transmission line itself, the footprint of the structure proposed for the project is 33 square feet.

Impacts from Operations, Maintenance, and Emergency Repairs

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation that would not interfere with the transmission line. Maintenance

and emergency repair activities could result in direct impacts on forest lands from the removal of vegetation, localized physical disturbance, and soil compaction caused by equipment. Maintenance and emergency repair-related impacts on forestry resources would be short-term and more localized than construction-related impacts.

5.3.2.3 Mining and Mineral Resources

This section describes mining and mineral resources within the West Section and the potential impacts on those resources from construction and operation of the proposed Project as required by MN PUC decision making for the Route Permit.

Mining and mineral resources are defined as areas with a concentration or occurrence of natural, solid, inorganic, or fossilized organic material in such form, quantity, grade, and quality that it has reasonable prospects for commercial extraction.

The ROI for this analysis of impacts to mining and mineral resources includes the anticipated 200-foot ROW of the transmission line and the permanent footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, and permanent access roads.

This ROI was selected based on an expectation that the potential direct and indirect impacts on mining and mineral resources would likely occur within this area.

The EIS assesses impacts on mining and mineral resources using the MnDNR Division of Lands and Minerals, All State Mineral Leases mapping and the MnDOT Aggregate Source Information System data to identify mining and mineral resources within the ROW. In situations where an aggregate resource data point appeared in close proximity to a proposed route or variation, the Aggregate Source Information System data was reviewed in conjunction with 2013 aerial photography; data points were shifted as necessary based on this review.

Mining and Mineral Resources in the West Section

Mining contributes less than one percent of the economy's total output in this region (Tuck 2014, reference (108); Tuck 2014, (109)). There are state mining leases identified in the West Section. Several abandoned metallic mineral mining sites are found along the proposed route and variations in the West Section. These sites include expired/terminated leases for the mining of metallic minerals (Map 5-5). None of these mining leases are currently active. Mining and mineral resources are described in more detail in Chapter 6.

There are no aggregate resources located within 100 feet of the proposed routes or variations in the West Section; however, there is an aggregate source located within 1,500 feet from the Roseau Lake WMA Variation in the Roseau Lake WMA Variation Area (Map 5-4). In addition, the MnDNR has identified that state-owned surface estate mineral resources (peat, sand and gravel aggregate, crushed stone, clay, etc.) may be encumbered by the proposed Project (MnDNR 2014, reference (110)). The Applicant would be responsible to work with the MnDNR to evaluate (at Applicant's expense) and determine if and where compensation would be required for encumbrance of surface estate mineral resources.

General Impacts

Potential impacts to mining and mineral resources associated with high voltage transmission line projects could be either short-term or long-term. Impacts can be mitigated by prudent routing and structure placement and placement of the alignment within the route to avoid any planned potential mineral resources. Potential impacts related to mining and mineral resources from the proposed Project are discussed further in Chapter 6 of this EIS.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. The construction of transmission lines could affect future mining operations if the structures interfere with access to mineable resources or the ability to remove mineral resources. If there are potentially recoverable mineral reserves in the West Section, construction of the proposed Project could limit the ability to successfully mine these reserves, depending on the considered route or variation and the location of any mineable reserves.

Impacts from Operations, Maintenance, and Emergency Repairs

Maintenance and emergency repair activities would have minimal to no impact on mining and mineral resources from localized physical disturbance caused by the use of maintenance equipment.

5.3.3 Archaeology and Historic Architectural Resources

This section describes the archaeological, historic architectural, and Native American resources, collectively referred to as cultural resources, within the West Section and the potential impacts from the proposed Project on these resources. This section also describes those cultural resources that have been included in, or determined eligible for inclusion in, the National Register of Historic Places (NRHP). Therefore, cultural resources may be archaeological resources, historic architectural or built resources, or properties of traditional religious and cultural importance to a federally-recognized Indian tribe, such as a traditional cultural property (TCP) or a traditional cultural landscape (TCL).

5.3.3.1 Archaeology and Historic Architectural Resources

Compliance with NEPA requires the evaluation of the potential impacts of a proposed action on cultural resources. Cultural resources generally consist of archaeological sites or districts, historic architectural or built resources, such as buildings, structures, districts, and objects, and Native American resources, such as properties of traditional religious and cultural importance to a federally recognized Indian tribe, like TCPs, or TCLs. Compliance with NEPA also requires demonstrating that a proposed action has been considered pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966 (16 U.S.C. 470f), as amended, and implementing regulations for Section 106 that were developed by the Advisory Council on Historic Preservation (ACHP) and codified in 36 CFR Part 800 (ACHP 2004, reference (111)).

The NHPA of 1966 (16 U.S.C. Part 470 *et. seq.*) is the primary federal law protecting cultural resources. Section 106 of the NHPA requires federal agencies to identify cultural resources that are historic properties within the Area of Potential Effect (APE) for a federal undertaking, consider the potential effects of their proposed federal undertakings on historic properties, and develop measures to avoid, minimize, or mitigate any adverse effects on historic properties (36 CFR Parts 800.4(d) and 800.5; ACHP 2004, reference (111)).

Historic properties are those cultural resources that are listed in or determined eligible for listing in the NRHP and may be any prehistoric or historic district, site, building, structure, object, including properties of traditional religious and cultural importance to a federally recognized Indian tribe that meet the National Register criteria (36 CFR Part 800.16(l)(1); ACHP 2004, reference (111)). Cultural resources are considered to be NRHP-eligible, and therefore, historic properties, if they display the quality of significance in one or more of the following areas: American history, architecture, archaeology, engineering, or culture. They also must possess integrity of location, design, setting, workmanship, feeling, and association, and generally have to meet one of the following four National Register criteria:

- Criterion A – properties that are associated with the events that have made a significant contribution to the broad patterns of American history; or
- Criterion B – properties that are associated with the lives of persons significant in our past; or
- Criterion C – properties that embody the distinctive characteristic of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic value, or that represent a significant or distinguishable entity whose components may lack individual distinction; or
- Criterion D – properties that have yielded or may likely yield information important in prehistory or history (National Park Service 1995, reference (112)).

For the purposes of compliance with Section 106 of the NHPA, the proposed DOE undertaking is the potential granting of a Presidential permit for the international border crossing requested by the Applicant as part of its proposed Project, as defined in the ACHP's implementing regulations for Section 106 of the NHPA (36 CFR Part 800.16(y)), and is a federal undertaking that has potential to cause effects on historic properties (36 CFR 800.3; ACHP 2004, reference (111)). DOE is coordinating its compliance with Section 106 of the NHPA with its review under NEPA according to the process set out in 36 CFR Part 800.3(c). DOE is also acting as lead agency under Section 106 for its cooperating federal agency partners, and will consider the potential effects of its cooperating agencies' proposed actions on historic properties as part of the Section 106 compliance process for the DOE undertaking (36 CFR 800.2(a)(2); ACHP 2004, reference (111)).

For the purposes of the impact analysis on cultural resources and historic properties, DOE determined that the ROI will be the APE for the proposed Project. The DOE's APE for the proposed Project currently consists of a direct or archaeological APE, within which direct impacts or effects (generally from construction and/or maintenance activities) may

occur on cultural resources and historic properties, and an indirect or aboveground APE, within which indirect impacts (generally visual or audible that may occur during construction, operation, and/or maintenance activities) may occur on cultural resources and historic properties. DOE's final determination of the direct and indirect APE for the proposed undertaking will be made in consultation with the SHPO, federally-recognized Indian tribes, and additional consulting parties as part of ongoing Section 106 consultation for the federal undertaking and the proposed Project.

For this analysis, the direct APE includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1 (the proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites). The direct APE was defined to recognize the potential for disturbance to surface and subsurface soils in association with construction activity. The indirect APE includes the direct APE plus a one mile radius on each side of the anticipated alignment of the proposed transmission line or the center of the footprint of the other elements of the proposed Project. The larger indirect APE serves to address the potential indirect adverse visual or other effects the proposed Project could have upon the setting of cultural resources and historic properties, particularly for historic architectural or other built resources, TCPS, and TCLs, where setting is or would be a character-defining feature that contributes to the significance of these cultural resources or historic properties.

DOE is phasing the identification and evaluation of historic properties within the APE and the application of the criteria of adverse effects in accordance with 36 CFR Part 800.4(b)(2) and 36 CFR Part 800.5(a)(3), respectively, because the proposed Project alternatives consist of routes, variations, and alignment modifications covering a large land area. Additionally, because the potential effects of the proposed Project on historic properties, including cultural resources, cannot be fully determined prior to approval of the proposed Project, DOE intends to execute a Programmatic Agreement (PA) in accordance with 36 CFR Part 800.14(b)(1)(ii) (ACHP 2004, reference (111)). Under the terms the PA that is executed for the proposed Project, DOE, in consultation with the Minnesota SHPO, the ACHP, federally-recognized Indian tribes, the Applicant, representatives of local governments, and other consulting parties, will ensure that stipulations developed to identify cultural resources and historic properties, determine the effects of the proposed Project on historic properties, and determine measures to avoid, minimize, and mitigate adverse effects on historic properties are implemented. DOE initiated the Section 106 consultation process for the proposed undertaking with the Minnesota SHPO via a November 19, 2014, letter, notifying them of proposed Project, the DOE's determination that the proposed Project is a federal undertaking that has the potential to affect cultural resources and historic properties, and defining the APE for the proposed Project. In a December 30, 2014 response letter to DOE, Minnesota SHPO acknowledged DOE's initiation of Section 106 consultation, and concurred with the DOE's definition of the APE for the undertaking and the agency's proposal to develop and execute a PA for the undertaking. DOE also invited the ACHP to participate in the development of its proposed PA for the proposed Project, and the ACHP accepted the agency's invitation to participate in the Section 106 consultation process on March 27, 2015. A record of DOE's consultation with the Minnesota SHPO and Advisory Council conducted to date is included in Appendix P.

To support the phased identification of cultural resources and historic properties, DOE performed a Phase IA cultural resources survey (i.e., desktop literature review) in order to identify previously recorded cultural resources and historic properties within the APE for the proposed Project (see Appendix P). The purpose of the DOE's Phase IA cultural resources survey was to develop a sufficient amount of information for known cultural resources and historic properties to allow DOE to consider the potential effects of the proposed Project on historic properties under Section 106 of the NHPA. Additionally, the information obtained in DOE's Phase IA cultural resources survey was used to independently verify the information provided by the Applicant for their proposed routes and to identify similar information for the alternatives, including proposed variations that are being evaluated as part of the NEPA process. The Phase IA cultural resources survey presents information obtained from site file searches and literature reviews conducted at the Minnesota Historical Society, SHPO Office, and Office of the State Archaeologist. The Minnesota SHPO maintains a comprehensive database on all prehistoric and historic archaeological sites as well as historic architectural resources (individual buildings and structures as well as historic districts) and cultural landscapes for the entire state. This database is the source of the majority of the information for previously identified cultural resources data within

the APE for the proposed Project, pending the completion of cultural resources investigations once the final route for the proposed Project has been determined. The results of DOE's Phase IA cultural resources survey are summarized in Sections 5.3.3, 5.4.3, and 5.5.3 and discussed more specifically for each variation area in Sections 6.2, 6.3, and 6.4.

Because the APE for the proposed undertaking also includes lands that were inhabited by American Indian tribes before Euro-American settlement, DOE is consulting with federally-recognized Indian tribes to identify Native American resources that may be impacted or affected by the proposed Project, including any Native American resources that are historic properties, such as NRHP-listed or -eligible archaeological sites, TCPs, or TCLs, that are not included in the Minnesota SHPO database. As proposed, the Project does not directly involve tribal reservation lands or require a ROW grant or special use grant from tribes. However, the proposed Project has the potential to impact resources that are of traditional religious and cultural importance to federally-recognized Indian tribes with current or historic interest in the APE. The U.S. entered into a number of treaties with American Indian tribes in the area under which tribal members retain rights to many of the resources found in the APE (see Section 5.3.1.3). Federally-recognized Indian tribes retain sovereignty over lands within their reservation boundaries and also retain rights for resources and activities on lands ceded to the U.S. under these treaties. DOE, like all federal agencies, has a trust obligation to assure that the proposed undertaking does not infringe or negate the tribes' abilities to exercise these retained treaty rights.

On June 27, 2014, DOE initiated its Section 106 consultation with tribes potentially affected by the proposed undertaking in accordance with its responsibilities under NEPA, Section 106 of NHPA, the American Indian Religious Freedom Act (16 U.S.C. 1996), the Archeological Resource Protection and Repatriation Act of 1990 (25 U.S.C. 470aa-mm), the Native American Graves Protection and Repatriation Act of 1990 (25 U.S.C. 3001, et. Seq.), Executive Order 13175, *Consultation and Coordination with Indian Tribal Governments* (2000, reference (113)), and DOE's "American Indian and Alaska Native Tribal Government Policy," (USDOE 2009, reference (114)) (Appendix A). As a part of this effort, DOE identified and invited over thirty federally-recognized American Indian tribes with potential current or historic interests in the area of the proposed Project to tribal consultation meetings on July 15, 2014 in Red Lake, Minnesota, and on July 22, 2014, in Deer River, Minnesota. The purpose of these consultation meetings was to gain the opinions and insights of tribes regarding cultural values that the tribes subscribe to the area and its resources, as well as to identify the opinions and insights of tribes that no longer live in the area of the proposed undertaking.

A total of 28 federally recognized Indian tribes responded to DOE's initiation of the Section 106 process: 22 tribes indicated that they wished to be considered Section 106 consulting parties, five tribes indicated that they did not wish to be Section 106 consulting parties but would like to be kept informed of the project, and one tribe indicated that they did not wish to be Section 106 consulting party and had no further interest in the proposed Project (see Appendix A). Responses from the remaining nine federally-recognized Indian tribes have not been received by DOE to date.

On March 24-25, 2015, DOE held another round of tribal consultation meetings under Section 106 of the NHPA at the Mystic Lake Hotel and Casino in Prior Lake, Minnesota. The purpose of these meetings was to establish a path forward for DOE's proposed approach for phased identification and evaluation of historic properties, including TCPs, through a proposed PA. A total of 16 tribes attended one day or more of the tribal meetings. As an outcome of the tribal meetings, the DOE invited the Red Lake Band of Chippewa Indians to be a cooperating agency in the NEPA process for the proposed Project as well as a consulting party to the Section 106 process and an invited signatory to the PA that is being developed for the proposed Project. Four additional tribes were identified as participants for the development of the PA for the Project as invited signatories (the Bois Forte Band of Chippewa Indians, the Mille Lacs Band of Chippewa, the White Earth Band of Chippewa, and the Leech Lake Band of Chippewa Indians). The remaining tribes indicated that that they wished to continue as Section 106 consulting parties.

Additional information at the March 24-25, 2015 meeting was provided by the tribes regarding the need for TCPs surveys and the consideration of treaty rights for subsistence and ceremonial purposes to be considered in both the PA and the EIS for the proposed Project as part of the NHPA and NEPA compliance processes. Specifically, Native American TCPs and TCLs need to be identified and evaluated under the Section 106 process. In order to complete this effort, background research related to previously documented ethnographic, ethnohistoric, and environmental data associated with the proposed Project area are necessary. Further tribal outreach and ethnographic interviews with Tribal Historic Preservation Officers (THPOs) and other leaders of tribes that are Section 106 consulting

parties in order to document the locations of TCPs and the potential effects that could result from the proposed Project would also be necessary. DOE's government-to-government consultation with American Indian tribes under Section 106, including discussions related to tribal cultural resources and TCPs, is currently on-going, and DOE will continue to work with consulting tribes to identify historic properties that are not included within the Minnesota SHPO database. This effort is described in greater detail in Section 1.2.4.1. A record of DOE's consultation with federally recognized Indian tribes conducted to date is also included in Appendix A.

DOE also initiated the Section 106 consultation process for the proposed undertaking with other consulting parties that may have an interest in the project, including representatives of local governments, historical societies and other historic preservation agencies or groups. A total of two groups responded to DOE's initiation of the Section 106 process, indicating that they wished to participate in the Section 106 consultation process for the proposed Project. No responses from other consulting parties have been received by DOE to date. A record of DOE's consultation with representatives of local governments, historical societies, and other historic preservation agencies or groups conducted to date is also included in Appendix P, It is noted here that, while DOE is coordinating its compliance with Section 106 of the NHPA with its review under NEPA according to the process set out in 36 CFR Part 800.3(c), DOE has used the NEPA scoping meetings and intends to use the public hearings and comment periods for the EIS for involvement of the public in the Section 106 process in accordance with 36 CFR 800.2(d).

5.3.3.2 Cultural Resources in the West Section

The West Section is primarily situated within the ecoregions of the Lake Agassiz Plain and the Aspen Parklands (Map 5-2). The ecological subsections for the West Section are shown on Map 5-2 and are described in more detail in Section 5.3.4.2 and Section 5.3.1.1.

Two archaeological regions are encompassed within the West Section: the Red River Valley North and the Northern Bog Region (Map 5-6). The Red River Valley North Archaeological Region includes flat plains and beach ridges that were once covered by tall grass prairie interspersed with forest stands along river bottoms and around seasonal shallow marshes. Previously recorded pre-contact archaeological sites, those sites having human activity prior to European contact within the Red River Valley Archaeological Region, are associated with Paleoindian, Archaic, and Woodland traditions. American Indians present during the Paleoindian tradition were small, mobile, and primarily hunted bison due to the extinction of many large mammals (e.g., mammoth, mastodon) that began to occur at the end of the Pleistocene. Gathering of wild plants and hunting of small animals also supplemented their diet. As such, American Indians made large lanceolate projectile points during this period. During the Archaic tradition, American Indians became more diverse in their diet and thus in their tool selection. Tools during this period included new projectile point forms, atlatls (spear thrower that allowed spears to be thrown farther and with more force), copper tools, and ground and pecked stone tools. Archaeological sites associated with both the Paleoindian and Archaic traditions tend to be small and ephemeral. Similar to the Archaic tradition, the Woodland tradition was diverse diet of plants and animal, but with the addition of ceramic vessels. In the late or terminal woodland period larger, more permanent populations started growing typically situated near rivers. The potential for encountering pre-contact archaeological sites is highest where the proposed routes and variations cross rivers and beach ridges associated with Glacial Lake Agassiz and the shorelines of former lakes (Gibbon et al. 2002, reference (115)).

The eastern portion of the West Section includes the Northern Bog Archaeological Region, which is primarily composed of peatlands and marshes. Forested conifer areas and forested wetlands are also found in portions of the region. Prior to the arrival of Europeans, archaeological sites within the Northern Bog Archaeological Region can be associated with Archaic and Woodland traditions. The potential for encountering additional pre-contact archaeological sites is highest where the proposed routes and variations cross rivers, glacial lake beach ridges, moraine complexes, and the shorelines of former lakes (Gibbon et al. 2002, reference (115)).

Historic period archaeological sites in both the Red River Valley North and the Northern Bog archaeological regions are not distributed in the same pattern as pre-contact archaeological sites. The contact/post contact period starts with the arrival of Europeans until intensive Euro-American settlement of the region. Minnesota's historical period began in 1673 when French explorers Marquette and Joliet discovered the upper portion of the Mississippi River. With arrival of the Europeans came more development, with the lumber industry being one of the earliest industries peaking between 1899 and 1905. Agriculture was also important in Minnesota

with wheat and flour mills dominating the state until the 1930s. The dominance of the iron ore mining industry created roads and towns allowing people to access previously un-inhabited remote areas of Minnesota. The abundance of historic archaeological sites tend to be located along water, railroad, or road transportation routes and can include the remains of abandoned farmsteads, abandoned businesses, logging and mining facilities, facilities related to railroads, and hunter and fur trapper cabins.

Additionally, historic architectural or other built resources can be found wherever conditions are suitable (as in the case of homesteads on higher elevations or in areas suitable for agriculture) or areas where structures were necessary (such as bridge crossings at rivers and streams, or a roadway through a swamp, or a level railroad bed that required cutting and filling to maintain acceptable grades). Historic architectural resources tend to be located in areas adjacent to a road, railroad, or water transportation route. The time periods represented by these sites are likely to extend from the Fur Trade and Contact Period though the modern industrial development period of the 1940s, 1950s, and 1960s (Dobbs 1990, reference (116)).

Archaeological and historic architectural resources data are shown on Map 5-6 by the number of records found by inventory type (archaeological sites and historic buildings or structures). Detailed data is provided in Appendix P. A more detailed description of the cultural resources present within the West Section and the potential effects are provided in Section 6.2.

5.3.3.3 General Impacts to Cultural Resources

Impacts to cultural resources can result from direct and indirect impacts as described below. Section 6.2 summarizes the potential impacts of the proposed routes and variations on archaeological and archaeological resources in the West Section, including those resources that are historic properties. As stated above, DOE is consulting with federally-recognized Indian tribes to identify Native American resources and historic properties. Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on cultural resources and historic properties. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Construction Impacts

Impacts on cultural resources during construction could result from ground-disturbing activities and/or demolition or removal of historic buildings or structures. Ground-disturbing activities associated with the proposed Project include excavation, grading, or other sub-surface disturbance that could damage or destroy surface and subsurface features comprising archaeological resources. Construction of the proposed Project could cause direct impacts to historic buildings or structures should construction activities require demolition or removal of historic buildings or structures.

The PA that DOE intends to execute for the proposed Project will include stipulated measures to address the potential construction impacts on cultural resources and historic properties. Stipulations would be developed to identify cultural resources and historic properties, determine the effects of the proposed Project on historic properties, and determine measures that would be implemented to avoid, minimize, and mitigate adverse effects on historic properties.

Operation, Maintenance, and Emergency Repair Impacts

Indirect impacts on cultural resources are generally associated with historic architectural or built resources or TCPs or TCLs. Indirect impacts could result from operation of the proposed Project if it is located near or within views of or from a historic building or structure, TCP, or TCL, and it results in new or different landscape features within the viewshed of any historic architectural or built resource or introduces a new or different audible feature within the setting. This is particularly a concern for those cultural resources and historic properties for which setting is a character-defining feature that contributes to the significance of the resource.

In the case of maintenance and emergency repair impacts, any impacts associated with ground disturbance would be the same as those identified for construction, although it is likely that this potential ground disturbance would occur in areas that were previously disturbed during construction. Any visual or audible impacts associated with maintenance and emergency repairs are likely to be temporary or short-term and limited to the duration of these activities.

The PA that DOE intends to execute for the proposed Project will include stipulated measures to address the potential operation, maintenance, and emergency repair impacts on cultural resources and historic properties. Stipulations would be developed to identify cultural resources and historic properties, determine the effects of the proposed Project on historic properties, and determine measures that

would be implemented to avoid, minimize, and mitigate adverse effects on historic properties.

5.3.4 Natural Environment

This section describes water resources, vegetation, and wildlife, which are present within the West Section and the potential impacts on those resources from construction and operation of the proposed Project.

5.3.4.1 Water Resources

This section describes water resources, including rivers and streams (i.e. watercourses), lakes and ponds (i.e. waterbodies), wetlands, floodplains, and groundwater resources, that occur in the West Section, as shown on Map 5-7, and the potential impacts on those resources from construction and operation of the proposed Project.

The ROI for this analysis of impacts to water resources includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations. This ROI was selected based on the expectation that, given the construction activities proposed and associated BMPs to minimize and mitigate impacts, the majority of water resources impacts would likely occur within this area.

Watercourses and Waterbodies

The Clean Water Act (CWA) establishes the structure for regulating the discharge of pollutants into waters of the United States and for developing water quality standards for surface waters (33 U.S.C. 1344 and 1311 et seq). Under the CWA, the EPA has established water quality standards for contaminants in surface waters. Under the CWA, the EPA regulates discharge of pollutants from point and non-point sources into surface waters unless a National Pollutant Discharge Elimination System (NPDES) permit is obtained (33 U.S.C. 1342). In Minnesota, a NPDES permit must be obtained for stormwater discharge from construction activities that disrupt more than one acre.

Under Section 303(d) of the CWA, states are required to monitor and assess their waters to determine if they meet water quality standards and, thereby, support the beneficial uses they are intended to provide (33 U.S.C. 1313(d)). Waters that do not meet their designated uses because of water quality standard violations are impaired. States are required to develop a list of impaired waters that require total maximum daily loads (TMDL) studies and submit an updated list of impaired waters to the EPA every two years. In Minnesota, the MPCA monitors and assesses Minnesota waters to determine if they meet water quality standards for designated uses and lists waters that do not meet their designated uses due to water quality standard exceedances as impaired.

Surface waters are also regulated under section 10 of the Rivers and Harbors Act (33 U.S.C. 401 et seq.) and section 404 of the CWA. The Rivers and Harbors act regulates such activities as excavating and dredging in, placing structures and materials on, and altering the course of these waterways (33 U.S.C. 403). The USACE issues permits under Section 10. The CWA section 404 prohibits the discharge of dredged and fill materials without a permit. It extends to more waterbodies than the Rivers and Harbors Act, namely all water of the United States, which includes among other things, navigable waters, interstate waters and wetlands, wetlands adjacent to water of the US and tributaries (33 CFR 320.1(d); 33 CFR 328.3). Wetland regulations are discussed in more detail later. The Applicant is currently coordinating with the USACE regarding Sections 404 and 10 permits for the proposed Project.

Although regulated separately, surface and ground water are intricately linked. Surface waters are open to the atmosphere, such as rivers, lakes, ponds, streams, and reservoirs and are replenished by groundwater and precipitation. Uses of surface water include drinking water, irrigation, cooling of thermoelectric power industry equipment, agriculture, mining, and commercial/industrial uses (USGS 2014, reference (117)). Groundwater is located beneath the surface in soil pore spaces and in fractures in rock. It is recharged by precipitation that falls on the surface and is pulled by gravity through the soil until it reaches water saturated rock material. Groundwater can help provide baseflow to rivers and lakes during dry periods, can recharge surface water sources, can sustain saturated conditions in wetlands, and can support aquatic habitat. Groundwater has many important uses, including irrigation, manufacturing, and commercial uses.

Groundwater resources are afforded federal and state protections. The Federal Safe Drinking Water Act requires states to develop programs to protect public water supplies from contamination (2 U.S.C. 300(f) et seq). The State of Minnesota regulates drinking water in Minnesota Rules, chapter 7050. The MDH implements safe drinking water standards for the state through its Wellhead Protection Program (Minnesota Rules, chapter 4720). Ground and surface waters are also managed by the MnDNR through the Water Appropriations Permit Program. Minnesota Statutes, section 103G.265 requires

the MnDNR to manage water resources to ensure an adequate supply to meet long-range seasonal requirements for domestic, agricultural, fish and wildlife, recreational, power, navigation, and quality control purposes. The state Water Appropriation Permit Program was created to balance competing objectives for both development and protection of Minnesota's water resources. A Water Use (appropriation) Permit from the MnDNR is required for all users withdrawing more than 10,000 gallons of water per day or 1 million gallons per year.

Watercourses and Waterbodies in the West Section

The West Section is located in both the Red River and Rainy River regional watersheds. Major watersheds include Roseau, Two Rivers, Lake of the Woods, and Lower Rainy River. Several watercourses and drainage ditches traverse the area, including MnDNR Public Water Inventory (PWI) watercourses. Watercourses in this area tend to be moderate to small in size and highly sinuous. Major watercourses include the Roseau River, Warroad River, and Winter Road River. Smaller watercourses include Bear Creek, Hay Creek, Sprague Creek, Pine Creek, Sucker Creek, Williams Creek, and Willow Creek; several unnamed watercourses are also present. Headwaters of these watercourses are predominantly associated with regional peatlands. Drainage ditches are present throughout the peatland areas, and were constructed in an attempt to drain these areas to support agricultural activities. Waterbodies are not common in the area; however, a few unnamed waterbodies are present in the West Section.

Several impaired waters are located in the West Section. Table 5-24 lists the impaired waters found in the West Section and summarizes the impairments (stressors) and affected designated uses for each of these impaired waters.

Floodplains

Floodplains are flat or nearly flat land adjacent to a river or stream that experiences occasional or periodic flooding. It includes the floodway, which consists of the stream channel and adjacent areas that carry flood flows; and the flood fringe, which includes areas covered by the flood, but which do not experience a strong current. Floodplains function to prevent flood damage by detaining debris, sediment, water, and ice. The Federal Emergency Management Agency (FEMA) delineates floodplains and determines flood risks in areas susceptible to flooding. The base flood that FEMA uses, known as the 100-year flood, has a one percent chance of occurring during each year. Executive Order 11988, entitled Floodplain Management, requires federal agencies to avoid, to the extent possible, the long and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative.

DOE also has rules specifically addressing floodplains (and wetlands) (10 CFR 1022). It requires identification of proposed actions located in a floodplain with an opportunity for early public review of such proposed actions, preparing floodplain assessments, and issuing statements of findings for such actions in a floodplain. In assessing the proposed Project's impacts on floodplains, DOE's assessment must discuss: (a) positive and negative, direct and indirect, and long and short-term effects on floodplains and (b) impacts on natural and beneficial floodplains values (10 CFR 1022.13(a)(2)). This regulation also requires that the effects of a proposed floodplain action on lives and property be evaluated.

At the state level, the MnDNR Floodplain Management Unit oversees the administration of the State Floodplain Management Program by promoting and ensuring sound land use development in floodplain areas in order to promote

Table 5-24 Summary of Impaired Waters in the West Section

Watercourse	Impairment (Stressor)	Affected Designated Use
Roseau River	Turbidity, mercury in fish tissue, dissolved oxygen	Aquatic consumption, Aquatic life
Sprague Creek	Turbidity	Aquatic life
East Branch Warroad River	Mercury in fish tissue	Aquatic consumption
West Branch Warroad River	Mercury in fish tissue	Aquatic consumption
Willow Creek	Dissolved oxygen	Aquatic life
Lake of the Woods	Nutrient/eutrophication, biological indicators	Aquatic recreation

Source(s): MPCA 2014, reference (118); MPCA 2014, reference (119)

the health and safety of the public, minimize loss of life, and reduce economic losses caused by flood damages. This unit also oversees the National Flood Insurance Program for the state of Minnesota. Floodplains are also regulated at the local level. Within the project area, the Roseau County Floodplain Management Ordinance allows for utility transmission lines as a conditional use for Floodway Districts and General Floodplain Districts, as discussed in Section 5.3.1.2.

Floodplains in the West Section

Floodplains in the West Section tend to be broad due to fairly flat topography. FEMA has designated Zone A (100-year) and Zone B (500-year) floodplains along the Roseau River and a Zone A floodplain along the Warroad River. Other West Section watercourses with FEMA-designated floodplains include Sprague Creek, Hay Creek, and the East and West Branches of the Warroad River.

Wetlands

Wetlands are areas with hydric (wetland) soils, hydrophytic (water-loving) vegetation, and wetland hydrology (inundated or saturated much of the year). Wetlands are part of the foundation of water resources and are vital to the health of waterways and communities that are downstream. Wetlands can be one source of hydrology in downstream watercourses and waterbodies, detain floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. Wetlands are also economic drivers because of their key role in fishing, hunting, agriculture, and recreation. Wetland types include marshes, swamps, bogs, and fens. Wetlands vary widely due to differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors (EPA 2013, reference (120)).

Wetlands across the proposed Project are identified using USFWS National Wetland Inventory (NWI) maps and are classified into different types according to the USFWS's Cowardin Classification System (Cowardin et al. 1979, reference (121)). The NWI tends to underestimate wetlands on the landscape, especially in forested conditions. As such, the presence of wetlands will be field surveyed as part of the permitting process.

Wetlands are protected as "waters of the United States" in the CWA (33 U.S.C. 1344). Although the USACE issues CWA Section 404 permits, the EPA has veto authority over those permits (33 U.S.C. 1344(c)). In implementing Section 404, the USACE and EPA jointly define wetlands as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." The Federal government, including the DOE, operates on a policy of "no net loss" of wetlands, meaning that operations and activities shall avoid the net loss of size, function, or value of wetlands.

Under Section 404 of the CWA, a permit is required for the discharge of dredged or fill materials into wetlands. As part of the permitting process, wetlands along the entire proposed project ROW would be identified and delineated by the Applicant according to the Federal Routine Determination Method, as described in the 1987 USACE Wetland Delineation Manual and associated regional supplements. For unavoidable impacts, compensatory mitigation is required to replace the loss of wetland, stream, or other aquatic resource functions. The USACE is responsible for determining the appropriate form and amount of compensatory mitigation required.

Executive Order 11990, entitled Protection of Wetlands, requires federal agencies to minimize the destruction, loss, or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. To meet these objectives, the order requires federal agencies to consider alternatives to wetland impacts and to minimize potential wetland impacts if an activity affecting a wetland cannot be avoided.

As noted above in the floodplain section, DOE has rules specifically addressing wetlands (10 CFR 1022.1-1022.24). For an action proposed in a wetland, the effects on the survival, quality, and values of the wetland shall be evaluated. In assessing the proposed Project's impacts on wetlands, DOE's assessment must discuss: (a) positive and negative, direct and indirect, and long and short-term effects on wetlands and (b) impacts on natural and beneficial wetland values (10 CFR 1022.13(a)(2)). Section 1022.14 states that, if there is no practicable alternative to avoiding wetland impacts, "then DOE shall design or modify its action in order to minimize potential harm to or within the….wetland consistent with the policies set forth in Executive Order 11988 and Executive Order 11990."

Minnesota has a number of state-level mechanisms protecting wetlands. The Minnesota Wetland Conservation Act (WCA) (Minnesota Rules, chapter 8420) is administered by the Board of Soil and Water Resources and was established to maintain and protect Minnesota's wetlands and the benefits they provide. The WCA's goal of no-net-loss of wetlands requires that proposals to drain, fill, or excavate a wetland must first avoid disturbing the

wetland, next minimize wetland impacts, and finally replace lost wetland acres, functions, and values. Certain activities are exempt from the WCA, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation.

A second state-level program that offers protection to the state's waters and wetlands is the Public Waters Inventory (PWI), administered by the MnDNR (Minnesota Statutes, section 103G.005). The agency's Waters Permit Unit regulates work below the ordinary high water level of PWI wetlands and waters through the Public Waters Work Permit Program. Examples of work activities addressed by this program include filling, excavation, bridges and culverts, dredging, structures, and other construction activities.

A final state-level wetland regulation applicable to the proposed Project is the Minnesota Peatland Protection Act. As described in Minnesota Statute, section 84.035, Peatland Protection, the Minnesota Peatland Protection Act protects and preserves peatlands through establishment and designation of certain peatland core areas as SNAs. Calcareous fens are a rare, groundwater-based type of wetland typically found in peatlands, and the only natural community specifically protected by the Minnesota Peatland Protection Act.

5.3.4.1.3.1 Wetlands in the West Section

Wetlands in the West Section primarily consist of large peatland complexes, including shrubby bog areas intermixed with forested and emergent wetlands. Pine Island Peatlands, Ross Peatlands, Thief Lake Peatlands, and Lude Beaches and Peatlands are present in the West Section (Map 5-1). The following wetland types are present throughout the West Section: palustrine emergent wetland (PEM), palustrine shrub wetland (PSS), palustrine forested wetland (PFO), and palustrine unconsolidated bottom pond (PUB). The MnDNR has mapped two calcareous fens within variation areas in the West Section; both calcareous fens are located in the Border Crossing Variation Area (Map 5-9). Only one calcareous fen is located within one mile of the anticipated ROW for a proposed route or variation. Currently, only the Pine Creek Peatland SNA and the Winter Road Lake Peatland SNA are protected by the Minnesota Peatland Protection Act, and both are located in the West Section; however, neither are crossed by the proposed routes or variations. SNAs are intended to preserve natural features and rare resources of exceptional scientific and educational value.

Additionally, MnDNR has established Watershed Protection Areas (WPAs) for peatland SNAs to protect the hydrology of groundwater-dependent natural communities, such as peatlands and calcareous fens. The Pine Creek Peatland SNA WPA and Sprague Creek SNA WPA are located within the Border Crossing and Roseau Lake WMA variation areas; both are crossed by proposed routes or variations. The Winter Road Lake Peatland SNA WPA is located in the Beltrami North and Beltrami North Central variation areas, which is crossed by proposed routes or variations. Section 5.3.5 provides additional information regarding fens and other rare wetland communities.

General Impacts

Construction and operation of the proposed Project may result in short-term and long-term impacts on water resources. Impacts to watercourses and waterbodies are primarily assessed by determining whether the ROW would require water crossings. The EIS assesses floodplain impacts by first quantifying the floodplain acreage within the ROW and then determining if the span between structures is long enough to require transmission structure placement in the floodplain. Similar to floodplain impacts, permanent wetland impacts are determined by whether fill associated with a transmission structure would be placed within wetland boundaries. Conversion of one wetland type to another through removal of woody vegetation as well as any changes to wetland functions or values due to impacts are also considered.

The potential impacts of the proposed routes and variations on water resources in the West Section are discussed in Section 6.2.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on vegetation.

Impacts from Construction

Short-term impacts on watercourses and waterbodies include localized physical disturbance caused by construction equipment during site preparation, including vegetation clearing, grading, excavation, and soil stockpiling. These activities increase the potential for soil erosion and subsequent sedimentation of local watercourses and waterbodies. The presence of exposed topsoil or disturbed vegetation during construction may also increase sediment runoff from stormwater, which may affect turbidity and dissolved oxygen levels in receiving waters. Long-term, indirect water resources impacts may include removal of riparian or shoreline forest areas within the ROW. In addition to habitat

changes, this vegetation clearing could increase light penetration to watercourses and waterbodies, potentially resulting in localized increases in water temperatures and changes to aquatic communities.

Wetlands may also be temporarily impacted by soil erosion and sediment deposition during construction. Sedimentation and ground disturbance in wetlands can make them more susceptible to establishment of invasive plant species, such as reed canary grass, which would adversely impact wetland function by reducing vegetative biodiversity and altering wildlife habitat. Water resources also have the potential to become contaminated during construction, due to accidental spilling of fuels or other hazardous substances.

Construction activities, including the establishment and use of temporary access roads, staging, and stringing areas, may require access across wetlands and other water resources to facilitate construction of parts of the proposed Project that are not easily accessible by public roadways. Preparing the site and installing structures may have short-term impacts on 0.92 acres per structure (200 feet by 200 feet) by soil compaction associated with concentrating surface disturbance and equipment use (Minnesota Power 2014, reference (123)). Impacts in stringing and staging areas will be determined once the final route has been selected by the MN PUC. Impacts to water resources could be minimized or mitigated through use of construction matting to traverse wetlands, limiting crossing of watercourses and using the shortest practical route, timing construction in these areas to take place during frozen conditions, and use of low ground pressure equipment to the extent practical. Construction access through wetlands could also be minimized through the use of helicopters to assist with construction activities, as appropriate.

It would be expected that all watercourses (including impaired waters), ditches, and ponds would be spanned, as the crossing distance for each of the watercourses and waterbodies in the West Section is shorter than the 1,250-foot typical spannable distance (Section 2.1). Direct impacts on these water resources are not anticipated because the Applicant would use BMPs, as described in Section 2.13. Floodplain or wetland crossings that are greater than the 1,250-foot typical spannable distance may require permanent placement of fill to construct one or more structure foundation within the floodplain or wetland. Where complete avoidance of floodplains is not feasible, it would be expected that structure placement would have limited effects on water flow, flood water storage capacity, or flooding in those floodplains as the volume displaced by the structures would likely be small in the context of the setting. FEMA does not require mitigation for construction within the floodplain, though local floodplain permitting entities could require mitigation, such as compensatory storage, as part of their floodplain permit conditions. Where avoidance of wetlands is not feasible, the potential adverse impacts to wetland function from these activities include local changes to wetland hydrology from compaction of soils as well as changes in nutrient and water uptake from changes in vegetative cover. Mitigation would be required for structure foundations placed within wetland boundaries, as well as for conversion of wetland from one type to another.The Applicant is currently developing a wetland mitigation plan in collaboration with the USACE to meet the agency's compensatory mitigation requirements. If a PWI wetland cannot be spanned and a structure foundation needs to be placed within its boundaries, the surrounding PWI wetland areas would be mitigated and restored in accordance with MnDNR permit specifications.

Groundwater may be temporarily impacted during construction if dewatering is necessary to install structures or if pumping wells are needed to supply water for concrete batch plant operations. Dewatering or pumping would require water appropriations permits from the MnDNR. Groundwater hydrology, including that of SNA WPAs, is not anticipated to be permanently impacted by construction. Structure installation is not expected to extend deep enough to substantially impact wellhead protection areas. Groundwater would not be permanently drawn away from the system and would be expected to recharge itself after temporary dewatering and pumping activities. Since SNA WPAs, wellhead protection areas, and other groundwater resources are not expected to be permanently impacted by the proposed Project, they are not discussed further in Chapter 6 of this EIS.

Impacts from Operation, Maintenance, and Emergency Repairs

Long-term, operational impacts on water resources would be primarily associated with maintenance and repairs. The Applicant would routinely clear woody vegetation within the ROW to maintain low-stature vegetation, which is needed for safe and efficient operations of the transmission line. Removing woody vegetation within a forested or shrub wetland would not reduce overall wetland acreage, but it would convert the forested or shrub wetland area to a different vegetation community and wetland type. Operational activities are not anticipated to impact water resources beyond wetland clearing discussed above.

5.3.4.2 Vegetation

Executive Order 13112, entitled Invasive Species, requires federal agencies to identify actions that could affect the status of invasive species, prevent and control the spread of invasive species on its projects, and not to authorize actions that are likely to introduce or spread invasive species unless the benefits of such actions outweigh potential harm caused by invasive species. All feasible and prudent measures to minimize harm are to be taken in conjunction with actions that would introduce invasive species.

In Minnesota, noxious weeds are managed at the state level through the Minnesota Department of Agriculture (MDA), which administers the Minnesota Noxious Weed Law. The MDA lists four categories of noxious weeds with differing levels of eradication, control, reporting, transport, sales, and propagation requirements (MDA 2015, reference (122)). There are 12 weeds on the eradicate list, 8 on the control list, 5 restricted species, and 4 specially regulated plants. Prohibited noxious weeds "are known to be detrimental to human or animal health, the environment, public roads, crops, livestock or other property" (MDA 2015, reference (122)). None of the plants on these lists is to be transported, propagated, or sold in the state. Weeds on the list include annual, biennial, and perennial plants. Counties may create and administer their own lists of noxious weeds; however, the counties across the proposed Project have not listed any species or rules above and beyond the MDA noxious weed lists.

Federal and state regulations in place to protect threatened and endangered plant species are discussed in Section 5.3.5.

The ROI for this analysis of impacts to vegetation includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites. This ROI was selected based on the expectation that, given the construction activities proposed and associated BMPs to minimize and mitigate impacts, the majority of vegetation impacts would likely occur within this area.

Vegetation in the West Section

This section describes the vegetation resources within the West Section and the potential impacts on those resources from construction and operation of the proposed Project.

The MnDNR USFS developed a hierarchical ecological classification system (ECS), which is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features, such as climate, geology, vegetation, and other landscape factors (MnDNR 2015, reference (92)). According to the ECS, the West Section is primarily located in the Agassiz Lowlands subsection, which is located in the Northern Minnesota and Ontario Peatlands section of the Laurentian Mixed Forest Province. The western portion of the West Section, including parts of the Border Crossing and Roseau Lake WMA variation areas, is located in the Aspen Parklands subsection, which is located in the Lake Agassiz, Aspen Parklands section of the Tallgrass Aspen Parklands Province. The ECS subsections in the West Section are identified on Map 5-2.

The Agassiz Lowlands subsection is predominantly comprised of vast peatlands and upland sand ridges resulting from the retreat of Glacial Lake Agassiz to the west. Peatlands are a mosaic of forests dominated by black spruce or tamarack, or herbaceous sedge meadow, fresh meadow, and poor or rich fens. Sand ridges are commonly dominated by aspen and birch, or jack pine forests and woodlands. The subsection is generally very flat and poorly drained. Past attempts at ditching and farming the peatlands have been largely unsuccessful and most of the subsection is uninhabited (MnDNR 2015, reference (92)).

The Aspen Parklands subsection is considered a transitional landscape between prairies to the west and forest provinces to the east. The characteristic landscape setting is typically low-lying lands with minimal topography. The regional water table is near the surface in much of the subsection, creating a mosaic of vegetation types including prairie, brushland, woodland, and forest. Peatlands are a common component in the subsection where the water table is near the ground surface. Fires were an important factor for maintaining vegetation communities where conditions were dry enough to allow for natural or human-set burns (MnDNR 2015, reference (92)).

Based on the USGS GAP data, the variation areas in the West Section are primarily comprised of herbaceous agricultural vegetation, upland forests, and lowland swamps (Map 5-5). Additional land cover types present in the West Section include grassland and shrubland, open water, emergent wetlands, developed/urban land, and disturbed or modified land (Appendix E).

Several state forests, including the Lost River State Forest, Beltrami Island State Forest, and Lake of the Woods State Forest, are located within or adjacent to variation areas in the West Section (Map 5-5). In addition, several sensitive ecological resources, such as MnDNR High Conservation Value Forest, Wildlife Management Areas (WMAs), Minnesota Biological Survey (MBS) Sites of Biodiversity Significance, and rare native plant communities are located within or adjacent to variation areas in the West Section (see Section 5.3.4.3 and Section 5.3.5).

General Impacts

Construction and operation of the proposed Project may cause short-term and/or long-term impacts on vegetation. The EIS assesses impacts on vegetation by primarily using the USGS GAP land cover mapping to identify vegetation cover within the ROW and by evaluating the proximity of the ROW to state forests, wetlands, and sensitive ecological resources.

Section 6.2 summarizes the potential impacts of the proposed routes and variations on vegetation in the West Section.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on vegetation. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

The use of construction equipment during site preparation (grading, excavation, and soil stockpiling) may result in short-term adverse impacts on existing vegetation, including localized physical disturbance and compaction. Construction activities, such as site preparation and installation of structures, may have short-term impacts on 0.92 acres of vegetation per structure (200 feet by 200 feet; Minnesota Power 2014, reference (123)). Construction activities involving establishment and use of access roads, staging, and stringing areas would also have short-term impacts on vegetation by concentrating surface disturbance and equipment use.

Construction activities would cause long-term impacts on vegetation by permanently removing vegetation at each structure footprint (33 square feet per structure; Minnesota Power 2015, reference (124)) and within portions of the ROW that are currently dominated by forest or other woody vegetation. The Applicant would permanently convert forested areas and shrublands to low-stature vegetation by clearing woody vegetation throughout the entire ROW. Permanent loss of forest would lead to fragmentation by reducing intact blocks of forest vegetation and create long-term, regional, adverse, indirect impacts to species dependent on large contiguous blocks of interior forest. Construction-related removal of vegetation and conversion to open habitats could have indirect impacts on native vegetation by increasing the potential for spread of invasive species as well as increasing the effects of light penetration, wind, and humidity that occur more prominent at edges between habitats.

Construction-related clearing of woody vegetation within the ROW would result in the widening of existing corridors or bisecting (fragmenting) forests and shrublands to establish new ROWs. Alteration of vegetation community composition and structure would occur at the edge of newly cleared forests or shrublands. In areas where the new transmission line would be located adjacent to an existing ROW, these effects would largely be limited to one side of the ROW and would not create newly fragmented areas. Impacts related to the permanent conversion of forest vegetation to low-stature open vegetation are expected to be extensive in areas where new ROW would be created and less so in situations where an existing ROW is expanded. Section 5.3.4.3 provides additional information related to fragmentation of forested areas.

Construction of any transmission line could lead to the introduction or spread of noxious weeds or other invasive species. Construction activities that could potentially lead to introduction of noxious weeds and invasive species include ground disturbance that leaves soils exposed for extended periods, introduction of topsoil contaminated with weed seeds, vehicles importing weed seed from a contaminated site to an uncontaminated site, and through conversion of landscape type, particularly from forested to open settings. Noxious weeds have potential to dominate and displace native plants and plant communities, permanently altering ecosystem functions.

Impacts from Operation, Maintenance, and Emergency Repairs

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation that would not interfere with the transmission line. Maintenance and emergency repair activities could result in direct impacts on vegetation from removal of vegetation, localized physical disturbance, and compaction caused by the use of equipment. Maintenance and emergency repair-related impacts on vegetation would be short-term and more localized than construction-related impacts.

5.3.4.3 Wildlife

Both federal and state laws protect certain wildlife, including those that are not endangered or threatened. The federal Migratory Bird Treaty Act (MBTA), for example, prohibits the "take" of migratory birds, including any species also listed under the Endangered Species Act (ESA), which is discussed below (16 U.S.C. 703-712). The MBTA requires Federal agencies to consult with the USFWS to determine if an agency's proposed action would have, or is likely to have, measurable negative effects on migratory bird populations, and if so, to develop measures intended to avoid any negative effects on migratory birds.

The Federal Bald and Golden Eagle Protection Act prohibits the taking of bald and golden eagles (*Haliaeetus leucocephalus* and *Aquila chrysaetos*, respectively) (16 U.S.C. 668-668c). The Federal Bald and Golden Eagle Protection Act requires consultation with the USFWS to determine if a proposed project may have potential impacts on bald and golden eagles and, if applicable, to develop habitat conservation plans intended to avoid and minimize the project's impacts on the bald and golden eagles.

The USFWS has established Grassland Bird Conservation Areas in the upper Midwest, including in Minnesota. Grassland Bird Conservation Areas are priority areas for grassland protection and enhancement that are thought to provide suitable habitat for many priority grassland bird species in the tallgrass prairies of region.

Wildlife management at the state level is primarily associated with MnDNR programs, including WMAs and the Shallow Lakes Program. WMAs in Minnesota were established to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses. The MnDNR manages these areas in order to protect wildlife for future generations; provide citizens with opportunities for hunting, fishing, and wildlife watching; and promoting wildlife-based tourism in the state. The MnDNR Shallow Lakes Program was developed to protect and enhance wildlife habitat on lakes dominated by shallow water/littoral zones.

Federal and state regulations in place to protect threatened and endangered wildlife species are discussed in Section 5.3.5.

The ROI for this analysis of impacts to vegetation includes the ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations. This ROI was selected based on the expectation that, given the construction activities proposed and associated BMPs to minimize and mitigate impacts, the majority of wildlife impacts would likely occur within this area.

Wildlife in the West Section

This section describes the wildlife resources that occur within the West Section and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning wildlife resources, as well as a discussion of the ROI for wildlife is provided above.

The landscape types and vegetation communities throughout the West Section of the proposed Project provide forage, shelter, nesting, overwintering, and stopover habitat for a wide range of resident and migratory wildlife species. Habitat types are diverse and range from grassland-dominant habitat types in the western part of the section to increasingly forested habitat types to the east. Similarly, wildlife communities also change along this same vegetative gradient from west to east.

As discussed in Section 5.3.4.2, the West Section is located within two Ecological Classification System (ECS) subsections classified by the MnDNR and USFS (MnDNR 2015, reference (92)); the Agassiz Lowlands and Aspen Parklands subsections (Map 5-2). MnDNR's comprehensive wildlife plan, *Tomorrow's Habitat for the Wild and Rare an Action Plan for Minnesota Wildlife* (MnDNR 2006, reference (125)), which corresponds to the ECS native plant communities, was used to summarize the wildlife likely present in the two ecological subsections in the West Section of the proposed Project. Identified within each ECS subsection are species of greatest conservation need (SGCN), which are those species whose populations are rare, declining, or vulnerable in Minnesota. Approximately half of the SGCN are also Minnesota state-listed species (MnDNR 2006, reference (125)).

Native community types located within the Agassiz Lowlands subsection provide habitat for species associated with lowland conifer, dune, and non-forested wetland vegetation communities. Birds found in this subsection include white pelican, common tern, American bittern, yellow rail, and numerous migratory shorebird, waterfowl, and perching species. Typical mammals that occupy these habitats include beaver, otter, and bog lemming. Forest communities present in this

subsection include habitats that harbor species such as spruce grouse, great gray owl, short-eared owls, and sharp-tailed grouse. Approximately 88 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within community types present within this subsection (MnDNR 2006, reference (125)).

Native community types located within the Aspen Parklands subsection provide habitat for species associated with grassland and woodland habitats. Species include short-eared owl, greater prairie chicken, northern harrier, elk, Franklin's ground squirrel, marbled godwit, and upland sandpiper. Approximately 85 species designated as endangered, threatened, special concern, or SGCN may occur within community types present within this subsection (MnDNR 2006, reference (125)).

In addition to the natural wildlife habitat present throughout the West Section, there are several areas of managed wildlife habitat present in the West Section. Several MnDNR WMAs are present in the variation areas in the West Section, including the Roseau Lake WMA and Cedar Bend WMA (Map 5-8). The MnDNR establishes WMAs to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, and fishing.

The National Audubon Society Big Bog Important Bird Area, which is part of the Big Bog State Recreation Area, is located within the southeastern portion of the West Section, in the Beltrami North and Beltrami North Central variation areas (Map 5-8). The National Audubon Society has established Important Bird Areas in an effort to identify and conserve areas that are vital to birds and other biodiversity.

Several USFWS Grassland Bird Conservation Areas, which serve as priority conservation areas for grassland nesting bird species, are present in the variation areas located in the western part of the West Section (Border Crossing, Roseau Lake WMA, and Cedar Bend), where more grassland vegetation is present (Map 5-8). The USFWS defines three core types (Type 1, Type 2, and Type 3) of Grassland Bird Conservation Areas based on size, width, amount of grass in the landscape, and the types of wetlands considered compatible for these birds. All three Grassland Bird Conservation Area core types are present in the western part of the West Section; for simplicity these three core types are grouped into one category, as impacts would be similar regardless of Grassland Bird Conservation Area core type.

There is a MnDNR-designated great gray owl (*Strix nebulosa*) reserve within the Border Crossing Variation Area. This reserve is located in the Lost River State Forest (Maps 5-5 and 5-8). The MnDNR has studied gray owls in northern Roseau County for over 33 years. The studies determined that both breeding owls and winter visitors are present in greater numbers in this part of Minnesota than in any other location in the state (MnDNR 2006, reference (126)).

There is a MnDNR-designated shallow lake within the Cedar Bend WMA Variation Area (Map 5-8). The MnDNR established the Shallow Lakes Program to protect and enhance wildlife habitat on lakes dominated by a shallow water zone (littoral zone), since these lakes generally provide important wildlife habitat.

The West Section also contains three state forests (discussed in Section 5.3.4.2), several rare native plant communities, and many other sensitive ecological resources (discussed in Section 5.3.5), all of which provide habitat for common and rare wildlife species.

General Impacts

Construction and operation of the proposed Project may cause short-term and long-term impacts on wildlife resources. The EIS assesses impacts on wildlife by evaluating the vegetation cover/habitat in the ROW, the proximity of the ROW to sensitive wildlife habitats, such as those described above, and known occurrences of sensitive wildlife species.

Section 6.2 summarizes the potential impacts of the proposed routes and variations on wildlife in the West Section.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate potential impacts on wildlife. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

Construction activities that generate noise, dust, or disturbance of habitat may result in short-term indirect impacts on wildlife. During construction of the proposed Project, wildlife would generally be displaced within the anticipated ROW. These impacts are expected to be short-term and localized. Common species habituated to human presence may continue to utilize habitats adjacent to the ROW during construction.

Construction of the proposed Project may result in long-term adverse impacts on wildlife from the loss or conversion of habitat and habitat fragmentation.

The proposed Project would expand existing cleared corridors and/or create new corridors, some of which would be converted from forest and shrubland to low-stature vegetation. The Applicant would permanently clear woody vegetation within the anticipated ROW by either widening existing ROWs or creating new ROWs through existing forests and shrublands. Wildlife species previously occupying forested communities in the ROW would be displaced in favor of species that prefer more open vegetation communities. Impacts are expected to be extensive in areas where new ROW would be created and more localized in situations where an existing ROW is expanded.

Conversion of vegetation structure alters species use by changing plant community composition and structure. When forested plant communities are converted to open communities, there are corresponding changes in wildlife communities. Species that rely on well-developed forest canopies for nesting, foraging, or shelter are displaced from the portion of the landscape where this alteration occurs. Species that rely on shrubby or grassland habitats may be less susceptible to, and may even benefit under alterations associated with transmission lines because they would undergo fewer changes in vegetation community structure and environmental factors, such as light intensity.

Habitat fragmentation reduces the size of contiguous blocks of vegetation, such as forest; this reduces the total area of contiguous habitat available to wildlife species and increases the isolation of the habitat. Opportunistic and adaptable animals often succeed in highly fragmented habitats. Non-native invasive or pioneering plant species may encroach where disturbance provides a competitive advantage and an avenue of introduction, such as where habitat fragments occur. The alteration of plant community composition and structure can adversely affect those species that rely on the presence of certain plant species or vegetative cover. Fragmentation effects are greatest where large contiguous blocks are broken up into smaller patches that reduces interior forest habitat necessary for some species such as song birds. The effects would generally be greatest where new corridor is created, rather than where the transmission line parallels an existing corridor.

Impacts from Operation, Maintenance, and Emergency Repairs

The Applicant would routinely maintain the ROW to support low-stature non-woody vegetation; emergency repairs may require additional vegetation clearing. Operation, maintenance, and emergency repair activities may have long-term indirect impacts on wildlife, including the displacement of birds, burrowing animals, and other species utilizing the ROW or its vicinity for foraging, breeding, or nesting. These impacts are expected to be long-term and localized.

Operation of the proposed Project may result in long-term impacts on wildlife, including the potential risk of avian collisions with transmission conductors and equipment, which could result in injury or death of individuals. Through use of Applicant proposed minimization measures, as described in Section 2.13, these impacts are expected to be limited. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Increased risk of avian collisions and potential electrocution with transmission conductors and equipment is possible with the development of all transmission lines. Electrocution occurs when an arc is created by contact between a bird and energized lines or an energized line and grounded structure equipment. Electrocution occurs more frequently with larger bird species, such as hawks, because they have wider wingspans that are more likely to create contact with the conductors. Electrocution occurs more frequently with distribution lines than transmission lines, because the conductors are often closer together or closer to grounded hardware on distribution lines. Because the structures would be larger and the phase spacing for the proposed Project's conductors greater compared to distribution lines, avian electrocutions are unlikely.

Transmission lines may present the possibility for avian collisions. Several factors, such as body size, weight, and flight behavior, affect the potential for birds to collide with overhead power lines. Larger birds, such as waterfowl, are generally the most likely to collide with transmission lines. Impacts are likely to be higher around features that attract birds, such as wetlands, lakes, and feeding sites.

5.3.5 Rare and Unique Natural Resources

The ESA provides for the conservation of species that are endangered or threatened throughout all or a significant portion of their range, as well as conservation of the habitats upon which they depend. An endangered species is one that is in danger of extinction throughout all or a significant portion of its range. A threatened species is one that is likely to become an endangered species in the foreseeable future. Section 7(a)(2) of the ESA at 16 U.S.C. 1536 requires that any actions a Federal agency carries out, permits, licenses, funds, or otherwise authorizes that may affect a federally-listed threatened or endangered species must

involve consultation with the USFWS to ensure its actions are not likely to jeopardize the continued existence of any listed species. Section 7(a)(4) of the ESA requires federal agencies to confer with the USFWS on any action that is likely to jeopardize the continued existence of any species proposed for federal listing or on actions that would result in adverse modification of critical habitat proposed to be designated. DOE's informal consultation under Section 7 of the ESA with USFWS is currently on-going (Appendix Q).

Minnesota Statutes, section 84.0895, Protection of Threatened and Endangered Species, requires the MnDNR to adopt rules designating species as endangered, threatened, or species of special concern. The resulting list of these species is codified in Minnesota Rules, chapter 6134, Endangered Threatened, and Special Concern Species. The Endangered Species Statute also authorizes the MnDNR to adopt rules that regulate treatment of species designated as endangered and threatened at the state level at Minnesota Rules, part 6212.1800 to part 6212.2300, Threatened and Endangered Species. A state-listed endangered species is threatened with extinction throughout all or a significant portion of its range within Minnesota. A state-listed threatened species is likely to become endangered in the foreseeable future throughout all or a significant portion of its range in Minnesota. A species is considered to be of special concern if, although the species is not endangered or threatened at the state level, it is extremely uncommon in Minnesota or has unique or highly-specific habitat requirements that deserves careful monitoring of its status. Minnesota's Endangered Species Statutes and the associated rules impose a variety of restrictions, a take permit program, and several exemptions pertaining to threatened or endangered species. Species of special concern, though often ecologically important, are not protected by Minnesota's Endangered Species Statue or the associated rules.

The MnDNR has established several classifications of rare communities across the state, including SNAs, MBS Sites of Biodiversity Significance, MnDNR High Conservation Value Forest, and MBS native plant communities.

SNAs are areas of land designated to preserve natural features and rare resources of exceptional scientific and educational values. Though SNAs are open to the public for nature observation and education, they are not meant for intensive recreational activities. SNAs in northern Minnesota are generally associated with peatlands and forest features.

The MnDNR MBS assigns a biodiversity significance rank to all sites surveyed across the state. These ranks are used to communicate statewide native biological diversity of each site and help to guide conservation and management activities. There are four biodiversity significance ranks: outstanding, high, moderate, and below. A site's biodiversity significance rank is based on the presence of rare species populations, the size, and condition of native plant communities within the site, and the landscape context of the site.

MnDNR High Conservation Value Forests are broadly defined as areas of outstanding biological or cultural significance. The MnDNR is required by Minnesota Statutes, chapter 89, State Forests; Tree Planting; Forest Roads and Minnesota Statutes, chapter 89A, Sustainable Forest Resources, to manage a broad set of objectives and forest resources, including the management and protection of rare species, communities, features, and values across the landscape. This directive coincides with the Forest Stewardship Council – United States' National Forest Management Standard, which requires that forests of high conservation value be identified and managed to maintain or enhance identified high conservation values. Most sites managed as MnDNR High Conservation Value Forests are to remain working forests.

The MnDNR MBS also identifies native plant communities across the state. A native plant community is a group of native plants that interact with each other and their environment in ways that have not been greatly altered by modern human activity or introduced organisms. Native plant communities provide a range of ecological functions that are increasingly recognized as valuable for the quality of life in Minnesota. In addition to the habitat value native plant communities provide, they have also played an important role in the development of Minnesota's cultural history and heritage.

The ROI for rare and unique natural resources varies for species and communities. The ROI for an analysis of impacts to federally- and state-listed species includes a one-mile buffer surrounding the proposed routes and variations in order to obtain a broad view of species that may be present across the proposed Project, since no formal surveys have been conducted for the proposed Project. The ROI for the analysis of impacts to rare communities includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, permanent and temporary access roads,

temporary laydown areas, temporary stringing areas, and temporary fly-in sites. These ROIs were selected based on the expectation that the majority of rare and unique natural resource impacts would likely occur within these areas.

5.3.5.1 Rare and Unique Natural Resources in the West Section

This section describes the rare and unique natural resources, including federally and state protected species and rare communities, which are present within the West Section. Potential impacts on these resources from construction and operation of the proposed Project are also discussed below.

Federally Listed Species in the West Section

The USFWS technical assistance website was reviewed to determine if any federally-listed species or federally-designated critical habitats are known to be present within Roseau and Lake of the Woods counties, where the West Section is located (USFWS 2015, reference (127)). The USFWS lists six species as occurring in Roseau and/or Lake of the Woods counties, including the federally-endangered butterfly, Poweshiek skipperling (*Oarisma poweshiek)* in Roseau County; the federally threatened gray wolf (*Canis lupus*), Canada lynx (*Lynx canadensis*), and northern long-eared bat (*Myotis septentrionalis*) in both Roseau and Lake of the Woods counties; the federally threatened piping plover (*Charadrius melodus*) in Lake of the Woods County; and the federal candidate bird, Sprague's pipit (*Anthus spragueii*) in Roseau County (USFWS 2015, reference (127); Table 5-25).

Designated-critical habitat associated with federally-listed species consists of "the specific areas within the geographical area occupied by the species, at the time it is listed…on which are found within those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection" (50 CFR 1533[b][2]). There is no designated critical habitat in any of the variation areas in the West Section for the federally-listed species in Roseau and Lake of the Woods counties.

Poweshiek skipperling. The Poweshiek skipperling, a small butterfly that inhabits native wet-mesic to dry tallgrass prairie remnants, was listed as federally endangered in 2014 (79 Federal Register 63671-63748). No designated critical habitat has been finalized for this species; however, the nearest proposed designated critical habitat for the poweshiek skipperling is located in Mahnomen County, Minnesota, which is over 60 miles from any of the proposed routes or variations.

Gray wolf. The gray wolf was federally listed as an endangered species in 1974 and was reclassified as threatened in 1977 (42 Federal Register 29527-29532). In 2011, the wolf was delisted by the USFWS (76 Federal Register 57943-57944). However, in 2014, a federal court reversed the USFWS decision to delist the gray wolf, restoring federal threatened status and designated critical habitat in Minnesota. Gray wolves occupy a diversity of habitats, including forests, prairies, and swamps (USFWS 2012, reference (128)). There is no designated critical habitat for gray wolf in the West Section; however critical habitat is present just south of the West Section, throughout the Central Section, and in the northern part of the East Section (Map 5-8, Map 5-15, and Map 5-22).

Canada lynx. The Canada lynx was listed as a federally threatened species in several states in the Northeast, Great Lakes Region (including Minnesota), and Southern Rockies in 2000 (65 Federal Register 16052-16086). Canada lynx inhabit boreal and mixed coniferous and deciduous forests, where snowshoe hare, their preferred diet, are present (USFWS 2013, reference (129)). The nearest designated critical habitat for lynx is over 60 miles east of the West Section and at least 11 miles east of the proposed routes or any variation in the proposed Project.

Piping plover. The northern Great Plains population of the piping plover was listed as federally threatened in 1985 (50 Federal Register 50726-50734). Piping plovers inhabit wide, flat, open, sandy

Table 5-25 Federally-listed Species Known to Occur in Roseau and/or Lake of the Woods Counties

Scientific Name	Common Name	Federal Status	State Status
Oarisma poweshiek	Poweshiek skipperling	Endangered	Endangered
Canis lupus	Gray wolf	Threatened	Special Concern
Lynx Canadensis	Canada lynx	Threatened	Special Concern
Charadrius melodus	Piping plover	Threatened	Endangered
Anthus spragueii	Sprague's pipit	Candidate	Endangered
Myotis septentrionalis	Northern long-eared bat	Threatened	Special Concern

Source: USFWS 2015, reference (127)

beaches with very little grass or other vegetation present (USFWS 2001, reference (130)). The nearest designated critical habitat for piping plover is Lake of the Woods, approximately 11 miles north of the northernmost variation in the Cedar Bend WMA Variation Area in the West Section (Map 5-8).

Sprague's pipit. The Sprague's pipit, a bird that inhabits native mixed or tallgrass prairies, was designated a federal candidate species in 2010 (75 Federal Register 56028-56050). Designated critical habitat has not been designated for the Sprague's pipit at this time.

Northern long-eared bat. The northern long-eared bat was proposed for listing as a federally endangered species in 2013 (78 Federal Register 61046-61080). In April of 2015, the USFWS listed the northern long-eared bat as federally threatened (80 Federal Register 18023-18028).The northern long-eared bat inhabits caves and mines in winter; in summer northern long-eared bats roost in live and dead trees with loose, flakey, or shaggy bark, crevices, or hollows (USFWS 2015, reference (131)). The USFWS has not identified designated critical habitat for the northern long-eared bat at this time.

Additional information on federally-listed species is available in the draft Biological Assessment being prepared in order to determine the impacts of the proposed Project on federally-listed species and to facilitate ESA Section 7 consultation (Appendix R).

State Listed Species in the West Section

The MnDNR Natural Heritage Information System (NHIS) database was queried in January of 2015 to obtain the locations of rare species documented within the West Section (MnDNR 2014, reference (132)). The NHIS database includes records of rare species, some of which are federally and/or state protected. The NHIS database also includes species that are either special concern or tracked by the MnDNR. The MnDNR database does not track documented records of gray wolf or Canada lynx.

Because no formal surveys for rare species have been conducted for the proposed Project, a one-mile buffer surrounding the proposed routes and variations in the West Section was used to obtain a broad view of the rare species that may be present across this portion of the proposed Project. The NHIS database documents the following state-threatened or endangered species within one-mile of the proposed routes and variations in the West Section: state-endangered and federal candidate Sprague's pipit (*Anthus spragueii*); state-endangered upward-lobed moonwort (*Botrychium ascendens*); and the state-threatened common moonwort (*Botrychium lunaria*), sterile sedge (Carex sterilis), ram's-head lady's slipper (*Cypripedium arietinum*), and eastern spotted skunk (*Spilogale putorius*) (Table 5-26). In addition to these state-endangered and threatened species, several state-special concern species have been documented within one-mile of the proposed routes and variations in the West Section; these include nine vascular plants, four birds, one mammal, two mussels, and one fish. State-endangered, threatened, and special concern species and their associated habitats are summarized below in Table 5-26. In addition to these species, the MnDNR also has a group of species that are being tracked in order to determine conservation needs. Tracked species that have been documented within one mile of the proposed routes and variations in the West Section are summarized in Appendix F.

State Rare Communities in the West Section

Several rare communities have been identified within or adjacent to the variation areas in the West Section; these include SNAs, MBS Sites of Biodiversity Significance, MnDNR High Conservation Value Forests, and MBS native plant communities (Map 5-9). Many rare communities present in the West Section are located within one of the three state forests in this area; these include Lost River State Forest, Beltrami Island State Forest, and Lake of the Woods State Forest (Map 5-5). State forests are discussed in Section 5.3.4.2. Other resources that may provide potential habitat for rare species, such as WMAs, Important Bird Areas, and Grassland Bird Conservation Areas, are discussed in Section 5.3.4.3 and shown on Map 5-8.

Scientific and Natural Area

There are three SNAs located in the West Section; two in the Border Crossing Variation Area (Pine Creek Peatland and Sprague Creek Peatland) and one in the Beltrami North Variation Area (Winter Road Lake Peatland); however only the Pine Creek Peatland SNA is located within close proximity (less than 1,500 feet) to a proposed route or variation (Map 5-9). The MnDNR designates SNAs to "protect and perpetuate in an undisturbed natural state those natural features which possess exceptional scientific or educational value" (Minnesota Statue 86A05, Subd. 5). Typically, SNAs contain native plant communities that harbor rare plants and animals or unique geological features. State regulations prohibit high voltage transmission lines from crossing SNAs (Minnesota Rules, part 7850.4300, subpart 2).

MBS Sites of Biodiversity Significance

Several areas mapped by the MBS as Sites of Biodiversity Significance are located throughout

Table 5-26 State-Endangered, Threatened, and Special Concern Species Documented within One Mile of the Proposed Routes and Variations in the West Section

Scientific Name	Common Name	Federal Status	State Status	Type	Associated Habitat
Anthus spragueii	Sprague's Pipit	Candidate	Endangered	Bird	Large tracts of well drained native prairies and grasslands.
Botrychium ascendens	Upward-lobed Moonwort	None	Endangered	Vascular Plant	Disturbance-related habitats such as old mine tailings basins in early successional forests.
Botrychium lunaria	Common Moonwort	None	Threatened	Vascular Plant	Disturbance-related habitats including drained tailings basins, gravel banks, rocky ledges, and talus. Open or sparsely vegetated habitats with grasses and scattered shrubs.
Carex sterilis	Sterile Sedge	None	Threatened	Vascular Plant	Calcareous fens.
Cypripedium arietinum	Ram's-head Lady's-slipper	None	Threatened	Vascular Plant	Coniferous swamps, bogs, or lowland forests. Drier upland pine forests.
Spilogale putorius	Eastern Spotted Skunk	None	Threatened	Mammal	Open lands with sufficient cover, such as fencerows, shelterbelts, thickets, brush, and riparian woodlands.
Botrychium minganense	Mingan Moonwort	None	Special Concern	Vascular Plant	Typically in mesic hardwood forests. Also observed in upland cedar forest, aspen-fir forest, wet cliff (mossy ledge of waterfalls), and old openings and trails.
Botrychium pallidum	Pale Moonwort	None	Special Concern	Vascular Plant	Disturbance-related habitats including drained tailings basins, ROWs, exposed soils in open or sparsely vegetated habitats, grassy fields with scattered shrubs.
Botrychium rugulosum	St. Lawrence Grapefern	None	Special Concern	Vascular Plant	Low, moist habitats in brushy or grassy areas and in open forest areas.
Botrychium simplex	Least Moonwort	None	Special Concern	Vascular Plant	Disturbance-related habitats including drained tailings basins, ROWs, exposed soils in open or sparsely vegetated habitats, grassy fields with scattered shrubs, and forest edges.
Cladium mariscoides	Twig-rush	None	Special Concern	Vascular Plant	Fen communities within bog complexes or calcareous fens.
Drosera anglica	English Sundew	None	Special Concern	Vascular Plant	Fens of open rich peatlands, primarily in water tracks in the interiors of large peatlands.
Drosera linearis	Linear-leaved Sundew	None	Special Concern	Vascular Plant	Fens of open peatlands, primarily in water tracks in the interiors of large peatlands.
Malaxis monophyllos var. brachypoda	White Adder's-mouth	None	Special Concern	Vascular Plant	Coniferous swamps within forested rich peatland, near upland margin of swamps.
Ranunculus lapponicus	Lapland Buttercup	None	Special Concern	Vascular Plant	Rich forested swamp, usually under a canopy of northern white cedar or black spruce.

Scientific Name	Common Name	Federal Status	State Status	Type	Associated Habitat
Accipiter gentilis	Northern Goshawk	None	Special Concern	Bird	Large tracts of mature, closed canopy, deciduous, coniferous, and mixed forests with an open understory
Ammodramus nelsoni	Nelson's Sparrow	None	Special Concern	Bird	Sedge or grass-dominated wetlands, particularly wet prairie, rich fens, and wet meadows. Avoids cattail-dominated marshes.
Coturnicops noveboracensis	Yellow Rail	None	Special Concern	Bird	Sedge or grass-dominated wetlands, particularly wet prairie or rich fens.
Limosa fedoa	Marbled Godwit	None	Special Concern	Bird	Large expanses of native grasslands with sparse to moderate cover, adjacent to a complex of wetlands.
Mustela nivalis	Least Weasel	None	Special Concern	Mammal	Meadows, grasslands, and marshy and shrubby habitats
Lasmigona compressa	Creek Heelsplitter	None	Special Concern	Mussel	Creeks, small rivers, and the upstream portions of large rivers.
Ligumia recta	Black Sandshell	None	Special Concern	Mussel	Riffle and run areas of medium to large rivers.
Ichthyomyzon fossor	Northern Brook Lamprey	None	Special Concern	Fish	Adults are found in swifter waters, riffles, or runs. Ammocoetes (the larval stage of lampreys) are found in side channels or other quiet water.

Source: MnDNR 2014, reference (132)

the northwestern and southeastern portions of the West Section (Map 5-9). While the mapping of Sites of Biodiversity Significance has been completed for Roseau County, mapping is only preliminary in Lake of the Woods County and the other counties across the proposed Project. The MBS designates four biodiversity significance ranks for Sites of Biodiversity Significance, these include:

- outstanding (best occurrences of the rarest species and native plant communities);
- high (good quality occurrences of the rarest species and high-quality examples of native plant communities);
- moderate (occurrences of rare species, moderately disturbed native plant communities), and
- below (sites with moderately disturbed native plant communities, but lacking occurrences of rare species).

Because data are preliminary across portions of the proposed Project, biodiversity significance ranks have not been designated in every location; these areas are designated "rank unknown" on Map 5-9. The Minnesota WCA affords protection for any native plant community contained within an area mapped or determined by the MBS to be eligible for mapping as an outstanding or high biodiversity significance ranking (Minnesota Rules, part 8420.0515, subpart 3).

Sites of all levels of biodiversity significance are present in the West Section, with the majority of sites ranked as moderate. The MBS has ranked Sites of Biodiversity Significance as outstanding within the Pine Creek Peatland SNA, Sprague Creek Peatland SNA, and the area where the Roseau Lake WMA, Cedar Bend WMA, and Beltrami North variation areas meet; these sites of outstanding biodiversity significance contain several native plant communities and are also designated as areas of MnDNR High Conservation Value Forest (discussed below; Map 5-9).

High Conservation Value Forest

The MnDNR has designated areas as High Conservation Value Forest within state forest land, with four of these areas present in the West Section (Map 5-9). High Conservation Value Forests are defined by the Forest Stewardship Council as "areas of outstanding biological or cultural significance" (MnDNR 2013, reference (133)). "Management activities in High Conservation Value Forests shall maintain or enhance the attributes which define such forests. Decisions regarding High Conservation Value Forests shall always be considered in the context of a precautionary approach. Minnesota Statutes, chapters 89 and 89A require that the state manage

High Conservation Value Forests for protection of rare species, communities, features, and values across the landscape" (MnDNR 2013, reference (133)).

The MnDNR's process for selection of High Conservation Value Forest has been ongoing. The MnDNR has determined that current management of many SNAs and MnDNR forests are sufficient to meet the Forest Stewardship Council High Conservation Value Forest program requirements. While High Conservation Value Forests have been identified in Roseau County, they have not been identified in Lake of the Woods County.

MBS Native Plant Communities

The MBS has mapped several native plant communities throughout the West Section. In the West Section, mapping of native plant communities has only been completed for Roseau County. The Beltrami North Central Variation Area is located in Lake of the Woods County; however, while native plant communities are likely present in Lake of the Woods County, no data are available (MnDNR 2014, reference (134)).

In Roseau County, there are MBS native plant communities mapped in areas designated as Sites of Outstanding and High Biodiversity Significance (Map 5-9). As previously mentioned, these native plant communities are also generally associated with State Forests, SNAs, and MnDNR High Conservation Value Forests (Map 5-9). Each native plant community is assigned a state conservation status as follows:

- S1 – community is critically imperiled;
- S2 – community is imperiled;
- S3 – community is vulnerable to extirpation or extinction;
- S4 – community is apparently secure;
- S5 – community is demonstrably widespread, abundant, and secure.

The Minnesota WCA affords protection for any native plant community having a conservation status rank of S1, S2, or S3 that are mapped or determined eligible for mapping by the Natural Heritage and Nongame Research Program or MBS (Minnesota Rules, part 8420.0515, subpart 3).

In the West Section (Roseau County only), 20 native plant community types have been identified within 1,500 feet of the proposed route or variations, these are identified in Appendix G None of these native plant community types have a conservation status of S1, however, nine of the native plant community types have a conservation status of S2 or S3, indicating that these community types are not secure across the landscape. These native plant community types include the following:

- Graminoid Rich Fen (Water Track), Flark Subtype (S2)
- Alder – (Red Currant – Meadow-Rue) Swamp (S3)
- Graminoid Rich Fen (Water Track), Featurless Water Track Subtype (S3)
- Lowland White Cedar Forest (Northern) (S3)
- Rich Black Spruce Swamp (Water Track) (S3)
- Rich Fen (Peatland) (S3)
- Tamarack – Black Spruce Swamp (Aspen Parkland) (S3)
- White Cedar Swamp (Northwestern) (S3)
- Aspen – Fir Forest (S3/S4)

In addition to these native plant community types, the MnDNR has mapped two calcareous fens within variation areas in the West Section; both fens are located in the Border Crossing Variation Area (Map 5-9). Calcareous fen data is mapped as centroid points by the MnDNR and the boundaries of the fen are not delineated. Because of this nuance, the calcareous fen centroid points that are located within one mile of the proposed routes and variations in the West Section were used to evaluate potential impacts on calcareous fens.

Calcareous fens are a globally rare and unique groundwater-fed wetland type, and are protected by the State of Minnesota under the Minnesota WCA. Calcareous fens are characterized by a substrate of non-acidic peat and are dependent on a constant flow of groundwater that is rich in dissolved calcium and magnesium bicarbonates. This supply of mineral rich groundwater supports plant communities that are dominated by calciphyllic plants or that tolerate the mineral rich environment. Calcareous fens are susceptible to disturbance, specifically a reduction in groundwater supply.

The MnDNR has established WPAs for Peatland SNAs; these WPAs are intended to provide protective buffers to protect the hydrology of peatlands and calcareous fens in particular. Section 5.3.4.1 provides additional discussion on calcareous fen hydrology.

5.3.5.2 General Impacts

Construction and operation of the proposed Project may cause short-term and long-term impacts on rare and unique natural resources. The EIS assesses impacts on rare and unique natural resources by evaluating the presence of rare species and their associated habitats within or near the ROW and the proximity of the ROW to rare resources and communities, such as those described above.

Federally-listed species that could occur in the ROW or associated construction areas are summarized above. The proposed Project may affect, but is not likely to adversely affect these federally-listed species or designated critical habitat; the draft Biological Assessment (Appendix R) provides discussion on potential impacts of the proposed Project on federally-listed species and designated critical habitat. The potential impacts of the proposed routes and variations on rare and unique natural resources in the West Section are discussed further in Section 6.2.

Impacts from Construction

Rare Species

Construction-related potential short-term indirect impacts on rare wildlife species would be similar to those described for non-listed species in Section 5.3.4.3 and may include displacement of rare species during construction activities that generate noise, dust, or disturbance of habitat. These species would likely temporarily abandon their habitat during construction in favor of suitable habitats nearby. These impacts are expected to be short-term and localized.

Construction activities that may impact rare vascular plant species include physical disturbance from construction equipment and the removal of woody vegetation in the ROW. The Applicant would conduct rare species field surveys prior to construction and would coordinate with the USFWS and/or the MnDNR if any federally- or state-listed species are found. Clearing could potentially have the positive impact of creating habitat for certain state-listed species, such as species of *Botrychium* (grapeferns and moonworts) that frequently colonize disturbed areas.

As described for non-listed species in Section 5.3.4.3 and Section 5.3.4.3, construction of the proposed Project may result in long-term adverse impacts on rare species from the loss or conversion of habitat and habitat fragmentation. Impacts are expected to be extensive in areas where new ROW would be created and more localized in situations where an existing ROW is expanded.

As discussed in Section 5.3.4.2 and Section 5.3.4.3, the Applicant would expand existing ROWs and/or create new ROWs, which would convert existing occupied habitat to primarily open, maintained ROW. Rare plant and animal species that rely upon forested or tall-shrub habitat would generally be displaced in favor of species that utilize open communities or species that are habitat generalists, a characteristic not common with rare species. Rare plant and animal species that utilize open habitats, such as wetlands, native grasslands, or prairies, may benefit from the clearing of trees and creation of open habitat. However, these species could also be adversely impacted by the introduction of non-native plant species, which could alter the quality and function of habitats.

The creation of new ROW corridors within the forested portions of the proposed Project would replace contiguous forest habitat with more open and edge habitat, which would reduce the total area of contiguous habitat available for rare plant and animal species that require large unbroken blocks of forested habitat. In addition, this could provide more habitat that is used by non-native and invasive plant species and habitat generalists that could outcompete or colonize areas previously suitable for sensitive rare species. These impacts would be less pronounced where clearing of woody vegetation occurs along the existing ROW. This is because there would be a wider open area, but little or no increase in the amount of edge habitat over that currently present. When placed alongside existing cleared ROW corridor, edge effects from the proposed Project would therefore be approximately the same as the existing condition.

Rare Communities

Construction activities may have short-term and long-term impacts on rare communities. The use of construction equipment during site preparation (grading, excavation, and soil stockpiling) may result in short-term adverse impacts on rare communities, including localized physical disturbance and soil compaction. While the Applicant would span rare communities to the extent feasible, it is possible that some structures would need to be placed within them; this would result in short-term and long-term impacts.

Construction activities would cause long-term impacts by permanently removing vegetation at each structure footprint (33 square feet per structure) and within portions of the ROW that are currently

dominated by forest or other woody vegetation. The Applicant would permanently convert rare forested and/or shrubland communities in the ROW to low-stature vegetation communities. Permanent loss of forest would lead to fragmentation by reducing intact blocks of forest vegetation. Removal of vegetation and conversion to open habitats would increase the potential for spread of invasive plant species and would alter the structure and function of rare communities, potentially making them less suitable for the rare species that would typically inhabit them. Impacts are expected to be extensive in areas where new ROW would be created and less so in situations where an existing ROW is expanded because fragmented forest would already be present.

Sections 5.3.4.1 and 6.2 (Water Resources) discuss potential hydrological impacts on calcareous fens and associated SNA WPAs.

Impacts from Operation, Maintenance, and Emergency Repairs

Rare Species

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation; emergency repairs may require additional vegetation clearing.

Operation, maintenance, and emergency repair activities may have short-term indirect adverse impacts on rare species, including the displacement of rare birds, burrowing animals, and other species utilizing the ROW or its vicinity for foraging, breeding, or nesting.

As discussed in Section 5.3.4.3, operation of the proposed Project would result in the potential risk of avian collisions and electrocutions with transmission conductors and equipment, which may cause long-term impacts on rare birds. Through use of Applicant proposed minimization measures, as described in Section 2.13, these impacts are expected to be limited. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Rare Communities

The Applicant would routinely clear woody vegetation in rare communities present within the ROW in order to maintain low-stature vegetation that would not interfere with operation of the transmission line. Maintenance and emergency repair activities could result in direct impacts on rare communities from removal of vegetation, localized physical disturbance, and soil compaction caused by the use of equipment. Maintenance and emergency repair-related impacts on vegetation communities would be short-term and more localized than construction-related impacts.

5.3.6 Corridor Sharing

This section describes corridor sharing or paralleling opportunities within the West Section and the potential impacts from the proposed Project. Corridor sharing is one of the factors MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4200, subparts H and J).

Minnesota Rules, part 7850.4200, subparts H and J require that MN PUC consider corridor sharing in determining whether to issue a permit for a high voltage transmission line. Corridor sharing can include use or paralleling of existing infrastructure including existing transportation, pipeline, and electrical transmission systems or rights-of-way, or use of established boundaries such as survey lines or agricultural field lines. Sharing corridors with existing infrastructure or paralleling existing ROWs minimizes fragmentation of the landscape and can minimize impacts to adjacent property.

While paralleling an existing transmission line generally presents a routing opportunity, there is also some risk that a single incident could affect service on both lines. As discussed in Section 5.3.7, that reliability risk should be taken into account when identifying transmission line paralleling opportunities.

The ROI for this analysis of corridor sharing generally includes infrastructure corridors within approximately 0.25 miles of the proposed routes and variations. This ROI was selected because as distance from existing corridors increases, the benefits of corridor sharing diminish and at a distance greater than approximately 0.25 miles, benefits are unlikely to be observed.

5.3.6.1 Corridor Sharing in the West Section

The corridor sharing opportunities in the West Section are shown on Map 5-10. These opportunities are located where the ROW for the proposed routes and variations would parallel the corridor of an existing transmission line, field or section line, roadway, or other infrastructure. Where a new transmission line parallels an existing corridor, it generally reduces the amount of additional impacts to land under private, corporate, state, or federal ownership. In addition, it may reduce visual impacts as described in Section 5.3.1.1.

In the West Section, the proposed route and variations parallel corridors including existing 230 kV

and 500 kV transmission lines, roads, field lines, trails, public land survey sections (PLSS), combinations of these corridors, or no corridor. Additional details related to corridor sharing in the West Section for the proposed Project are discussed further in Chapter 6 and Chapter 7 of this EIS.

As described above, constructing and operating the proposed Project could potentially impact human settlements, land-based economies, archaeological and historic resources, and the natural environment in the proposed Project area. These impacts could be mitigated by prudent routing and corridor sharing with existing ROWs.

By following existing corridors, and reducing the need to create new transmission line corridors for the proposed Project, potential impacts to human settlements, land-based economies, and the natural environment would be minimized. Specifically, the following impacts could be minimized by corridor sharing:

- Impacts to human settlement can be minimized by selecting route alternatives that maximize corridor sharing with existing linear ROW (e.g., transmission lines, roadways and railroads) to reduce aesthetic impacts in open spaces and developed areas, and to reduce impacts to cultural values that conflict with new infrastructure corridors.
- Impacts on land-based economies can be reduced by sharing ROW to minimize the total ROW needed and paralleling existing corridors to consolidate encumbrances to certain land based economies like forestry and mining.
- Impacts on the natural environment can be minimized through corridor sharing that reduces habitat fragmentation.

5.3.6.2 General Impacts

When a transmission line parallels roads, railroads or other transmission lines and can share ROW, the easement required from an adjacent landowner is relatively smaller. When paralleling existing roadways, for example, the general practice is to place the structureson the adjacent private property, a few feet outside the existing ROW, as required by state or local regulations. So, although the structure is still located on private property, the transmission line can share or occupy some of the public ROW, thereby reducing the size of the easement required from the private landowner. If the normally required ROW width is 200 feet, for example, and the structure is placed 10 feet off an existing road ROW, only a 110-foot easement would be required from the landowner rather than a 200-foot easement. The roadway and transmission line would share the other 90-foot-wide section of ROW.

MnDOT's utility accommodation policy outlines the policies and procedures governing use of state trunk highway ROWs by utilities. The policy was developed in accordance with the requirements of state and federal law (23 CFR, part 645, subpart B). It is designed to ensure that the placement of utilities does not interfere with the flow of traffic or the safe operation of vehicles.

MnDOT is responsible for preserving the public investment in the transportation system and for ensuring that non-highway uses of the ROW do not interfere with the ability of the state to make long-term highway improvements, such as adding lanes, interchanges or bridges, or to safely operate and maintain the existing system. The requirements of MnDOT's accommodation policy vary based on whether the utility is crossing the highway or running parallel to it and on the type of highway.

Impacts from Construction

Corridor sharing would minimize potential impacts to the affected environment by minimizing the proliferation of new utility ROW and, where ROW sharing is possible, reducing the overall ROW footprint of impact. Sharing ROW with existing infrastructure would likely require coordination during construction and acquiring necessary approvals from the ROW owner (like a railroad) or the agency overseeing use of a particular ROW (like MnDOT).

Impacts from Operation, Maintenance, or Emergency Repairs

Sharing or paralleling existing infrastructure may also require coordination for maintenance or emergency repair and may require approvals from the ROW owner (like a railroad) or the agency overseeing use of a particular ROW.

5.3.7 Electrical System Reliability

This section of the EIS summarizes the electric transmission reliability requirements and reliability-related construction and operation issues presented by the proposed Project. Electrical system reliability is one of the factors MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4200, subpart K). Potential impacts related to electrical system reliability from the proposed Project are discussed further in Chapter 6 and Chapter 7 of this EIS.

As discussed in Section 2.2, one of the Applicants' stated purposes for the proposed Project is to enhance electrical system reliability and help meet long-term regional needs. The Applicant contends in the state CN docket that the reliability benefits due to the proposed Project have been substantiated by both its own studies and by those of Midcontinent Independent System Operator (MISO).[77]

Currently, there are two high voltage transmission lines that connect Manitoba and Minnesota: the Riel-Forbes 500 kV transmission line and a 230 kV transmission line that crosses the international border just east of the 500 kV transmission line. According to the Applicant, if the proposed Project was not built, the additional energy transfer required by the Applicant's agreements with Manitoba Hydro would cause more power to flow on the existing Riel-Forbes 500 kV transmission line, increasing the severity of an unexpected outage of that transmission line. The existing 500-kV transmission line already has experienced an unexpected outage causing it to be the second largest contingency in the MISO footprint. According to the Applicant, the proposed Project, therefore, is designed to both ensure the reliability of the Riel-Forbes 500 kV transmission line and facilitate the incremental transfer capacity necessary to serve the Applicant's customers.

In addition to these general grid reliability issues, all of the Applicant's proposed routes and the route variations include segments that would run parallel and adjacent to, but not within, the ROW of one of the two existing high voltage transmission lines. For example, the Proposed Blue and Orange Routes parallel existing electrical transmission lines for approximately 66.4 miles and 84.2 miles, respectively.

The NERC has established mandatory reliability standards for American utilities including conditions for the operation of high voltage transmission lines on adjacent or common ROWs. The applicable Category D contingencies are loss of all transmission lines along a common ROW and loss of an entire voltage level at a substation (see Section 2.8.5). The effects of these transmission contingencies on the system (and the transmission system's ability to serve load) must be monitored and managed by utilities. The more that parallel or common ROWs are used for multiple transmission lines, particularly high voltage facilities, the more likely it becomes that an outage involving multiple facilities could occur. There are trade-offs between electrical system reliability and environmental benefits of corridor sharing, so the analysis for the proposed Project would be on a case-by-case basis by the Applicant based on NERC standards.

When the proposed Project parallels an existing transmission line, the Applicant is proposing to offset the proposed transmission line by 50 feet from the ROW of the existing transmission line. In addition, the Applicant has proposed to minimize the number of crossings of the existing transmission lines with the proposed transmission line.

Even using these wider non-overlapping ROWs, parallel configurations can present reliability concerns because of the resulting concentration of transmission facilities in a common corridor. When facilities are located in close proximity, there is a greater risk that a single event can take out multiple lines.

Unexpected transmission line outages occur for a number of reasons including extreme weather events (lightning, high winds, extreme icing, or tornadoes) and equipment failures (conductors, shield wires, insulators, or structures). Extreme weather events could result in a simultaneous outage of the 500 kV transmission lines if the localized effect at the parallel corridor was extreme enough to cause damage to the transmission lines. Failure of transmission line equipment could result in a simultaneous or near-simultaneous outage if the separation distance between the transmission lines was not adequate, thereby, allowing the failed equipment of one transmission line to damage the other transmission line.

However, according to the Applicant, in practice, unexpected transmission line outages are rare, and simultaneous unexpected outages of parallel transmission lines that do not share a common structure are even rarer. The likelihood of an actual event severely impacting the 500 kV transmission lines (or the new 500 kV and the existing 230 kV line) can be reduced by maintaining the proposed 50 foot offset between ROWs and incorporating appropriate transmission line design considerations into the engineering, measures which the Applicant has included as part of its proposed Project.

The proposed Project and variations, therefore, would meet applicable NERC standards. Although any approved route must meet applicable NERC standards, the close proximity of parallel lines can make constructing and repairing the lines more difficult. These difficulties could, for example, increase outage times, should an outage occur. Some specific route variations could present construction and operation problems, such as where three high voltage transmission lines are proposed along parallel ROW.

77 Available at: http://mn.gov/commerce/energyfacilities/Docket.html?Id=33608.

The ROI for this analysis of impacts to electrical system reliability is defined as the corridors for the existing transmission lines. This ROI was selected based on an expectation that, given the construction activities proposed, the majority of impacts on electrical system reliability would likely occur within this area.

5.3.7.1 Electrical System Reliability in the West Section

This section describes the electrical system reliability within the West Section and the potential impacts on those resources from the proposed Project for the purposes of MN PUC decision making.

The proposed Project is similar in size and purpose to the existing Riel-Forbes 500 kV transmission line owned by Xcel Energy, which originates at the Riel Substation near Winnipeg, Manitoba. The Riel-Forbes 500 kV transmission line is the larger of the two existing transmission lines that currently connect Manitoba and Minnesota; a 230 kV transmission line also crosses the international border just east of the Riel-Forbes 500 kV transmission line crossing (Map 5-4).

From the Winnipeg area, the Riel-Forbes 500 kV line crosses the Minnesota-Manitoba border near Roseau, Minnesota, and connects to the Forbes Substation on Minnesota's Iron Range, where a second 500 kV line continues from Forbes to the Chisago Substation near the Twin Cities. The existing 230 kV transmission line crosses the existing 500 kV transmission line in two locations in the West Section.

The proposed route and variations would parallel either the 500 kV or 230 kV transmission lines throughout the section. There would be a maximum of two transmission lines co-located within a corridor in the West Section and the proposed transmission line would be adjacent to, but not within, the existing transmission line ROW. In the West Section, the proposed route would not cross either of these existing transmission lines, but multiple variations would cross one or both transmission lines.

The proposed Project would result in no more than two transmission lines co-located within a corridor in the West Section. Based on information provided by the Applicant, the likelihood of an actual event severely impacting both transmission lines can be reduced by incorporating appropriate transmission line design considerations (including maintaining a 50 foot separation between ROWs) into the engineering of the proposed Project (Minnesota Power 2014, reference (123)).

Therefore, reliability impacts are not expected as a result of construction of the proposed Project, regardless of the route or variation considered in the West Section.

5.3.7.2 General Impacts

Construction, operation, maintenance, or emergency repairs of the proposed Project would not interfere with the operation of existing transmission lines as the appropriate separation distance would be maintained for clearance and safety issues. Since potential impacts related to electrical system reliability are not expected from the operation, maintenance, or emergency repairs of the proposed Project for any proposed route or variation considered, electrical system reliability in the West Section is not discussed further in Chapter 6 of this EIS.

Construction

Construction of the proposed Project would not interfere with the operation of existing transmission lines as the appropriate separation distance would be maintained for clearance and safety issues. No impacts are expected as a result of construction of the proposed Project, regardless of the route or variation considered. Since potential impacts related to electrical system reliability are not expected from construction and operation of the proposed Project for any route or variation considered in the West Section, electrical reliability for the West Section is not discussed further in Chapter 6 of this EIS.

Operation, Maintenance, and Emergency Repairs

Operation, maintenance, or emergency repairs of the proposed Project would not interfere with the operation of existing transmission lines as the appropriate separation distance would be maintained for clearance and safety issues. No impacts are expected as a result of construction of the proposed Project, regardless of the route or variation considered. Since impacts related to electrical system reliability are not expected from the operation, maintenance, or emergency repairs of the proposed Project for any proposed route or variation considered in the West Section, electrical system reliability for the West Section is not discussed further in Chapter 6 of this EIS.

In addition to ROW offsets, the Applicant states that the reliability of the Riel-Forbes 500 kV transmission line outage is currently addressed with a special protection system (SPS). The existing special protection system acts nearly instantaneously to reduce the power transfer from Manitoba to the U.S. in the event of an unexpected outage of one or more

of the four existing tie lines between Manitoba and the U.S. As an additional Manitoba-to-United States tie transmission line, the proposed Project would also come under the existing special protection system (see Section 2.8.3 for more information).

The Applicant has proposed a variety of additional measures to maintain system reliability where the proposed Project would be constructed in parallel with the existing 500 kV or 230 kV transmission lines:

- Addressing potential simultaneous outages of the proposed Project and the existing 500 kV transmission line due to weather events, by developing a weather study to define and incorporate the appropriate design considerations based on actual weather data. Based on the weather study, the design criteria for the proposed Project may be adjusted to increase the robustness of the design where the proposed Project parallels the existing 500 kV transmission line.
- Considering more frequent use of anti-cascade structures, maintaining an increased supply of emergency spare structures, or even locating a permanent storage facility for emergency spare structures where design criteria cannot fully address potential simultaneous outages due to weather events, such as tornadoes.
- Installing a protective relay scheme that allows power to continue being transferred over the transmission line even if one of the three phases is struck by lightning. Since the majority of lightning events only affect one phase of a transmission line, single pole tripping should alleviate any concerns with simultaneous outages due to lightning.

Therefore, the reliability impacts in the U.S. of an unexpected simultaneous outage of both the proposed and exsiting 500 kV tie transmission lines in the West Section (and the Central and East Sections) would largely be addressed by these measures in conjunction with the proposed special protection system and corresponding power transfer reductions.

5.3.8 Costs of Constructing, Operating, and Maintaining the Facility which are Dependent on Design and Route

This section of the EIS summarizes the costs of constructing, operating, and maintaining the facility which are dependent on design and route of the Proposed Project. Cost evaluation is one of the factors the MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4100, subpart L). A summary of the costs associated with constructing the proposed routes and variations in the West Section is provided in Table 5-27.

The Applicant developed these cost estimates based on an estimated cost per mile for the general structure type planned for each proposed route or variation. The cost estimates have a range of plus or minus 30 percent. Since there is a lack of certainty regarding property acquisition, access costs, or segment-specific design criteria (i.e. increased return period where the proposed route or variation parallels existing corridors) these are not full construction estimates and were developed for comparative purposes only and a contingency has not been built into these numbers because it would require further engineering and analysis.

The cost for routine maintenance would depend on the topology and the type of maintenance required, but typically runs from $1,100 to $1,600 per mile annually (Minnesota Power 2013, reference (135)). Using the $1,600 per mile for operation and maintenance, the estimated cost would range from $13,000 to $71,000 annually for these alternatives in the West Section.

5.4 Route Specific Impacts to Central Section

Section 5.4 described impacts that are unique to one or more of the alternatives contained within the Central Section. The Central Section contains nine alternatives, which are as follows: the Proposed Blue Route, the Proposed Orange Route, one variation in the Beltrami South Central Variation Area, one variation in the Beltrami South Variation Area, one variation in the North Black River Variation Area, one variation in the C2 Segment Option Variation, one variation in the J2 Segment Option Variation Area, one variation in the Northome Variation Area, and one variation in the Cutfoot Variation Area.

5.4.1 Human Settlement

5.4.1.1 Aesthetics

This section describes the aesthetic, or visual, resources within the Central Section and the potential impacts from the proposed Project.

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

Table 5-27 Proposed Routes and Variations in the West Section

Variation Area	Name in the EIS	Cost (Total)	Cost (per mile)	Length (mi)
Border Crossing	Proposed Border Crossing-Blue/Orange Route	$29,012,219	$1,160,489	25.0
	Border Crossing Pine Creek Variation	$29,292,118	$1,139,771	25.7
	Border Crossing Hwy 310 Variation	$21,144,610	$1,136,807	18.6
	Border Crossing 500kV Variation	$11,512,144	$1,151,214	10.1
	Border Crossing 230kV Variation	$9,862,592	$1,208,592	8.2
Roseau Lake WMA	Proposed Blue/Orange Route	$33,247,089	$1,081,910	30.7
	Roseau Lake WMA Variation 1	$57,086,075	$1,293,882	44.1
	Roseau Lake WMA Variation 2	$46,162,144	$1,273,438	37.5
Cedar Bend WMA	Proposed Blue/Orange Route	$27,197,650	$1,101,119	24.7
	Cedar Bend WMA Variation	$21,235,417	$1,084,970	19.6
Beltrami North	Proposed Blue/Orange Route	$18,984,370	$1,150,568	16.5
	Beltrami North Variation 1	$18,411,668	$1,165,295	15.8
	Beltrami North Variation 2	$24,571,721	$1,247,295	19.7
Beltrami North Central	Proposed Blue/Orange Route	$12,574,123	$1,083,976	11.6
	Beltrami North Central Variation 1	$13,708,602	$1,000,628	13.7
	Beltrami North Central Variation 2	$14,478,550	$1,149,091	12.6
	Beltrami North Central Variation 3	$16,155,266	$1,324,202	12.2
	Beltrami North Central Variation 4	$17,168,969	$1,188,164	13.5
	Beltrami North Central Variation 5	$16,636,730	$1,109,115	15.0

Source: Minnesota Power 2014, reference (9)

Note(s): Totals may not sum due to rounding.

resources form the overall impression that an observer has of an area or its landscape character. Visual quality is generally defined as the visual significance or appeal of a landscape based on cultural values and the landscape's intrinsic physical elements (Smardon, R.C. et al 1988, reference (87)). Visual sensitivity refers generally to viewer interest and concern for the visual quality of the landscape and potential changes to it. For a more detailed discussion of terms and concepts related to aesthetics, please see Section 5.3.1.1.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.1.1)) and is 1,500 feet from the anticipated alignment of the transmission line and within 1,500 feet from the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites.

Visual Character of Central Section

The existing landscape character provides the context for assessing the effects of changes to the landscape. Major components of landscape character that define the appearance of the landscape include landform, water, vegetation, and human or cultural modifications. The landscape character of the Central Section is described below based on ecological subsections developed by the MnDNR (2015, reference (92)) in combination with observations of human or cultural modifications to the landscape. Ecological subsections are shown on Map 5-2 and described in more detail in Section 5.4.4.2.

The Central Section is comprised primarily of three ecological subsections, the Agassiz Lowlands, Littlefork-Vermillion Uplands, and Chippewa Plains. A fourth ecological subsection, the St. Louis Moraines, occurs in a small area in the extreme southeastern corner of the Central Section. The Agassiz Lowlands ecological subsection occupies most of the Central Section and occurs in the northern, western, and central portions. The Agassiz Lowlands is generally flat with some low sand ridges. Streams, wetlands, ponds, and lakes are fairly common. Vegetation consists of extensive peatlands in low-lying areas and upland forests of aspen and birch or jack pine in the higher sand ridge areas. Peatlands consist of a mosaic of black spruce or tamarack forests, meadows, and fens.

The Littlefork-Vermillion Uplands ecological subsection occurs primarily in far eastern and southern portions of the Central Section. Its

landform is generally flat to gently rolling. Rivers and streams meander extensively throughout the area. Major streams in the section include the Big Fork and Little Fork rivers which both flow north. The area contains extensive wetlands and peatlands as well as scattered small ponds. Vegetation is a mosaic of prairie, brushland, woodland, and peatlands, and forests are common. Quaking aspen forests are extensive throughout the upland areas.

The Chippewa Plains ecological subsection occurs in a small area in the far south-central part of the Central Section. Its topography is generally level to gently rolling. The area contains numerous small streams and several lakes, including Island Lake, Moose Lake, Big and Little Constance Lakes, Teufer Lake, Lake Cameron, Pine Lake, and Battle Lake. The area contains extensive forests consisting mostly of aspen with mixed stands of aspen, birch, maple, oak, spruce, and pine.

The St. Louis Moraines ecological subsection occurs in a small area in the extreme southeastern corner of the Central Section. The topography in this portion of the Central Section is gently rolling to rolling and contains numerous small ponds and a few small streams, including the upper reaches of the Big Fork River, Deer Creek, and Coon Creek. Much of the area is forested with aspen, pine, birch, and northern hardwoods, with aspen the most common.

Much of the Central Section is forested and contains extensive peatlands. A number of state forests occur in the section, including Beltrami Island, Lake of the Woods, Red Lake, Smokey Bear, Koochiching, George Washington, Big Fork, and Pine Island (Map 5-12). Pine Island State Forest occupies the central part and covers the largest area of the Central Section. Upper and Lower Red Lakes are large lakes located in the western part of the Central Section. Major streams in the section include the Rapid, Big Fork, and Little Fork rivers, all of which drain to the north. A variety of tributaries to these and smaller streams meander through the Central Section as well. Due largely to the extensive forests and peatlands in the Central Section, agriculture is not extensive, but occurs mostly in small, scattered concentrations in the northwestern, northern, northeastern and southwestern potions of the Central Section. Agriculture in these areas consists mostly of row crops, pastures, and hay fields. Fields are often lined by drainage ditches laid out in rectilinear patterns.

Human settlement is sparse throughout the Central Section and most often occurs in association with areas of agriculture and recreation. Human settlement primarily consists of scattered rural residences, often with associated farm buildings, and a few small communities, which are mostly located in the southern portion of the Central Section (e.g., Effie, Mizpah, Northome, Funkley, and Kelliher). The communities of Big Fork and Littlefork are located in the central-eastern and eastern portions of the Central Section. Several large transmission lines run through the Central Section and several tall communication towers also are scattered through the area (Map 5-11). Views in agricultural areas of the Central Section are often somewhat enclosed and limited in distance by surrounding forests. Views in forested areas tend to be very enclosed and limited due to screening by the dense trees.

No county parks, state parks, state forest campgrounds, national parks, or water access points were found within 1,500 feet of the proposed routes and variations in the Central Section; however the remaining features included in the analysis (residences, historic architectural sites, state forests, national forests, scenic byways, state trails, snowmobile trails, and state water trails) were identified within the footprint or within 1,500 feet of the anticipated alignment in Section. 5.2.1.1 and Section 6.3.

General Impacts

General impacts on existing aesthetic resources in the Central Section are similar to those in the West Section and are described in Section 5.3.1.1. Impacts may be caused by construction and operation of the proposed Project and could include short-term and long-term impacts. Impacts on aesthetics are assessed based on the extent of changes to landscape character and scenic quality, the level of contrast introduced by the proposed Project, its proximity to viewers, and the visual sensitivity related to views of the proposed Project.

To further characterize the potential impacts in the Central Section, photographs were taken and simulations created for several locations where the proposed Project directly cross, or are located near, aesthetic resources. Photosimulations were created for the locations where the proposed Orange Route is located near the Big Bog State Recreation Area in the Pine Island Variation Area (Viewpoint 01 in Appendix N) and a fire lookout tower just north of Waskish on the east side of Upper Red Lake (Viewpoint 02 in Appendix N) also in the Pine Island Variation Area. A photosimulation was also created for the location where the J2 Segment Option Variation in the J2 Segment Option Variation Area crosses the Edge of the Wilderness Scenic Byway south of Effie (Viewpoint 05 in Appendix N). Further discussion of the potential aesthetic impacts of the proposed Project routes and variations on those

aesthetic resources are included in the Pine Island Variation Area discussion (Section 6.3.1) and the J2 Segment Option Variation Area (Sections 6.3.6).

For a more detailed discussion of short- and long-term aesthetic impacts of transmission line projects, please see Section 5.3.1.1. The potential impacts of the proposed route and variations on aesthetic resources in the Central Section are discussed in Section 6.3. Applicant proposed measures to avoid, minimize, or mitigate impacts on aesthetic resources is provided in Section 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Construction Impacts

Short-term, adverse aesthetic impacts could result from ROW clearing, temporary construction access roads, temporary construction areas, and vehicle and equipment operations for transmission line construction. Construction related impacts to aesthetics are discussed in Section 5.3.1.1.

Operation, Maintenance, and Emergency Repair Impacts

Long-term, adverse impacts on aesthetic resources are most likely to occur during operation of the transmission line and would occur over the life of the proposed Project. Operation, maintenance, and emergency repair impacts to aesthetics are discussed in Section 5.3.1.1.

5.4.1.2 Land Use Compatibility

This section describes existing land uses and applicable land use policies and zoning within the Central Section of the proposed Project and the potential impacts to that resource from the proposed Project.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.1.2) and includes land within 1,500 feet of the anticipated alignment of the transmission line and within 1,500 feet of the footprint of the proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites.

Land Use Compatibility in the Central Section

The Central Section is located in Lake of the Woods, Beltrami, Koochiching, and Itasca counties in areas that are primarily rural with sparse development. The proposed routes and variations would pass near the cities of Keliher, Northome, Mizpah, Effie, Big Falls, and Littlefork. The predominant land use in the Central Section is undeveloped forest and swampland; much of which is state forest land and state fee land, including Lake of the Woods State Forest, Pine Island State Forest, Koochiching State Forest, and Beltrami State Forest (Map 5-12). Any route crossing state lands or waters would require a license to cross as required under Minnesota Statutes, section 84.415 and Minnesota Rules, chapter 6135.

In addition, there are scattered parcels of USFWS interest lands in the northwest part of the Central Section. Any route crossing USFWS interest lands (including easements) would require a ROW permit under 50 CFR 29.

The Central Section also includes some concentration of agricultural land uses in the northern and southern borders of the section. Developed land, including residences are scattered near the agriculture land and incorporated cities. Several airports and air strips are also located near developed areas, as described in Section 5.2.1.6. The various land uses present along the proposed routes and variations are shown in Map 5-12.

The proposed routes and variations would be located primarily in rural, unincorporated communities; therefore, no local township land use plan or ordinances were identified. Relevant elements of county comprehensive plans and ordinances are described below. Although as previously stated, a MN PUC Route Permit would supersede all local zoning, building, or land use regulations; including local, county and regional regulations (Minnesota Statutes, section 216E.03).

The **Lake of the Woods County Comprehensive Plan** and the **Lake of the Woods County Zoning Ordinance**, as described in Section 5.3.1.2, are also applicable to the Central Section of the proposed Project.

The **Beltrami County Shoreland Management Ordinance** provides land use controls along a number of waterbodies in the County. The ordinance identifies utility transmission power lines as a conditional use in shoreland management districts. Conditional uses require submission of a Conditional Use Permit to the county's Environmental Services Director and Planning Commission for review and approval. Approval may be contingent on increases to setbacks, landscaping and vegetative screening, and other reasonable requirements to fulfill the intent of the county's ordinance (Beltrami County 2006, reference (136)).

The **Koochiching County Development Ordinance** identifies utilities including power transmission towers, structures and lines, transformers, and substations as a conditional use in most districts. Utility uses are not listed as a permitted, conditional, or prohibited use for Commercial, Manufacturing, Open Space, or Rural Village districts. Conditional uses require review of the proposed project by the county's Planning Commission and approval by the Koochiching County Board. Approval may be contingent on increases to setbacks; limiting heights of buildings; requiring screening for nearby properties; and other conditions to protect the public health, safety, and welfare (Koochiching County 2008, reference (137)).

The **Itasca County Zoning Ordinance** identifies tower structures as a permitted or conditional use in all zoning districts with the exception of rural residential districts. However, the ordinance indicates towers associated with utility transmission lines regulated by the MN PUC are not governed by the specific tower requirements contained in the ordinance (Itasca County 2012, reference (138)).

The **Minnesota Forest Resource Strategies**, as discussed previously in Section 5.3.1.2, are also applicable to the Central Section of the proposed Project.

The **Beltrami Island Land Utilization Project Comprehensive Conservation Management Plan** as discussed previously in Section 5.3.1.2, are also applicable to the Central Section of the proposed Project.

General Impacts

Construction, operation, maintenance, and emergency repairs of the proposed Project in the Central Section would result in similar impacts as are expected and described for the West Section in Section 5.3.1.2.

Section 6.3 summarizes the potential impacts of the proposed routes and variations on land use in the Central Section. Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on land use. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Construction Impacts

Construction of the proposed Project in the Central Section would result in similar impacts as are expected and described for the West Section in Section 5.3.1.2.

Operation, Maintenance, and Emergency Repair Impacts

Operation, maintenance, and emergency repairs of the proposed Project would result in long-term impacts on land use within the Central Section, similar to those described for the West Section in Section 5.3.1.2.

5.4.1.3 Cultural Values

This section describes the cultural values within the Central Section and the potential impacts to cultural values from the proposed Project.

Cultural values are shared beliefs or attitudes that define what is acceptable or unacceptable, important or unimportant, right or wrong, workable or unworkable and provide a framework for unity and sense of identity for a community, region, or people.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.1.3) and includes Beltrami, Itasca, Koochiching, and Lake of the Woods counties which are crossed by the proposed routes and variations.

Ceded treaty areas, and tribal reservations in the Central Section are shown on Map 5-13. Archaeological and historic resources data are also shown on Map 5-13 by the number of records found by inventory type. Detailed data is provided in the initial Cultural Resources Report provided in Appendix P of this EIS.

Cultural Values in the Central Section

Cultural values in the Central Section are in many ways similar to the cultural values in the West Section generally, with some important differences due to the proximity of the Red Lake and Bois Forte Bands of Chippewa and the related history of treaties and rights retained by the Bands for hunting, gathering, and fishing in the area. Euro-American cultural values unique to the Central Section are largely tied to the transition to more sparsely populated, forested and peatland areas.

Like Roseau and Lake of the Woods counties, Koochiching County is identified as "Emptying Nest" type according to Chinni and Gimpel's analysis (Chinni and Gimpel 2010, reference (100)). According to Chinni and Gimpel's analysis, Beltrami County is categorized as a "Boom Town" type, characterized by fast growing communities with rapidly diversifying communities. However, the portion of Beltrami County located within the Central Section appears to share many of the "Emptying Nest" features of the counties next door. Similar to the West Section, themes mentioned on the

websites of regional cities and business communities stress hard work, optimism, and appreciation of the natural world. The major values within the region include pragmatism, appreciation, and use of natural resources, individualism, political and social conservatism, community pride, and economic well-being. The majority of public comments provided during the EIS scoping meetings in the Central Section raised concerns primarily related to possible visual and environmental impacts, implying cultural values of visual aesthetics of the landscape and sustained environmental conditions. In addition, commenters identified the importance of avoiding impacts to agricultural activities associated with wild rice cultivation, an indication of the value placed on preservation of the agricultural activities unique to this region (DOE and DOC-EERA 2014, reference (102)).

Euro-American cultural values unique to the Central Section are largely tied to the transition to more sparsely populated, forested and peatland areas. Particularly in these areas of sparse population, there appears to be a strong link between individuals' sense of identity and the relative solitude and remoteness that the region has to offer. This seems to manifest as a particular flavor of individualism that places a value on a sort of undisturbed independence in the wilderness.

Residents of this region appear to have a particularly strong sense of the significant physical presence of the Big Bog and the challenging post Euro-American settlement history associated with the Big Bog (Bradoff 1992, reference (139)). This appears to have, over time, cultivated a certain culture of respect and appreciation for the Big Bog as a natural resource (MnDNR 2015, reference (140)).

Tribal Values in the Central Section

The Anishinabe people have traditionally placed strong value on peatlands as central to their way of life. The network of lakes, forest, and peatland in the region supported the wild rice crop, cranberry bushes, fish, and various animals (Mayer 1992, reference (103)). The discussion of tribal cultural values in the Central Section revolves around the Red Lake and Bois Forte Bands of Chippewa.

Red Lake Band

Prior to the influx of white settlers, the Red Lake Band inhabited a large area of northwestern Minnesota encompassing about 13 million acres. The 1855 Treaty, which involved three Anishinabe Bands (the Mississippi, Pillager, and Lake Winnibigoshish), ceded territory in north central Minnesota, west of 1854 Treaty border. In 1863, the Red Lake Band, in its first significant treaty with the federal government, ceded about 11 million acres of their land to the United States. The second land cession by the Red Lake Band occurred in 1889. In that year Congress passed the Nelson Act, which authorized negotiations for the purchase of land from the Red Lake Band. A three member commission, which became known as the Rice Commission, was appointed to conduct negotiations.

The final land cession by the Red Lake Band occurred in 1904. Congress authorized negotiations in March 1901 and Inspector James McLaughlin negotiated an agreement with the Red Lake Band in 1902. The agreement was not ratified by Congress because of disagreement over method of payment, but Congress in 1904 did consummate the cession on terms substantially identical to the 1902 agreement, except for method of payment. Under this treaty, the Red Lake Band ceded 256,132 acres adjoining the Thief River and Red River Valley, land known as the "Western Townships". The Red Lake Band, through treaties and agreements summarized above, gave up land, but never ceded the main reservation surrounding the Lower Red Lake and a portion of Upper Red Lake. This un-ceded land is spoken of as the "diminished" reservation.

Historic differences between Euro-American cultural values and native Indian values in the area might be summarized by the history of the Volstead Act. Passed by the Minnesota Legislature in 1908, the Act was aimed at draining the public wetlands in northern Minnesota. Minnesota state law makers believed the Volstead Act projects would produce revenue for the Indians, revenue for the state, and farmland for homesteaders. Anishinabe leaders, on the other hand, explained that because of its influence on the level and quality of the waters of Red Lake, the wetlands supported plant and animal life central to their way of life. The Anishinabe well understood that the network of lakes, peatland, and forest supported the wild rice, cranberry bushes, fish, and wildlife (Mayer 1992, reference (103)).

The entire Anishinabe subsistence cycle depended, and still depends, on this network of water and resources. This example demonstrates a difference of opinion between the Bands and Euro-Anglo peoples based on deeply held cultural values. The Red Lake economy today continues to be based largely on the same resources that native inhabitants of the region have used for generations. Similarly, the Red Lake Band has also resisted the allotting of reservation land to individual families, in order to preserve the centuries-old spiritual connection of Anishinabe people to the land.

Peatland that had been ceded by the Red Lake Band was a large portion of the wetlands targeted by the Volstead Act. The Red Lake Band, however, eventually retained ownership of some parcels of the ceded lands where homestead entry was never made or where homesteaders failed to fulfill the terms of the legislation to receive title. This accounts for the current dispersal of Red Lake Reservation land throughout the peatland, outside of the main "diminished" reservation area. Of the total 840,000 acres that make up the Red Lake Reservation, the diminished reservation is 636,954 acres, including most of Red Lake itself (Map 5-13). The scattered parcels and the Northwest Angle section, returned to the Red Lake Band in 1934, total about 156,900 acres.

Key cultural values for the Red Lake Band therefore include preserving the natural environment, especially water resources, including Red Lake and the surrounding peatland and forest, which support wild rice, cranberry bogs, plants, fish, and wildlife.

The Red Lake Band take their status as a sovereign entity very seriously, with inherent rights pre-dating the U.S. Constitution. An important area of current contention between cultural values held in the Central Section relates to the possession of hunting and fishing rights by the Red Lake Band, which the various acts and treaties previously discussed may not have clearly defined but are fundamental to the Red Lake Band's way of life.

Bois Forte Band

As mentioned in Section 5.3.1.3 above, the proposed Project also passes through the area in which lands of the Bois Forte Band of Chippewa are located.

There are three parts that comprise the Bois Forte Reservation. The only part of the Bois Forte Reservation within the proposed Project area is the 23,000 acre Deer Creek sector located in Itasca County. While the Deer River sector is part of the Bois Forte Reservation and the Tribe manages the natural resources, no tribal members currently live there.

The largest sector of the Reservation is at Nett Lake in St. Louis and Koochiching counties, which is home to the majority of Bois Forte Band members and the Band's Tribal Government Offices. Fifty percent of the Nett Lake sector is wetland and is considered to be the largest producer of wild rice in the United States.

The third sector, the Vermilion Reservation, is located near the city of Tower on Lake Vermilion in St. Louis County and is home to Fortune Bay Resort Casino, the Bois Forte Heritage Center, the Vermilion Family Wellness Center, and the Vermilion Community Center and Health/Dental Clinics.

The community first entered into a treaty with the U.S. in 1854 that set aside an undefined region around Lake Vermilion as a reservation. The sectors at Nett Lake and Itasca County – Deer Creek – were officially established in an 1866 treaty, and the Lake Vermilion lands were defined in an 1881 Executive Order. In 1936, Bois Forte Band members living at Nett Lake incorporated with other Ojibwe as the Minnesota Chippewa Tribe, following the passage of the Indian Reorganization Act of 1934. This Act established the powers of tribal governments as equal to state or city governments. In 1997, the Bois Forte Reservation Tribal Council assumed full responsibility for the delivery of all government programs and services to its people.

The people of the Bois Forte Band have seen many changes. In the modern economy, they have preserved their ancient traditions: harvesting wild rice, tapping maple trees, collecting birch bark, and picking berries, to name a few. The Bois Forte Band has many cultural values in common with the Red Lake Band, which include preserving the natural environment, importance of water resources, and maintaining their independence.

General Impacts

General impacts to cultural values are detailed in Section 5.3.1.3. While impacts to individualism and appreciation for natural resources may be associated with the natural resource impacts discussed further in Chapter 6 of this document, the relative homogeneity of the human and natural environment along the proposed routes and variations in the Central Section, measureable differences in impacts to cultural values at the community or regional scale are not expected across the various proposed routes and variations.

Impacts to cultural values can be minimized primarily through corridor sharing with existing transmission infrastructure. Where existing infrastructure is present, impacts to the values addressed are likely to be marginal.

Although some permanent impacts to cultural values may be felt on a local basis, particularly where transmission lines run close to communities with values that are at odds with the presence of new, large infrastructure projects, at a county-wide or regional level no conflicts with cultural values is anticipated. Since potential impacts related to cultural values at the community or regional scale from the proposed Project are not expected for any proposed route or variation considered, cultural

values are not analyzed and discussed further in Chapter 6 of this EIS.

Construction Impacts

General impacts to cultural values from the proposed project are discussed above. The construction phase of the proposed Project is not expected to result in any unique impacts to cultural values held by Euro-Americans or American Indian tribes.

Operation, Maintenance, and Emergency Repair

General impacts to cultural values from the proposed project are discussed above. Operation, maintenance, and emergency repair are not expected to result in any unique impacts to cultural values held by Euro-Americans or American Indian tribes.

5.4.2 Land-Based Economies

Constructing and operating the proposed Project could potentially affect land-based economies in the proposed Project area. Transmission lines and associated structures are a physical, long-term presence on the landscape, which could prevent or otherwise limit use of the land for other purposes. When placed in an agricultural field, transmission line structures have a relatively small footprint, yet they could potentially interfere with farming operations. In addition, tall trees are not allowed in transmission line ROWs, a restriction that could affect forestry operations along the ROW, and transmission line structures could affect access to mineral resources.

5.4.2.1 Agriculture

This section describes the agricultural resources within the Central Section and the potential impacts from the proposed Project. The definition and regulations for agriculture are described in Section 5.3.2.1.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.2.1)) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites.

Agriculture in the Central Section

Agriculture is a minor land-based economic resource in the Central Section. In 2010, cash receipts for agricultural operations were approximately $25 million in Beltrami County, $7 million in Koochiching County, and $10 million dollars in Itasca County (MDA, 2012, reference (104)). Principal crops in Lake of the Woods and Beltrami counties are sugar beets and wheat, while Koochiching County is predominantly forested (Ye 2014, reference (105)). Farmers in the Central Section raise primarily cattle, but also limited numbers of hogs and pigs, broiler or other meat-type chickens, and sheep (USDA 2012, reference (106)). The following sections describe potential route-specific impacts to farmland, organic farms, livestock, aerial spraying, irrigation system and precision farming practices.

Farmland

Agricultural land in the Central Section includes lands designated as prime farmland, prime farmland if drained, and farmland of statewide importance. The FPPA defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides and labor" (CFR, title 7, section 657.5 (a) (1)). Farmland of statewide importance includes other land that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops.

Potential impacts related to prime farmland, prime farmland if drained, farmland not classified as prime farmland, and farmland of statewide importance from the proposed Project are discussed in Chapter 6 of this EIS. Mitigation strategies for potential impacts to these types of farmlands are similar to those described below for all agricultural lands.

Organic Farms

As noted in Section 5.3.2.1, since potential impacts related to organic farms are expected to occur if special special construction and maintenance procedures are followed and do not vary by proposed route or variation considered, organic farms are not discussed further in Chapter 6 of this EIS.

Livestock

Hog, poultry, cattle, and sheep farms are located in the Central Section. Livestock operations could be temporarily affected during construction of the proposed Project. Construction activities could temporarily disrupt livestock access to pasture lands and disturb livestock with construction noise. In addition, poultry could be sensitive to disease caused by pathogens introduced by offsite soils. Measures to minimize impacts to livestock during construction could include erecting temporary fences, temporarily relocating livestock from

construction areas, restoring vegetative cover using landowner-approved seed mixes suitable for livestock grazing, and washing equipment prior to entering poultry farms.

Though no stray voltage impacts are anticipated as a result of the proposed Project, stray voltage could be of concern to livestock farmers, particularly on dairy farms, due to its potential impacts to milk production and quality. Stray voltage is discussed further in Section 5.2.2.3. Induced voltage also may be of concern to livestock farmers, especially for farms with buildings near a transmission line that would require grounding of the metal components of the building. No impacts due to induced voltage are anticipated from the proposed Project if effective grounding is implemented. Induced voltage is discussed further in Section 5.2.2.4. Since potential impacts related to livestock are expected to be limited and do not vary by proposed route or variation considered, livestock are not discussed further in Chapter 6 of this EIS.

Aerial Spraying

Transmission line structures could potentially affect the coverage and effectiveness of aerial spraying. Structures could limit the ability of aerial applicators to reach specific areas of fields, by limiting those areas where applicators could safely fly. Adverse effects on aerial spraying and to crops could be mitigated by aligning the proposed Project in a configuration that is consistent with current aerial spraying patterns or by using land-based herbicides or pesticides in the areas near the transmission line. Since potential impacts related to aerial spraying are expected to be limited and do not vary by proposed route or variation considered, aerial spraying is not discussed further in Chapter 6 of this EIS.

Irrigation Systems

Transmission line structures in agricultural fields could potentially impede the use of irrigation systems, either by necessitating reconfiguration of an irrigation system to accommodate structures or by reducing crop revenue because all or a portion of a field could not be irrigated. No known center-pivot or other irrigation systems have been identified in the Central Section; therefore, impacts to irrigation systems are not anticipated and mitigation would not be required. If an irrigation system is encountered during construction of the proposed Project, procedures specified in the AIMP would be implemented to minimize disruption of the system. Further discussion of the AIMP can be found in Section 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions. Since potential impacts related to irrigation systems are not expected from the proposed Project and do not vary by proposed route or variation considered, irrigation systems are not discussed further in Chapter 6 of this EIS.

Precision Farming Systems

Precision farming involves the use of GPS and, more recently, RTK GPS in farm machinery, allowing the machinery to be directed more accurately and maximize a farm's efficiency. Transmission lines have the potential to interfere with RTK and standard GPS used for precision farming. Further discussion on interference can be located in Section 5.2.1.5. If interference with electronic devices, including precision farming systems, does occur and is caused by the presence or operation of the transmission line, Route Permits issued by the MN PUC require permittees to take those actions which are feasible to restore electronic reception to pre-project quality (Appendix B). Since potential impacts related to precision farming systems are expected to be limited and do not vary by proposed route or variation considered, precision farming systems are not discussed further in Chapter 6 of this EIS.

General Impacts

Potential impacts to agriculture associated with projects of this nature could be either short-term or long-term and are discussed generally below. Chapter 6 of this EIS assesses impacts on agriculture using USDA NRCS, SSURGO Farmland Classification mapping to identify areas of prime farmland, prime farmland if drained, and farmland of statewide importance within the ROW.

Agricultural land uses would continue to be allowed in the ROW, but the presence of transmission structures may prevent some farm equipment from accessing land. Impacts to agricultural operations could be mitigated by prudent routing (i.e., by selecting routes that avoid agricultural fields by following existing infrastructure ROWs, field lines and property lines). Where structures are placed in fields, impacts could be mitigated by not placing structures diagonally across fields, but rather parallel to existing field lines or spanning fields if diagonal crossings are necessary.

Impacts to agricultural lands could also be minimized by limiting the removal of crops to only those necessary for construction and on-going safe operation of the line. Additionally, the Applicant, in collaboration with the MDA would prepare an AIMP for the proposed Project. The AIMP identifies measures that the Applicant would take to avoid, mitigate, or provide compensation for agricultural

impacts that could result from constructing and operating the project. The AIMP specifies procedures for repairing damaged drain tile, alleviating compaction, and removing construction debris. Compliance with the AIMP is not a permit condition in the MN PUC's generic route permit template, but has been included as a permit condition for other high voltage transmission line projects (Appendix B). Further discussion on the AIMP can be found in Section 2.13.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. These activities could limit the use of fields or could affect crops and soil by compacting soil, generating dust, damaging crops or drain tile, or causing erosion. Project construction activities would typically be limited to the transmission line ROW. Short-term impacts in agricultural lands are estimated as 0.92 acres per structure location.

Construction activities would cause long-term impacts to agriculture by the physical presence of transmission line structures and associated facilities in crop, pasture, or other agricultural lands. For the transmission line itself, the footprint of the structure proposed for the project is 33 square feet. The impact of such structures, however, could be greater than their footprint since they could impede the use of farm equipment and irrigation systems and interfere with aerial spraying. These physical impacts could result in lost farming income or decreased property values (Section 5.2.1.4). In addition, stray voltage could affect livestock if not properly mitigated (Section 5.2.2.3).

Impacts from Operations, Maintenance, and Emergency Repairs

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation that would not interfere with the transmission line. Maintenance and emergency repair activities could result in direct impacts on farmlands from the removal of crops, localized physical disturbance, and soil compaction caused by equipment. Maintenance and emergency repair-related impacts on farmland would be short-term and more localized than construction-related impacts.

5.4.2.2 Forestry

This section describes the forestry resources within the Central Section and the potential impacts on those resources from construction and operation of the proposed Project.

Forestry resources are defined as forest lands and their associated harvestable products, including but not limited to, trees, saplings, seedlings, logs, brush, and slashing.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.2.2) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites.

Forestry in the Central Section

The Central Section includes primarily forested lands. State-owned forest lands, including the Beltrami Island, Lake of the Woods, Smokey Bear, Pine Island, Red Lake, Koochiching, and Big Fork State Forests, are managed by the MnDNR. The MnDNR Forestry Timber Sales Program manages timber harvesting on state-owned forest lands, which provides a source of funding for public services in Minnesota. Itasca, Koochiching, and Beltrami counties are among Minnesota's top five timber harvest counties, with Itasca County producing more than 300,000 cords annually and Beltrami and Koochiching counties producing more than 200,000 cords annually. Lake of the Woods County produces more than 50,000 cords annually (MnDNR 2011, reference (107)). The southern portion of the Central Section includes the Chippewa National Forest. The Central Section also includes other forested areas with private, corporate, or federal (USFS) ownership.

General Impacts

Potential impacts to forestry resources associated with projects of this nature could be either short-term or long-term. The EIS assesses impacts on forestry resources using MnDNR Division of Forestry, State Forest Boundaries and USFWS Interest mapping to identify areas of state forests and USFS national forest lands within the ROW.

Impacts to timber harvesting operations could be mitigated by prudent routing (i.e., by selecting routes that avoid forest lands by following existing infrastructure ROWs, access road ROWs, and property lines). ROW maintenance could be managed to reduce impacts on forestry resources. For example, leaving small fruiting trees and shrubs and using mechanical versus chemical vegetation management could help mitigate the loss of forestry resources. In addition, increasing the time between line maintenance in forested areas could result in

harvestable products. Finally, elevated spanning, in areas with high elevations, could reduce forest clearing.

Due to the possibility of permanent tree removal in forest lands, potentially significant impacts to forestry resources are expected as a result of construction and operation of the proposed Project, depending on the route or variation considered. Adverse, long-term, and regional impacts to forestry resources are expected, and they are considered significant by the MnDNR; however, the estimated loss in public revenue from timber harvesting is unknown. Potential impacts related to forestry from the proposed Project are discussed further in Chapter 6 of this EIS.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. Construction activities could limit timber harvesting efforts, affect timber stands and soil by compaction, damage trees, or cause erosion. Project construction activities would typically be limited to the transmission line ROW. As mentioned above, short-term impacts are estimated as 0.92 acres per structure location and for the transmission line itself, the footprint of the structure proposed for the project is 33 square feet. Long-term impacts to forestry resources are caused by the clearing of trees and physical presence of transmission line structures and associated facilities in forest lands.

Impacts from Operations, Maintenance, and Emergency Repairs

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation that would not interfere with the transmission line. Maintenance and emergency repair activities could result in direct impacts on forest lands from the removal of vegetation, localized physical disturbance, and compaction caused by equipment. Maintenance and emergency repair-related impacts on forestry resources would be short-term and more localized than construction-related impacts.

5.4.2.3 Mining and Mineral Resources

This section describes mining and mineral resources within the Central Section and the potential impacts from the proposed Project as required by MN PUC decision making for the Route Permit.

Mining and mineral resources are defined as areas with a concentration or occurrence of natural, solid, inorganic, or fossilized organic material in such form, quantity, grade, and quality that it has reasonable prospects for commercial extraction.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.2.3) and includes the ROW of the transmission line and the permanent footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, and permanent access roads.

Mining and Mineral Resources in the Central Section

Moving from northwest to southeast across this section, mining's contribution to the economy's total output varies from 1 percent in the northwest portion of this section of the Project area which overlaps with the Northwest region as defined in Tuck 2014, reference (109) to 15 percent (in the southwest portion of this section of the Project area which overlaps with the Headwaters region as defined in Tuck (2014, reference (141)). There are state mining leases identified in the Central Section. Several abandoned metallic mineral and iron ore mining sites are found along the proposed routes and variations in the Central Section. These sites include expired/terminated leases for the mining of metallic minerals, and to a lesser extent iron ore. None of these mining leases are currently active.

The MnDNR has identified an area of recent and historic metallic occurrence, leasing, and exploration in northwestern Koochiching County (Township 159 North, Range 27 West), in the vicinity of the North Black River Variation Area (Map 5-12; MnDNR 2014, reference (110)). The MnDNR provided comments during the scoping process suggesting a route variation that would be less likely to impede future exploration for metallic mineral resources; this is discussed further in Section 6.3.4.2.

In the Central Section, there are aggregate sources located within 100 feet from the Pine Island Proposed Orange Route (2 sites) in the Pine Island Variation Area, the Proposed Orange Route (2 sites) and J2 Segment Option Variation (1 site) in the J2 Segment Option Variation Area, and the Proposed Orange Route (1 site) and the Cutfoot Variation (1 site) in the Cutfoot Variation Area (Map 5-11). There are also several aggregate sources located within 1,500 feet from the proposed routes and variations in the West Section. The MnDNR has identified their concern regarding the potential encumbrance of state-owned surface estate mineral resources (peat, sand and gravel aggregate, crushed stone, clay, etc.), which is described in Section 5.3.2.3.

General Impacts

Potential impacts to mining and mineral resources associated with high voltage transmission line projects could be either short-term or long-term. The EIS assesses impacts on mining and mineral resources using the MnDNR Division of Lands and Minerals, All State Mineral Leases (2014) mapping to identify areas with mineral leases within the ROW.

Impacts can be mitigated by prudent routing and by prudent structure placement and placement of the alignment within the route to avoid any planned mineral mining sites. Potential impacts related to mining and mineral resources from the proposed Project are discussed further in Chapter 6 of this EIS.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. The construction of transmission lines could affect future mining operations if the structures interfere with access to mineable resources or the ability to remove mineral resources. If there are potentially recoverable mineral reserves in the Central Section, construction of the proposed Project could limit the ability to successfully mine these reserves, depending on the route or variation and the location of any mineable reserves.

Impacts from Operations, Maintenance, and Emergency Repairs

Maintenance and emergency repair activities would have minimal to no impact on mining and mineral resources from localized physical disturbance caused by the use of maintenance equipment.

5.4.3 Archaeology and Historic Architectural Resources

This section describes the setting for archaeological, historic, and Native American resources, collectively referred to as cultural resources within the Central Section and the potential impacts from the proposed Project.

5.4.3.1 Archaeology and Historic Architectural Resources Regulations

A summary of the applicable regulatory requirements and Executive Orders relevant to cultural resources and historic properties are provided in Section 5.3.3.1.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.3) and includes the direct APE which is the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1 (the proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites). It also includes the indirect APE, which includes the direct APE plus a one mile radius on each side of the anticipated alignment of the proposed transmission line or the center of the footprint of the other elements of the proposed Project.

5.4.3.2 Cultural Resources in the Central Section

The Central Section is comprised primarily of three ecological subsections, the Agassiz Lowlands, Littlefork-Vermillion Uplands, and Chippewa Plains. A fourth ecological subsection, the St. Louis Moraines, occurs in a small area in the extreme southeastern corner of the Central Section. The ecological subsections for the Central Section are shown on Map 5-13 and are described in more detail in Section 5.4.4.2 and Section 5.4.1.1.

The Central Section is composed of four archaeological regions: the Northern Bog West, Northern Bog East, Central Lakes Coniferous West, and Central Lakes Coniferous East (Map 5-13; Gibbon et al. 2002, reference (115)). The Northern Bog West and Northern Bog East archaeological regions are sub-regions of the greater Northern Bog Archaeological Region, as described in Section 5.3.3.2. The Central Lake Coniferous Archaeological Region is characterized by hilly terminal moraines extending though the region's center while the less rugged terrain of glacial origin covers the remaining portions; these include ground moraines, outwash plains, and lake plains. The Mississippi River traverses much of the region, flowing through or near several large lakes; lake distribution is very dense in the area with only the plain of Glacial Lake Upham and Glacial Lake Aitkin lacking significant bodies of standing water. Soil types vary greatly in the Central Lakes Coniferous Archaeological Region, but generally consist of course to medium textured forest soils. Peat deposits and fine textured forest soils can be found in the lakebeds of Glacial Lake Upham and Glacial Lake Aitkin. Pine trees, including white, jack, and red, once dominated the native vegetation. Deciduous trees such as elm, maple, basswood, ash, oak, aspen, and birch were also once present; peat bog vegetation covered the glacial lake plains in the southeast. Subsistence resources that thrived in

this environment would have included deer, beaver, moose, and black bear. Fish and waterfowl were abundant and wild rice was a staple (Gibbon et al. 2002, reference (115)).

Prehistoric period settlement patterns and site distribution patterns in the Northern Bog West and East Archaeological sub-regions of the Central Section are similar to those described for the West Section in Section 5.3.3.2. Prehistoric period settlement patterns in the Central Lakes Coniferous Archaeological Region are not as fully understood, but a focus of activity seemed to occur near lakes. Sites are generally located on major lakes and rivers, with very few sites occurring in the interior; sites are also concentrated along abandoned channels of the Mississippi River. Prehistoric sites include villages, burial mounds, and earthworks; in addition, one bison kill site (21CE1) has been recorded within the region (Dobbs 1989, reference (142)). With an increasing focus on wild rice harvesting, village concentrations were often located on major lakes near wild rice beds.

Historic period archaeological sites and historic architectural or built resources in both the Northern Bog and Central Lakes Coniferous archaeological regions are expected to be distributed in the same pattern as was described for the West Section (see Section 5.3.3).

Archaeological and historic architectural resources data are shown on Map 5-13 by the number of records found by inventory type (archaeological sites and historic buildings and structures). Detailed data is provided in Appendix P. A more detailed description of the cultural resources present within the Central Section and the potential effects are provided in Section 6.3.

5.4.3.3 General Impacts

Impacts to cultural resources can result from direct and indirect impacts as described below. Section 6.3 summarizes the potential impacts of the proposed routes and variations on archaeological and historic architectural resources in the Central Section, including those resources that are historic properties. As stated above, DOE is consulting with federally-recognized Indian tribes to identify Native American resources and historic properties in the Central Section. Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on cultural resources and historic architectural properties. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Construction Impacts

Construction impacts to archaeological sites and historic architectural or built resources in the Central Section could result from ROW clearing, temporary construction access roads, temporary construction areas, and vehicle and equipment operations for transmission line construction. A full description of the construction related impacts to archaeological sites and historic architectural or built resources are described in Section 5.3.3. Measures to avoid, minimize and mitigate construction impacts on cultural resources and adverse effects on historic properties are the same as those identified in Section 5.3.3.

Operation, Maintenance, and Emergency Repair Impacts

Impacts to archaeological sites and historic architectural or built resources in the Central Section could also result from operation, maintenance, and emergency repairs and would be similar to those described in Section 5.3.3. Measures to avoid, minimize and mitigate operation, maintenance, and emergency repairs impacts on cultural resources and adverse effects on historic properties are the same as those identified in Section 5.3.3.

5.4.4 Natural Environment

This section describes water resources, vegetation, and wildlife, which are present within the Central Section and the potential impacts on those resources from construction and operation of the proposed Project.

5.4.4.1 Water Resources

This section describes water resources, including rivers and streams (i.e. watercourses), lakes and ponds (i.e. waterbodies), wetlands, floodplains, and groundwater resources, that occur in the Central Section, as shown on Map 5-14, and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning water resources for water resources can be found in Section 5.3.4.1.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.4.1) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, permanent and temporary access roads,

temporary laydown areas, temporary stringing areas, and temporary fly-in sites.

Watercourses and Waterbodies in the Central Section

The Central Section is included in the Red River and Rainy River regional watersheds. Major watersheds include Red Lakes, Rapid River, Lower Rainy River, Rainy Lake, Little Fork River, and Big Fork River. Several rivers, streams, and creeks (collectively referred to as watercourses) and drainage ditches traverse the area, including MnDNR PWI watercourses and waterbodies. Similar to the West Section, rivers in this area tend to be moderate to small in size and highly sinuous. Major watercourses include the Rapid River, Black River, Big Fork River, Sturgeon River, and Rainy River. Smaller named watercourses include the Popple River, Black Duck River, Peppermint Creek, Pitt Grade Creek, Deer Creek, Troy Creek, Elm Creek, Plum Creek, Chase Brook, Caldwell Brook, and Bowerman Brook. Headwaters of these watercourses are predominantly associated with regional peatlands. Drainage ditches are present throughout the peatland areas, and were constructed in an attempt to drain these areas to support agricultural activities. Waterbodies in this area are generally restricted to peatland-lakes or constructed impoundments. Upper Red Lake and Lower Red Lake can be found in the southwest portion of the Central Section. Several smaller waterbodies are located in the southern portion of this section, including Pine Lake, Battle Lake, Island Lake, Moose Lake, Grass Lake, and Thimble Lake. Small, unnamed waterbodies are also found on the landscape, more frequently in the southern half of the Central Section than the northern half.

The MPCA monitors and assesses Minnesota waters to determine if they meet water quality standards for designated uses. Waters that do not meet their designated uses due to water quality standard exceedances are listed as impaired waters. Table 5-28 lists the impaired waters found in the Central Section and summarizes the impairments (stressors) and affected designated uses for each of these impaired waters.

To protect the propagation of trout, MnDNR has established lakes and portions of streams and tributaries as designated trout lakes and streams statewide. Special fishing regulations apply to designated trout waters. One designated trout stream, Pitt Grade Creek, is located in the Central Section.

Floodplains in the Central Section

Floodplains in the northwest portion of the Central Section tend to be narrower than in the West Section due to more varied topography. FEMA has designated Zone A floodplains along the Rapid River, Black River, and Big Fork River.

Wetlands in the Central Section

Wetlands in the Central Section primarily consist of large peatland complexes, including shrubby bog areas intermixed with forested and emergent wetlands. Red Lake Peatlands, Beltrami-Pine Island Peatlands, Pine Island Peatlands, Koochiching Peatlands, and Myrtle Lake Peatlands are present in the Central Section. The following wetland types are present throughout the Central Section: palustrine emergent wetland (PEM), palustrine shrub wetland (PSS), palustrine forested wetland (PFO), and palustrine unconsolidated bottom pond (PUB).

The MnDNR has mapped three calcareous fens the Central Section. The fen in the Pine Island Variation Area is within one mile of the anticipated ROW for a proposed route or variation. The MnDNR has established WPAs for Peatland SNAs to protect hydrology of groundwater-dependent natural communities. The North Black River Peatland

Table 5-28 Summary of Impaired Waters in the Central Section

Watercourse/Waterbody	Impairment (Stressor)	Affected Designated Use
Big Fork River	Mercury in fish tissue	Aquatic consumption
Black River	Mercury in water column	Aquatic consumption
Black Duck River	Mercury in fish tissue	Aquatic consumption
Little Fork River	Turbidity, mercury in fish tissue	Aquatic life, aquatic consumption
Popple River	Fish bioassessments	Aquatic life
Rainy River	Mercury in fish tissue	Aquatic consumption
Island Lake	Mercury in fish tissue	Aquatic consumption
Dark Lake	Mercury in fish tissue	Aquatic consumption
Lower Red Lake	Mercury in fish tissue	Aquatic consumption
Upper Red Lake	Mercury in fish tissue	Aquatic consumption

Source(s): MPCA 2014, reference (118); MPCA 2014, reference (119)

SNA WPA is located within the Pine Island and C2 Segment Option variation areas, while the Lost River Peatland SNA WPA is found in the Pine Island and J2 Segment Option variation areas. The Myrtle Lake Peatland SNA WPA is located in the Pine Island and North Black River variation areas, and the Pine Island Variation Area also contains the Red Lake Peatland SNA WPA. Additional information regarding rare and unique communities associated with these areas can be found in Section 5.4.5.

General Impacts

Potential construction and operational impacts on water resources that may be caused by the proposed Project are similar to those summarized in the West Section in Section 5.3.4.1.

The potential impacts of the proposed routes and variations on water resources in the Central Section are discussed in Section 6.3.

Impacts from Construction

Potential construction impacts on water resources that may be caused by the proposed Project are similar to those summarized in the West Section in Section 5.3.4.1.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repair on water resources that may be caused by the proposed Project are similar to those summarized in the West Section in Section 5.3.4.1, Water Resources.

5.4.4.2 Vegetation

This section describes the vegetation resources within the Central Section and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning vegetation resources can be found in Section 5.3.4.2.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.4.2) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites.

Vegetation in the Central Section

According to the ECS, the Central Section is located in the Agassiz Lowlands and Littlefork-Vermillion Uplands subsections, which are located in the Northern Minnesota and Ontario Peatlands section of the Laurentian Mixed Forest Province. A small part of the southern portion of this section is located in the Chippewa Plains subsection, which is located in the Northern Minnesota Drift and Lake Plains section of the Laurentian Mixed Forest Province. The ECS subsections in the Central Section are identified on Map 5-2.

The Agassiz Lowlands subsection is predominantly comprised of vast peatlands and upland sand ridges resulting from the retreat of Glacial Lake Agassiz to the west. Peatlands are a mosaic of forests dominated by black spruce or tamarack, or herbaceous sedge meadow, fresh meadow, and poor or rich fens. Sand ridges are commonly dominated by aspen and birch, or jack pine forests and woodlands. The subsection is generally very flat and poorly drained. Past attempts at ditching and farming the peatlands have been largely unsuccessful and most of the subsection is uninhabited (MnDNR 2015, reference (92)).

The Littlefork-Vermillion Uplands subsection is a transition zone between the vast peatlands to the west and the shallow bedrock controlled, clayey soils to the east. This subsection contains a rich variety of vegetation types, much of it occupied by aspen-birch forest trending toward white pine, white spruce, and balsam fir. The eastern portion of the subsection is dominated by white pine, red pine, and jack pine forest. Poor and rich fens, black spruce bog, and cedar-black ash swamp are typical in lowlands (MnDNR 2015, reference (92)).

The Chippewa Plains subsection is comprised of level to gently-rolling till plain and lake plain settings, which form a mosaic of vegetation communities. Outwash plain settings tend toward sandy soils and support dry forest communities dominated by upland conifers. Vegetation communities in this subsection include upland conifer forest, shrub and woodland uplands, and non-forested wetlands (MnDNR 2015, reference (92)).

Based on USGS GAP data, the variation areas in the Central Section are primarily comprised of upland forests and lowland swamps; additional land cover types present in the Central Section include herbaceous agricultural, open water, developed/urban land, and disturbed or modified land (Map 5-12; Appendix E).

Several state forests are located within or adjacent to variation areas in the Central Section, including the Beltrami Island State Forest, Lake of the Woods State Forest, Pine Island State Forest, Red Lake State Forest, Big Fork State Forest, Smokey Bear State Forest, George Washington State Forest, and Koochiching State Forest (Map 5-12). The Chippewa National Forest is located in the southern part of the Central Section (Map 5-12). In addition, several sensitive ecological resources, such as WMAs, SNAs, MnDNR Ecologically Important Lowland Conifer Forests, and MBS Sites of Biodiversity Significance (see Sections 5.4.4.3 and 5.4.5) are located within or adjacent to variation areas in the Central Section.

General Impacts

Potential construction and operation-related short-term and long-term impacts on existing vegetation in the Central Section are similar to those summarized for the West Section in Section 5.3.4.2.

Section 6.3 summarizes the potential impacts of the proposed routes and variations on vegetation in the Central Section.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on vegetation. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

Potential construction impacts on existing vegetation in the Central Section are similar to those summarized for the West Section in Section 5.3.4.2.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repairs on existing vegetation in the Central Section are similar to those summarized for the West Section in Section 5.3.4.2.

5.4.4.3 Wildlife

This section describes the wildlife resources that occur within the Central Section and the potential impacts on those resources from the proposed Project.

Federal and state regulations concerning wildlife resources can be found in Section 5.3.4.3.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.4.3) and includes the anticipated 200-foot ROW and the footprint of the other elements of the proposed Project, including the proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations.

Wildlife in the Central Section

The landscape types and vegetation communities throughout the Central Section of the proposed Project provide forage, shelter, nesting, overwintering, and stopover habitat for a wide range of resident and migratory wildlife species. Habitat types in the Central Section primarily consist of various forested communities.

As discussed in Section 5.4.4.2, the Central Section is located within three ECS subsections classified by the MnDNR and USFS (MnDNR 2015, reference (92)); the Agassiz Lowlands, Littlefork-Vermillion Uplands, and Chippewa Plains subsections (Map 5-2). The MnDNR's comprehensive wildlife plan, *Tommorrow's Habitat for the Wild and Rare an Action Plan for Minnesota Wildlife* (MnDNR 2006, reference (125)), which corresponds to the ECS native plant communities, was used to summarize the wildlife likely present in the three ecological subsections in the Central Section of the proposed Project. Each ECS subsection identifies SGCN, which are those species whose populations are rare, declining, or vulnerable in Minnesota. Approximately half of the SGCN are also Minnesota state-listed species (MnDNR 2006, reference (125)).

Native community types located within the Agassiz Lowlands subsection provide habitat for species associated with lowland conifer, dune, and non-forested wetland vegetation communities. Birds found in this subsection include white pelican, common tern, American bittern, yellow rail, and numerous migratory shorebird, waterfowl, and perching species. Typical mammals that occupy these habitats include beaver, otter, and bog lemming. Forest communities present in this subsection include habitats that harbor species such as spruce grouse, great gray owl, short-eared owls, and sharp-tailed grouse. Approximately 88 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within community types present within this subsection (MnDNR 2006, reference (125)).

Native community types located within the Littlefork-Vermillion Uplands subsection provide habitat for species associated with lowland and upland conifer and mixed conifer deciduous forest vegetation communities. Forested community types within this subsection provide habitat for a variety of species, such as bald eagle, Canada lynx, great gray owl, boreal owl, and numerous game species such as ruffed grouse and white-tailed deer. Wetlands

provide habitat for yellow rail, trumpeter swan, red-necked grebe, and a variety of waterfowl. Approximately 67 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

Native community types located within the Chippewa Plains subsection provide key habitat for species associated with upland conifer, shrub, and woodland uplands, and non-forested wetland vegetative communities. Bird species include bald eagle, Virginia rail, yellow rail, black-backed woodpecker, and numerous migratory species such as shorebirds and waterfowl. Typical mammals that occupy these habitats include fisher, beaver, and gray wolves. Forest communities present in this subsection include habitats that harbor species such as ruffed grouse, great gray owl, saw-whet owl, red-disked alpine, and bog copper. Approximately 83 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

In addition to the natural wildlife habitat present throughout the Central Section, there are several areas of managed wildlife habitat present in the Central Section. These managed wildlife habitats include: WMAs in the northeastern part of the Central Section, including the Red Lake WMA and Carp Swamp WMA; the Big Bog and Chippewa Plains Important Bird Areas; a few small Grassland Bird Conservation Areas scattered throughout the Central Section; and a MnDNR-designated shallow lake in the Northome Variation Area (Map 5-15). Section 5.3.4.3 provides additional information on each of these wildlife resources.

Much of the Central Section is USFWS-designated critical habitat for gray wolf (Map 5-15); Section 5.4.5 provides further discussion of gray wolf critical habitat. The Central Section also contains a small portion of the Chippewa National Forest, several State Forests (discussed in Section 5.4.4.2), and sensitive ecological resources (discussed in Section 5.4.5), all of which provide habitat for common and rare wildlife species.

General Impacts

Potential construction and operation-related short-term and long-term impacts on wildlife in the Central Section are similar to those summarized for the West Section in Section 5.3.4.3.

Section 6.3 summarizes the potential impacts of the proposed routes and variations on wildlife in the Central Section. Sections 5.4.4.2 and 6.3 discuss potential impacts on vegetation, Sections 5.4.4.1 and 6.3 discuss potential impacts on wetland habitat, and Sections 5.4.5 and 6.3 discuss potential impacts on sensitive ecological resources used by wildlife.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on wildlife. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

Potential construction impacts on wildlife in the Central Section are similar to those summarized for the West Section in Section 5.3.4.3.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repairs on wildlife in the Central Section are similar to those summarized for the West Section in Section 5.3.4.3.

5.4.5 Rare and Unique Natural Resources

This section describes the rare and unique natural resources, including federal and state protected species and rare communities, which are present within the Central Section and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning rare and unique natural resources can be found in Section 5.3.5.

The ROI for an analysis of impacts to federally- and state-listed species includes a one-mile buffer surrounding the proposed routes and variations in order to obtain a broad view of species that may be present across the proposed Project, since no formal surveys have been conducted for the proposed Project. The ROI for the analysis of impacts to rare communities includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations.

5.4.5.1 Federally Listed Species in the Central Section

The USFWS technical assistance website was reviewed to determine if any federally-listed species or designated critical habitats are known to be present within Lake of the Woods, Koochiching, Beltrami, and Itasca counties, where the Central

Section is located (USFWS 2015, reference (127)). The USFWS lists four species as occurring in Lake of the Woods, Koochiching, Beltrami, and/or Itasca counties, including the federally threatened gray wolf (*Canis lupus*), Canada lynx (*Lynx canadensis*), and northern long-eared bat (*Myotis septentrionalis*) in all four counties; and the federally threatened piping plover (*Charadrius melodus*) in Lake of the Woods County (USFWS 2015, reference (127); Table 5-29).

Designated-critical habitat associated with federally-listed species consists of "the specific areas within the geographical area occupied by the species, at the time it is listed…on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection" (50 CFR 1533[b][2]).

Gray wolf. The gray wolf was federally listed as an endangered species in 1974 and was reclassified as threatened in 1977 (42 Federal Register 29527-29532). In 2011, the wolf was delisted by the USFWS (76 Federal Register 57943-57944). However, in 2014, a federal court reversed the USFWS decision to delist the gray wolf, restoring federal threatened status and designated critical habitat in Minnesota. Gray wolves occupy a diversity of habitats, including forests, prairies, and swamps (USFWS 2012, reference (128)). Designated critical habitat for gray wolf is present throughout the Central Section (Map 5-15).

Canada lynx. The Canada lynx was listed as a federally threatened species in several states in the Northeast, Great Lakes Region (including Minnesota), and Southern Rockies in 2000 (65 Federal Register 16052-16086). Canada lynx inhabit boreal and mixed coniferous and deciduous forests, where snowshoe hare, their preferred diet, are present (USFWS 2013, reference (127)). The nearest designated critical habitat for lynx is at least 11 miles east of the proposed routes or any variation in the Central Section.

Piping plover. The northern Great Plains population of the piping plover was listed as federally threatened in 1985 (50 Federal Register 50726-50734). Piping plovers inhabit wide, flat, open, sandy beaches with very little grass or other vegetation present (USFWS 2001, reference (130)). The nearest designated critical habitat for piping plover is Lake of the Woods, over 20 miles from the Pine Island Variation Area in the Central Section (Map 5-8).

Northern long-eared bat. The northern long-eared bat was proposed for listing as a federally endangered species in 2013 (78 Federal Register 61046-61080). In April of 2015, the USFWS listed the northern long-eared bat as federally threatened (80 Federal Register 18023-18028). The northern long-eared bat inhabits caves and mines in winter; in summer northern long-eared bats roost in live and dead trees with loose, flakey, or shaggy bark, crevices, or hollows (USFWS 2015, reference (131)). The USFWS has not identified designated critical habitat for the northern long-eared bat at this time.

Additional information on federally-listed species is available in the Biological Assessment, which was prepared to assist in determining the potential impacts of the proposed Project on federally-listed species and to facilitate ESA Section 7 consultation (Appendix R).

5.4.5.2 State Listed Species in the Central Section

The MnDNR NHIS database was queried in January of 2015 to obtain the locations of rare species documented within the Central Section (MnDNR 2014, reference (132)). Additional information on the NHIS database is provided in Section 5.3.5.

Because no formal surveys for rare species have been conducted for the proposed Project, a one-mile buffer surrounding the proposed routes and variations in the Central Section was used to obtain a broad view of the rare species that may be present across this portion of the proposed Project. The NHIS database documents the following state-threatened or endangered species within one-mile of the proposed routes and variations in the Central Section: state-endangered upward-lobed moonwort (*Botrychium ascendens*); and the state-threatened common moonwort (*Botrychium lunaria*), sterile sedge (*Carex sterilis*), ram's-head lady's slipper (*Cypripedium arietinum*), beaked spike rush (*Eleocharis rostellata*), and hair-like beak rush

Table 5-29 Federally-Listed Species Known to Occur in Lake of the Woods, Koochiching, Beltrami, and/or Itasca Counties

Scientific Name	Common Name	Federal Status	State Status
Canis lupus	Gray wolf	Threatened	Special Concern
Lynx canadensis	Canada lynx	Threatened	Special Concern
Charadrius melodus	Piping plover	Threatened	Endangered
Myotis septentrionalis	Northern long-eared bat	Threatened	Special Concern

Source: USFWS 2015, reference (127)

(*Rhynochospora capillacea*) (Table 5-30). In addition to these state-endangered and threatened species, several state-special concern species have been documented within one-mile of the proposed routes and variations in the Central Section; these include seven vascular plants, two birds, one insect, two mussels, and one fish. State-endangered, threatened, and special concern species and their associated habitats are summarized below in Table 5-30. Species tracked in the NHIS database, as described in Section 5.3.5, that have been documented within one mile of the proposed routes and variations in the Central Section are summarized in Appendix F.

According to the NHIS database, there are ten MnDNR-designated colonial waterbird nesting sites in the Central Section, most of which are located in the southern portion of the section. Colonial waterbird nesting sites are documented locations of large groups of nesting waterbirds; these locations are generally found in association with trees and emergent wetland vegetation.

5.4.5.3 State Rare Communities in the Central Section

Several rare communities have been identified within or adjacent to the variation areas in the Central Section; these include SNAs, MBS Sites of Biodiversity Significance, MnDNR native plant communities (fens), and MnDNR-designated Ecologically Important Lowland Conifers (Map 5-16). In addition to these rare resources, MBS native plant communities and MnDNR-designated areas of High Conservation Value Forest are also likely present in the Central Section; however, as mentioned in Section 5.3.5, the MnDNR is in the process of mapping these resources for the counties in the Central Section and data are currently unavailable (MnDNR 2014, reference (134)).

Many rare communities present in the Central Section are located within one of the eight state forests in this area (Map 5-12 and Map 5-16). State forests are discussed in Section 5.4.4.2. Other resources that may provide potential habitat for rare species, such as WMAs, Important Bird Areas, and Grassland Bird Conservation Areas, are discussed in Section 5.4.4.3 and shown on Map 5-15.

Scientific and Natural Areas

There are eight SNAs located in the Central Section, including Caldwell Brook Cedar Swamp, Gustafson's Camp, Lost River Peatland, Maurice O'Link Ribbed Fen, Myrtle Lake Peatland, North Black River Peatland, Red Lake Peatland, and South Black River Peatland (Map 5-16). No SNAs are crossed by the proposed routes or variations or occur within their ROWs. However, as discussed below, Red Lake Peatland SNA, Myrtle Lake Peatland SNA, and North Black River SNA are located within close proximity (less than 1,500 feet) to a proposed route or variation (Map 5-16). See Section 5.3.5 for additional information on SNAs.

MBS Sites of Biodiversity Significance

Several areas mapped by the MBS as Sites of Biodiversity Significance are located throughout the Central Section (Map 5-16). Mapping of Sites of Biodiversity Significance is only preliminary in Lake of the Woods, Koochiching, Beltrami, and Itasca counties. Because of this, biodiversity significance ranks, as summarized in Section 5.3.5, have not been designated in every location in the Central Section; these areas are designated "rank unknown" and primarily occur in Lake of the Woods and Koochiching counties on Map 5-16. Sites of all levels of biodiversity significance are present in the Central Section. However, for discussion purposes in Section 6.3, biodiversity significance ranks are not distinguished from one another because of the preliminary status and/or unknown ranks. All SNAs in the Central Section are also MBS Sites of Biodiversity Significance, ranked outstanding or high.

The MBS Sites of Biodiversity Significance ranked outstanding and high likely contain several native plant communities and areas designated as areas of High Conservation Value Forest; however, as mentioned above, these resources have not yet been mapped and are currently unavailable. See Section 5.3.5 for additional information on MBS Sites of Biodiversity Significance.

Ecologically Important Lowland Conifers

The MnDNR Division of Forestry manages vegetation on Wildlife and Forestry units through the Subsection Forest Resource Management Plan, which uses ECS subsections to define planning units. Within the Central Section, the MnDNR has identified several Ecologically Important Lowland Conifer stands specifically targeted for protection. These stands serve as placeholders for Lowland Conifer Old Growth forests. Management in old growth forests is prohibited and the MnDNR is responsible for treating these Ecologically Important Lowland Conifer stands as if they are old growth. The MnDNR is currently in the process of assessing Ecologically Important Lowland Conifers and designating Lowland Conifer Old Growth stands. Because final Lowland Conifer Old Growth data are not currently available, all data presented here are referred to as Ecologically Important Lowland Conifer stands, some

Table 5-30 State-endangered, Threatened, and Special Concern Species Documented within One Mile of the Proposed Routes and Variations in the Central Section

Scientific Name	Common Name	Federal Status	State Status	Type	Associated Habitat
Botrychium ascendens	Upward-lobed Moonwort	None	Endangered	Vascular Plant	Disturbance-related habitats such as old mine tailings basins in early successional forests.
Botrychium lunaria	Common Moonwort	None	Threatened	Vascular Plant	Disturbance-related habitats including drained tailings basins, gravel banks, rocky ledges, and talus. Open or sparsely vegetated habitats with grasses and scattered shrubs.
Carex sterilis	Sterile Sedge	None	Threatened	Vascular Plant	Calcareous fens.
Cypripedium arietinum	Ram's-head Lady's-slipper	None	Threatened	Vascular Plant	Coniferous swamps, bogs, or lowland forests. Drier upland pine forests.
Eleocharis rostellata	Beaked Spike-rush	None	Threatened	Vascular Plant	Calcareous fens.
Rhynchospora capillacea	Hair-like Beak-rush	None	Threatened	Vascular Plant	Calcareous fens.
Botrychium pallidum	Pale Moonwort	None	Special Concern	Vascular Plant	Disturbance-related habitats including drained tailings basins, ROWs, exposed soils in open or sparsely vegetated habitats, grassy fields with scattered shrubs.
Botrychium simplex	Least Moonwort	None	Special Concern	Vascular Plant	Disturbance-related habitats including drained tailings basins, ROWs, exposed soils in open or sparsely vegetated habitats, grassy fields with scattered shrubs, and forest edges.
Carex exilis	Coastal Sedge	None	Special Concern	Vascular Plant	Fens.
Cladium mariscoides	Twig-rush	None	Special Concern	Vascular Plant	Fen communities within bog complexes or calcareous fens.
Drosera anglica	English Sundew	None	Special Concern	Vascular Plant	Fens of open rich peatlands, primarily in water tracks in the interiors of large peatlands.
Juncus stygius var. americanus	Bog Rush	None	Special Concern	Vascular Plant	Rich and acid peatlands.
Torreyochloa pallida	Torrey's Manna-grass	None	Special Concern	Vascular Plant	Wetlands.
Asio flammeus	Short-eared Owl	None	Special Concern	Bird	Native prairie, pasture, sedge wetlands, shrub swamps, and open peatlands.
Coturnicops noveboracensis	Yellow Rail	None	Special Concern	Bird	Sedge or grass-dominated wetlands, particularly wet prairie or rich fens.
Oxyethira itascae	A Caddisfly	None	Special Concern	Insect	Larvae are found in lakes and streams; adults prefer meandering, silt-bottomed streams.
Lasmigona compressa	Creek Heelsplitter	None	Special Concern	Mussel	Creeks, small rivers, and the upstream portions of large rivers.
Ligumia recta	Black Sandshell	None	Special Concern	Mussel	Riffle and run areas of medium to large rivers.
Acipenser fulvescens	Lake Sturgeon	None	Special Concern	Fish	Large rivers and lakes.

Source: MnDNR 2014, reference (132)

of which may ultimately be designated Lowland Conifer Old Growth.

MBS Native Plant Communities

The MnDNR has mapped three calcareous fens within the Central Section (Map 5-16). Calcareous fen data is mapped as centroid points by the MnDNR and the boundaries of the fen are not delineated. Because of this nuance, the calcareous fen centroid points that are located within one mile of the proposed routes and variations in the Central Section were used to evaluate potential impacts on calcareous fens. See Section 5.3.5 for additional information on fens.

The MnDNR has established WPAs for Peatland SNAs; these WPAs are intended to provide protective buffers to protect the hydrology of peatlands and calcareous fens in particular. Section 5.4.4.1 provides additional discussion on calcareous fen hydrology.

5.4.5.4 General Impacts

Potential construction and operation-related short-term and long-term impacts on rare and unique natural resources in the Central Section are similar to those summarized for the West Section in Section Section 5.3.5. The potential impacts of the proposed routes and variations on rare and unique natural resources in the Central Section are discussed further in Section 6.3.

Section 5.4.4.1 and 6.3 (Water Resources) discuss potential hydrological impacts on calcareous fens and associated SNA WPAs.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on rare and unique natural resources. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

Potential construction impacts on rare and unique natural resources in the Central Section are similar to those summarized for the West Section in Section 5.3.5 with the exception of potential impacts on critical habitat designated for gray wolf.

Removal of forested land in the ROW during construction would result in habitat fragmentation, which could reduce the quality of critical habitat designated for gray wolf in the Central Section. The effects of fragmentation on gray wolves would generally be greatest where new corridors are created, rather than where the transmission line would parallel an existing corridor, where the forest has already been fragmented.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repairs on rare and unique natural resources in the Central Section are similar to those summarized for the West Section in Section 5.3.5.

Operation, maintenance, and emergency repairs are not likely to result in additional impacts to critical habitat designated for gray wolf beyond the impacts that would likely result from construction, as described above.

5.4.6 Corridor Sharing

This section describes corridor sharing opportunities within the Central Section and the potential impacts from the proposed Project. Corridor sharing is one of the factors the MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4200, subparts H and J). See Section 5.3.6 for more information regarding corridor sharing.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.6.1) and includes infrastructure corridors within approximately 0.25 miles of the proposed routes and variations.

5.4.6.1 Corridor Sharing in the Central Section

The corridor sharing opportunities in the Central Section are shown on Map 5-17. These opportunities are located where the ROW for the proposed routes and variations would parallel the corridor of an existing transmission line, field or section line, roadway, or other infrastructure. Where a new transmission line parallels an existing corridor, it generally reduces the amount of additional impacts land under private, corporate, state, or federal ownership. In addition, it may reduce visual impacts as described in Section 5.4.1.1.

In the Central Section, the proposed route and variations parallel corridors including existing 230 kV and 500 kV transmission lines, roads, field lines, trails, PLSS, combinations of these corridors, or no corridor. Additional details related to corridor sharing in the Central Section for the proposed Project are discussed further in Chapter 6 of this EIS.

5.4.6.2 General Impacts

As discussed in Section 5.3.6.1, corridor sharing would minimize potential impacts to the affected environment by minimizing the proliferation of new utility ROW and, where ROW sharing is possible,

reducing the overall ROW footprint of impact. Section 5.3.6.1 provides additional discussion of ROW sharing and associated approvals. See Section 5.3.7 for reliability issues associated with corridor sharing.

As discussed in Section 5.3.6.1, by following existing corridors, and reducing the need to create new transmission line corridors for the proposed Project, potential impacts to human settlements, land-based economies, and the natural environment would be minimized.

Since corridor sharing is considered to be a measure to reduce impacts on resources, no additional adverse impacts are anticipated due to corridor sharing.

Impacts from Construction

As discussed in Section 5.3.6.1 sharing or paralleling existing infrastructure would likely require coordination during construction and acquiring necessary approvals from the ROW owner (like a railroad) or the agency overseeing use of a particular ROW (like MnDOT).

Impacts from Operation, Maintenance, and Emergency Repairs

As discussed in Section 5.3.6.1, sharing or paralleling existing infrastructure may require coordination for maintenance or emergency repair and may require approvals from the ROW owner (like a railroad) or the agency overseeing use of a particular ROW.

5.4.7 Electrical System Reliability

This section describes the electrical system reliability within the Central Section and the potential impacts on those resources from the proposed Project. Electrical system reliability is one of the factors MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4200, subpart K). See Section 5.3.7 for more information regarding electrical system reliability.

NERC has established mandatory reliability standards for American utilities. In addition, the Applicant has stated their purpose and need as related to electrical reliability. For a more detailed discussion of concepts related to electrical reliability, see Section 5.3.7.

The ROI for the Central Section is the same as described for the West Section (Section 5.3.7.2) and is the corridors for the existing transmission lines.

5.4.7.1 Electrical System Reliability in the Central Section

The existing 500 kV transmission line (Riel-Forbes) and 230 kV transmission line cross the Central Section (Map 5-11). The transmission lines enter into the north-central portion of the Central Section. The proposed route and variations would parallel portions of either the 500 kV or 230 kV transmission lines in the Central Section. There would be a maximum of two transmission lines co-located in a corridor. The proposed transmission line would be adjacent to, but not within, the existing transmission line ROW. The Proposed Orange Route and variations would not cross the existing transmission lines, but the Proposed Blue Route would cross both existing transmission lines once.

There would be only two transmission lines co-located within a corridor in the Central Section. Based on information provided by the Applicant, the likelihood of an actual event severely impacting both transmission lines can be reduced by incorporating appropriate transmission line design considerations into the engineering of the proposed Project. No impacts are expected as a result of construction of the proposed Project, regardless of the route or variation considered in the West Section.

5.4.7.2 General Impacts

Construction, operation, maintenance, or emergency repairs of the proposed Project could interfere with the operation of existing transmission lines as it may be difficult to maintain the appropriate separation distance required for clearance and safety issues and are similar to the described within the West Section (Section 5.3.7.2). Mitigation in the Central Section is similar to mitigation described for the West Section and is described in Section 5.3.7.2.

Impacts from Construction

Impacts associated with construction of the proposed Project in the Central Section are similar to those described for the West Section and are described in Section 5.3.7.2. Since impacts related to electrical system reliability are not expected from construction and operation of the proposed Project for any proposed route or variation considered in the Central Section, electrical system reliability for the Central Section is not discussed further in Chapter 6 of the EIS.

Operation, Maintenance, and Emergency Repairs

Impacts associated with operation, maintenance, or emergency repairs of the proposed Project in the

Central Section are similar to those described for the West Section and are described in Section 5.3.7.2. No impacts are expected as a result of construction of the proposed Project, regardless of the route or variation considered. Since potential impacts related to electrical system reliability are not expected from the operation, maintenance, or emergency repairs of the proposed Project for any proposed route or variation considered in the Central Section, electrical system reliability in the Central Section is not discussed further in Chapter 6 of this EIS.

5.4.8 Costs of Constructing, Operating, and Maintaining the Facility which are Dependent on Design and Route

This section of the EIS summarizes the costs of constructing, operating, and maintaining the facility which are dependent on design and route of the Proposed Project. Cost evaluation is one of the factors the MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4100, subpart L). A summary of the costs associated with constructing the proposed routes and variations in the West Section is provided in Table 5-31.

The Applicant developed these cost estimates based on an estimated cost per mile for the general structure type planned for each proposed route or variation. The cost estimates have a range of plus or minus 30 percent. Since there is a lack of certainty regarding property acquisition, access costs, or segment-specific design criteria (i.e. increased return period where the proposed route or variation parallels existing corridors) these are not full construction estimates and were developed for comparative purposes only and a contingency has not been built into these numbers because it would require further engineering and analysis.

The cost for routine maintenance would depend on the topology and the type of maintenance required, but typically runs from $1,100 to $1,600 per mile annually (Minnesota Power 2013, reference (135)). Using the $1,600 per mile for operation and maintenance, the estimated cost would range from $2,000 to $176,000 annually for these alternatives in the Central Section.

5.5 Route Specific Impacts to East Section

The East Section contains seven alternatives, which are as follows: the Proposed Blue Route, the Proposed Orange, one variation in the Effie Variation Area, one variation within the East Bear Lake Variation area, one variation within the Balsam Variation Area, one variation in the Dead Man's Pond Variation Area, and one variation within the Blackberry Variation Area. Section 5.5 describes unique impacts to these alternatives.

Table 5-31 Proposed Routes and Variations in the Central Section

Variation Area	Variation Names in the EIS	Cost (Total)	Cost (per mile)	Length (mi)
Pine Island	Proposed Blue Route	$118,546,237	$1,077,693	109.8
	Proposed Orange Route	$113,672,041	$1,082,591	105.4
Beltrami South Central	Proposed Orange Route	$5,805,518	$1,038,554	1.2
	Beltrami South Central Variation	$9,925,396	$1,318,114	1.7
Beltrami South	Proposed Orange Route	$1,214,573	$995,551	5.6
	Beltrami South Variation	$3,440,123	$1,977,082	7.5
North Black River	Proposed Blue Route	$9,893,560	$1,179,209	8.4
	North Black River Variation	$9,240,164	$1,006,554	9.2
C2 Segment Option	Proposed Blue Route	$3,5769,239	$1,087,211	32.8
	C2 Segment Option Variation	$54,466,435	$1,184,053	46.0
J2 Segment Option	Proposed Orange Route	$48,706,641	$1,154,186	42.2
	J2 Segment Option Variation	$52,128,879	$1,153,294	45.2
Northome	J2 Segment Option Variation	$4,192,942	$1,121,108	3.7
	Northome Variation	$6,385,615	$1,596,404	4.0
Cutfoot	Proposed Orange Route	$5,640,538	$1,336,620	4.2
	Cutfoot Variation	$6,222,257	$1,309,949	4.8

Source: Minnesota Power 2014, reference (9)

5.5.1 Human Settlement

5.5.1.1 Aesthetics

This section describes the aesthetic, or visual, resources within the East Section and the potential impacts from the proposed Project.

Aesthetic, or visual resources, are generally defined as the natural and built features of a landscape that may be viewed by the public and contribute to the visual quality and character of an area. Aesthetic resources form the overall impression that an observer has of an area or its landscape character. Visual quality is generally defined as the visual significance or appeal of a landscape based on cultural values and the landscape's intrinsic physical elements (Smardon, R.C. et al 1988, reference (87)). Visual sensitivity refers generally to viewer interest and concern for the visual quality of the landscape and potential changes to it. Section 5.3.1.1 provides a detailed discussion of terms and concepts related to aesthetics.

The ROI for the East Section is the same as described for the West Section (see Section 5.3.1.1) which is 1,500 feet from the anticipated alignment of the transmission line and within 1,500 feet from the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations.

Visual Character of East Section

The existing landscape character provides the context for assessing the effects of changes to the landscape. Major components of landscape character that define the appearance of the landscape include landform, water, vegetation, and human or cultural modifications. The landscape character of the East Section is described below based on ecological subsections developed by the MnDNR (2015, reference (92)) in combination with observations of human or cultural modifications to the landscape. Ecological subsections are shown on Map 5-2 and described in more detail in Section 5.5.4.2.

The East Section is comprised primarily of three ecological subsections, the Littlefork-Vermillion Uplands, the St. Louis Moraines, and the Nashwauk Uplands. A fourth ecological subsection, the Tamarack Lowlands, barely protrudes into the extreme southern portion of the East Section.

The Littlefork-Vermillion Uplands ecological subsection occurs in the northern portion of the East Section. Its landform is generally flat to gently rolling. Rivers and streams are not common in this southern portion of the subsection; however, short segments of the upper reaches of the Little Fork, Big Fork, Bear, and Valley rivers, which all flow north, meander through the area. The area contains extensive wetlands and peatlands as well as scattered small ponds. Vegetation is a mosaic of prairie, brushland, woodland, and peatlands, and forests are common. Quaking aspen forests are extensive throughout the upland areas.

The St. Louis Moraines ecological subsection occurs in much of the western, central, and southern portions of the East Section. The topography in this portion of the East Section is gently rolling to rolling with dominant end moraines and many steep slopes in the southern portion of this subsection. The entire subsection is pocked with numerous ponds and lakes, as well as a few larger lakes such as Deer Lake and Larson Lake. The area contains very few streams and the south-flowing Prairie River in the south portion of the subsection is the only notable river. Much of the area is forested with aspen, pine, birch, and northern hardwoods, with aspen the most common.

The Nashwauk Uplands ecological subsection occurs in much of the eastern portion of the East Section. The topography in this portion of the East Section is mostly flat to rolling except for a high, narrow ridge, called the Giants Range, which extends diagonally across the southern portion of this subsection in a northeast to southwest direction. The subsection contains a few streams, including segments of the East and Swan rivers, and a number of small and larger lakes, including Grass, Trestle, and Big Diamond lakes. Much of the subsection is forested with aspen, pine, birch, and northern hardwoods, with aspen the most common.

The Tamarack Lowlands ecological subsection occupies a very small area in the extreme southern part of the subsection south of the proposed Project terminus. The topography in this area is flat to gently rolling and there are no notable streams or lakes in this small area. Much of the area contains sedge meadows or is forested with aspen, pine, birch, and northern hardwoods, with aspen the most common.

Much of the northern portion of the East Section is forested or covered in peatlands or wetlands and much of the southern portion is covered with wetlands, ponds, or lakes. State forests in the section include George Washington and Koochiching in the northern portion of the East Section. State parks include Scenic State Park in the west-central area and Hill-Annex Mine State Park in the southeastern portion of the East Section (Map 5-19). Numerous lakes and ponds occur throughout the section, with

the highest concentration of lakes and ponds in the western and central portions of the East Section. The largest streams in the section include the Little Fork, Big Fork, Bear, and Valley rivers in the north and the Prairie, East, and Swan rivers in the central and south. A variety of smaller tributaries to these streams and rivers meander through the section as well. Due largely to the extensive forests, wetlands, lakes, and ponds, there is very little agriculture in the East Section. Where it does occur, mostly in the southern portion of the section, agriculture is in small, scattered concentrations and consists mostly of row crops, pastures, and hay fields.

Human settlement is sparse throughout the northern portion of the East Section but is much more prevalent in the southern portion of the section where there are a number of communities. These communities tend to be associated with the Giants Range, a high, narrow ridge extending diagonally from northeast to southwest across the southern part of this area where much of the iron mining in Minnesota occurs. This area includes the communities of Cohasset, Grand Rapids, La Prairie, Coleraine, Bovey, Taconite, Marble, Calumet, and Nashwauk. Other areas of human settlement in the East Section are most often associated with recreation or forestry activities. Human settlement in the northern, sparsely populated area consists primarily of scattered rural residences and farmsteads. In the southern more populous area, human settlement is mostly concentrated in and near the towns. A number of residences throughout the section appear to be located around lakes. Transmission lines are not common in most of the East Section. One large transmission line runs through the northeastern part of the section and a number of large transmission lines run through the southern portion of the East Section and are concentrated along its south boundary and in the vicinity of the Blackberry Substation. Several tall communication towers also are scattered through the East Section (Map 5-18). Views in non-forested areas of the section can be expansive but are often limited in distance by tall stands of trees. Views in forested areas of the section tend to be enclosed and limited due to screening by the dense trees.

No state parks, state forest campgrounds, national forests, scenic byways, water trails, or national parks were found within 1,500 feet of the anticipated alignment of the proposed routes and variations in the East Section. However, residences, historic architectural sites, state trails, state forests, county parks, snowmobile trails, water access points, were identified within the ROW and/or within 1,500 feet of the anticipated alignment for one or more of the proposed routes and variations as discussed in Sections 5.2.1.1 and 6.2.

General Impacts

General impacts on existing aesthetic resources in the East Section are similar to those in the West Section and are discussed in Section 5.3.1.1. Impacts may be caused by construction and operation of the proposed Project and could include short-term and long-term impacts. Impacts on aesthetics are assessed based on the extent of changes to landscape character and scenic quality, the level of contrast introduced by the proposed Project, its proximity to viewers, and the visual sensitivity related to views of the proposed Project. For a more detailed discussion of short- and long-term aesthetic impacts of transmission line projects, please see Section 5.3.1.1. The potential impacts of the proposed route and variations on aesthetic resources in the East Section are discussed in Section 6.4. Applicant proposed measures to avoid, minimize, or mitigate impacts on aesthetic resources are summarized in Section 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions.

To further characterize the potential impacts in the East Section, photographs were taken and simulations created for the location where the proposed Orange Route is located near a Reserve with recreation facilities located along the east side of Scenic Highway near Balsam Memorial Hall in the East Section (Viewpoint 03 in Appendix N). Further discussion of the potential aesthetic impacts of the proposed Project on that aesthetic resource is discussed in Section 6.4.

Construction Impacts

Short-term aesthetic impacts could result from ROW clearing, temporary construction access roads, temporary construction areas, and vehicle and equipment operations for transmission line construction. Construction related impacts to aesthetics are discussed in Section 5.3.1.1.

Operation, Maintenance, and Emergency Repair Impacts

Long-term impacts on aesthetic resources are most likely to occur during operation of the transmission line and would occur over the life of the proposed Project. Operation, maintenance, and emergency repair impacts to aesthetics are discussed in Section 5.3.1.1.

5.5.1.2 Land Use Compatibility

This section describes existing land uses and applicable land use policies and zoning within the East Section of the proposed Project and the potential impacts to that resource from the proposed Project. Land use categories and the ROI were similarly identified for the East Section as for the West and Central sections and discussed in Section 5.3.1.2.

The ROI for the East Section is the same as described for the West Section (Section 5.3.1.2) which is 1,500 feet from the anticipated alignment of the transmission line and within 1,500 feet from the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations.

Land Use Compatibility in the East Section

The East Section is located in Koochiching and Itasca counties in areas that are primarily rural, but near to several population centers and areas with lake homes. The proposed Project would pass through the city of Taconite and near the adjacent cites of Grand Rapids, Colerain, Bovey, Marble, Calumet, and Nashwauk. The land uses in the northern half of the East Section largely state forests and state fee land including Koochiching State Forest and the George Washington State Forest. Land cover in the state forests is predominately forested and wetlands. Some agriculture and developed land is located in the northwest corner of the East Section near the border of Koochiching County. South of the state forests and fee lands, undeveloped forest and wetlands continues are predominate land uses. Agriculture and developed land is sparsely scattered though this area. The southern portion of the East Section is predominantly undeveloped forest land but includes some agriculture and significant urban and developed land concentrated in the incorporated cities. A large number of medium and small-sized lakes are scattered throughout the East Section. A number of airstrips and airports are also located throughout the section, as described in Section 5.2.1.6. The various land uses present along the proposed routes and variations are shown in Map 5-19.

The proposed routes and variations would be located primarily in rural communities and would only pass through one incorporated city (Taconite). Relevant elements of county and city comprehensive plans and ordinances are described below. As discussed, Minnesota Statues indicate that a MN PUC Route Permit would supersede all local zoning, building, or land use regulations; including local, county and regional (Minnesota Statutes, section 216E.03).

The **Koochiching County Development Ordinance** and the **Itasca County Zoning Ordinance**, as described in Section 5.4.1.2, are also applicable to the East Section of the proposed Project.

The **Taconite Comprehensive Plan** does not include any direct policies regarding transmission lines. The plan identifies one and two family Residential as the primary land use in the city; though much of the land along the proposed Project is vacant or undeveloped. The Project would pass through land zoned as Farm Residential and Heavy Industrial (Arrowhead Regional Planning Division 2007, reference (143)). Zoning code for the city was not available, but based on zoning codes for similar communities; it is assumed that these zoning designations would not preclude the construction of a transmission line. The city of Taconite is currently in the process of updating their comprehensive plan.

The **Minnesota Forest Resource Strategies** as discussed previously in Section 5.3.1.2, are also applicable to the East Section of the proposed Project.

General Impacts

Construction, operation, maintenance, and emergency repairs of the proposed Project in the East Section would result in similar impacts as are expected and described for the West Section in Section 5.3.1.2.

Section 6.4 summarizes the potential impacts of the proposed routes and variations on land use in the East Section. Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on land use. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Construction Impacts

Construction of the proposed Project in the East Section would result in similar impacts as are expected and described for the West Section in Section 5.3.1.2.

Operation, Maintenance, and Emergency Repair Impacts

Operation, maintenance, and emergency repairs of the proposed Project would result in long-term impacts on land use within the East Section, similar to those described for the West Section in Section 5.3.1.2.

5.5.1.3 Cultural Values

This section describes the cultural values within the East Section and the potential impacts to cultural values from the proposed Project.

Cultural values are shared beliefs or attitudes that define what is acceptable or unacceptable, important or unimportant, right or wrong, workable or unworkable and provide a framework for unity and sense of identity for a community, region, or people. Section 5.3.1.3 provides a more detailed discussion of cultural values.

The ROI for the East Section is the same as described for the West Section (Section 5.3.1.3) which includes Itasca, Koochiching, and St. Louis counties crossed by the proposed routes and variations.

5.5.1.3.1 Cultural Values in the East Section

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

From north to south, the East Section transitions from the "Emptying Nest" type community of Koochiching County (Section 5.4.1.3) to a "Service Worker" type community in Itasca County. "Service Worker" counties are characterized by midsize and small towns with economies fueled by hotels, stores, and restaurants and with lower-than-average median household income by county (Chinni and Gimpel 2010, reference (100)). Themes mentioned on the websites of regional cities and business communities stress hard work, optimism, and appreciation of the natural world. The major values within the region include pragmatism, appreciation, and use of natural resources, individualism, political and social conservatism, community pride, and economic well-being. The majority of public comments provided during the EIS scoping meetings in the East Section raised concerns primarily related to possible visual and environmental impacts, implying cultural values of visual aesthetics of the landscape and sustained environmental conditions. In addition, commenters identified the importance of avoiding impacts to homes and the communities in Balsam and Lawrence townships and agricultural activities associated with wild rice cultivation, an indication of the value placed on preservation of the agricultural activities unique to this region (DOE and DOC-EERA 2014, reference (102)).

Euro-American cultural values unique to the East Section are largely tied to the transition to more populated areas with many lakes and cabins and to the area of the Mesabi Iron Range.

Tribal Values in the East Section

Tribal cultural values are similar to those described in Section 5.4.1.3 and include preserving the natural environment, retaining traditional cultural gathering, hunting and fishing rights, and preserving their independence.

General Impacts

General impacts to cultural values are detailed in Section 5.3.1.3. In the East Section, the communities in Balsam and Lawrence tend to strongly value the aesthetics of their communities as well the small town, rural atmosphere, which may be linked to an absence of major infrastructure, including vertical intrusions from transmission infrastructure within the viewshed of these areas. Citizens and local government officials have expressed concern that the Proposed Orange Route would fundamentally undermine the values of these communities (DOE and DOC-EERA 2014, reference (102)).

Many of the communities at the southern end of the Eastern Section grew out of the iron and taconite mining industry on the Mesabi Iron Range. The Iron Range is characterized by a more industrial, blue collar population whose political culture and value for social and cultural organizations were significantly shaped by the struggles of immigrant workers in the mines during the late 1800s and early 1900s. Impacts to the mining industry are unlikely to affect these long-established values. Potential for impacts to mining and mineral resources from the proposed Project are discussed further in Sections 5.3.2.3 and 6.4.

Impacts to cultural values can be minimized primarily through corridor sharing with existing transmission infrastructure. Where existing infrastructure is present, impacts to the values addressed in Section 5.5.1.3 are likely to be marginal.

Although some permanent impacts to cultural values may be felt on a local basis, particularly where transmission lines run close to communities with values that are at odds with the presence of new, large infrastructure projects, at a county-wide or regional level no conflict with cultural values is are anticipated. Since potential impacts related to cultural values at the community or regional scale from the proposed Project are not expected for any route and variation considered, cultural values are

not analyzed or discussed further in Chapter 6 of this EIS.

Construction Impacts

General impacts to cultural values from the proposed Project are discussed above. The construction phase of the proposed Project is not expected to result in any unique impacts to cultural values held by Euro-Americans or American Indian tribes.

Operation, Maintenance, and Emergency Repair

General impacts to cultural values from the proposed Project are discussed above. Operation, maintenance, and emergency repair are not expected to result in any unique impacts to cultural values held by Euro-American or American Indian tribes.

5.5.2 Land-Based Economies

Constructing and operating the proposed Project could potentially affect land-based economies in the proposed Project area. Transmission lines and associated structures are a physical, long-term presence on the landscape, which could prevent or otherwise limit use of the land for other purposes. When placed in an agricultural field, transmission line structures have a relatively small footprint, yet they could potentially interfere with farming operations. In addition, tall trees are not allowed in transmission line ROWs, a restriction that could affect forestry operations along the ROW, and transmission line structures could affect access to mineral resources.

5.5.2.1 Agriculture

This section describes the agricultural resources within the East Section and the potential impacts on those resources from construction and operation of the proposed Project. The definition and regulations for agriculture are described in Section 5.3.2.1. The ROI for the East Section is the same as described for the West Section (Section 5.3.2.1) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations.

Agriculture in the East Section

Agriculture is one of the land-based economic resources in the East Section. In 2010, cash receipts for agricultural operations were approximately $7 million in Koochiching County, and $10 million in Itasca County (MDA 2012, reference (104)). Principal crops in Koochiching County and Itasca counties include corn and oats (USDA 2012, reference (106)). Farmers in the East Section raise livestock, including pigs, broiler or other meat-type chickens, cattle, and sheep (USDA 2012, reference (106)). The following sections describe potential route-specific impacts to farmland, organic farms, livestock, aerial spraying, irrigation systems and precision farming practices.

Potential impacts related to prime farmland, prime farmland if drained, and farmland of statewide importance from the proposed Project are discussed further in Chapter 6 of this EIS. Mitigation strategies for potential impacts to these types of farmlands are similar to those described below for all agricultural lands.

Farmland

Agricultural land in the East Section includes lands designated as prime farmland, prime farmland if drained, and farmland of statewide importance. The FPPA defines prime farmland as "land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides and labor" (CFR, title 7, section 657.5 (a) (1)). Farmland of statewide importance includes other land that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops.

Potential impacts to prime farmland, prime farmland if drained, and farmland of statewide importance from the proposed Project are discussed in Chapter 6 of this EIS. Mitigation strategies for potential impacts to these types of farmlands are similar to those described below for all agricultural lands.

Organic Farms

As noted in Section 5.3.2.1, since potential impacts related to organic farms are expected to occur if special special construction and maintenance procedures are followed and do not vary by proposed route or variation considered, organic farms are not discussed further in Chapter 6 of this EIS.

Livestock

Hog, poultry, cattle, and sheep farms are located in the East Section. Livestock operations could be temporarily affected during construction of the proposed Project. Construction activities could temporarily disrupt livestock access to pasture lands and disturb livestock with construction noise. In addition, poultry could be sensitive to disease

caused by pathogens introduced by offsite soils. Measures to minimize impacts to livestock during construction could include erecting temporary fences, temporarily relocating livestock from construction areas, restoring vegetative cover using landowner-approved seed mixes suitable for livestock grazing, and washing equipment prior to entering poultry farms.

Though no stray voltage impacts are anticipated as a result of the proposed Project, stray voltage could be of concern to livestock farmers, particularly on dairy farms, due to its potential impacts to milk production and quality. Stray voltage is discussed further in Section 5.2.2.3. Induced voltage also may be of concern to livestock farmers, for farms with buildings near a transmission line that would require grounding of the metal components of the building. No impacts due to induced voltage are anticipated from the proposed Project if effective grounding is implemented. Induced voltage is discussed further in Section 5.2.2.4. Since potential impacts related to livestock are expected to be limited and do not vary by proposed route or variation considered, livestock are not discussed further in Chapter 6 of this EIS.

Aerial Spraying

Transmission line structures could potentially affect the coverage and effectiveness of aerial spraying. Structures could limit the ability of aerial applicators to reach specific areas of fields, by limiting those areas where applicators could safely fly. Adverse effects on aerial spraying and to crops could be mitigated by aligning the proposed Project in a configuration that is consistent with current aerial spraying patterns or by using land-based herbicides or pesticides in the areas near the transmission line. Since potential impacts related to aerial spraying are expected to be limited and do not vary by proposed route or variation considered, aerial spraying is not discussed further in Chapter 6 of this EIS.

Irrigation Systems

Transmission line structures in agricultural fields could potentially impede the use of irrigation systems, either by necessitating reconfiguration of an irrigation system to accommodate structures or by reducing crop revenue because all or a portion of a field could not be irrigated. No known center-pivot or other irrigation systems have been identified in the East Section; therefore, impacts to irrigation systems are not anticipated and mitigation would not be required. If an irrigation system is encountered during construction of the proposed Project, procedures specified in the AIMP would be implemented to minimize disruption of the system. Further discussion of the AIMP can be found in Section 2.13. These Applicant proposed measures are potential MN PUC Route Permit conditions. Since potential impacts related to irrigation systems are not expected from the proposed Project and do not vary by proposed route or variation considered, irrigation systems are not discussed further in Chapter 6 of this EIS.

5.5.2.1.1.6 Precision Farming Systems

Precision farming involves the use of GPS and, more recently, RTK GPS in farm machinery, allowing the machinery to be directed more accurately and maximize a farm's efficiency. Transmission lines have the potential to interfere with RTK and standard GPS used for precision farming. Further discussion on interference can be located in Section 5.2.1.5. If interference with electronic devices, including precision farming systems, does occur and is caused by the presence or operation of the transmission line, Route Permits issued by the Commission require permittees to take those actions which are feasible to restore electronic reception to pre-project quality (Appendix B). Since potential impacts related to precision farming systems are expected to be limited and do not vary by proposed route or variation considered, precision farming systems are not discussed further in Chapter 6 of this EIS.

General Impacts

Potential impacts to agriculture associated with projects of this nature could be either short-term or long-term and are discussed generally below. Chapter 6 of this EIS assesses impacts on agriculture using USDA NRCS, SSURGO Farmland Classification mapping to identify areas of prime farmland, prime farmland if drained, and farmland of statewide importance within the ROW.

Agricultural land uses would continue to be allowed in the ROW, but the presence of transmission structures may prevent some farm equipment from accessing land. Impacts to agricultural operations could be mitigated by prudent routing (i.e., by selecting routes that avoid agricultural fields by following existing infrastructure ROWs, field lines and property lines). Where structures are placed in fields, impacts could be mitigated by not placing structures diagonally across fields, but rather parallel to existing field lines or spanning fields if diagonal crossings are necessary.

Impacts to agricultural lands could also be minimized by limiting the removal of crops to only that necessary for construction and on-going safe operation of the line. Additionally, the Applicant, in collaboration with the MDA would prepare an

AIMP for the proposed Project. The AIMP identifies measures that the Applicant would take to avoid, mitigate, or provide compensation for agricultural impacts that could result from constructing and operating the project. The AIMP specifies procedures for repairing damaged drain tile, alleviating compaction, and removing construction debris. Compliance with the AIMP is not a permit condition in the MN PUC's generic route permit template, but has been included as a permit condition for other high voltage transmission line projects (Appendix B). Further discussion on the AIMP can be found in Section 2.13.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. These activities could limit the use of fields or could affect crops and soil by compaction soil, generating dust, damaging crops or drain tile or causing erosion. Project construction activities would typically be limited to the transmission line ROW. Short-term impacts in agricultural lands are estimated as 0.92 acres per structure location.

Construction activities would cause long-term impacts to agriculture by the physical presence of transmission line structures and associated facilities in crop, pasture, or other agricultural lands. For the transmission line itself, the footprint of the structure proposed for the project is 33 square feet. The impact of such structures, however, could be greater than their footprint since they could impede the use of farm equipment and irrigation systems and interfere with aerial spraying. These physical impacts could result in lost farming income or decreased property values (Section 5.2.1.4). In addition, stray voltage could affect livestock if not properly mitigated (Section 5.2.2.3).

Impacts from Operations, Maintenance, and Emergency Repairs

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation that would not interfere with the transmission line. Maintenance and emergency repair activities could result in direct impacts on farmlands from the removal of crops, localized physical disturbance, and compaction caused by equipment. Maintenance and emergency repair-related impacts on farmland would be short-term and more localized than construction-related impacts.

5.5.2.2 Forestry

This section describes the forestry resources within the East Section and the potential impacts on those resources from construction and operation of the proposed Project.

Forestry resources are defined as forest lands and their associated harvestable products, including but not limited to, trees, saplings, seedlings, logs, brush, and slashing.

For the purposes of this analysis, the ROI for forestry resources is defined as 100 feet on each side of the transmission line alignment. This ROI was selected based on an expectation that, given the construction activities proposed, the majority of impacts on forestry would likely occur within this area.

Forestry in the East Section

The East Section includes predominantly forested lands. State-owned forest lands, including the Koochiching, George Washington, and Bowstring state forests, are managed by the MnDNR. The MnDNR Forestry Timber Sales Program manages timber harvesting on state-owned forest lands, which provides a source of funding for public services in Minnesota. Itasca and Koochiching counties are among Minnesota's top five timber harvest counties, with Itasca County producing more than 300,000 cords annually and Koochiching County producing more than 200,000 cords annually (MnDNR 2011), reference (100). The East Section also includes other forested areas with private or corporate ownership.

The ROI for the East Section is the same as described for the West Section (Section 5.3.2.2) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations.

General Impacts

Potential impacts to forestry resources associated with projects of this nature could be either short-term or long-term. The EIS assesses impacts on forestry resources using MnDNR Division of Forestry, State Forest Boundaries and USFWS Interest mapping to identify areas of state forests and USFS national forest lands within the ROW.

Impacts to timber harvesting operations could be mitigated by prudent routing (i.e., by selecting routes that avoid forest lands by following existing infrastructure ROWs, access road ROWs, and property lines). ROW maintenance could be

managed to reduce impacts on forestry resources. For example, leaving small fruiting trees and shrubs and using mechanical versus chemical vegetation management could help mitigate the loss of forestry resources. In addition, increasing the time between line maintenance in forested areas could result in harvestable products. Finally, elevated spanning, in areas with high elevations, could reduce forest clearing.

Due to the possibility of permanent tree removal in forest lands, potentially significant impacts to forestry resources are expected as a result of construction and operation of the proposed Project, depending on the route or variation considered. Adverse, long-term, and regional impacts to forestry resources are expected and are considered significant by the MnDNR; however, the estimated loss in public revenue from timber harvesting is unknown. Potential impacts related to forestry from the proposed Project are discussed further in Chapter 6 of this EIS.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. Construction activities could limit timber harvesting efforts, affect timber stands and soil by compaction, damage trees, or cause erosion. Project construction activities would typically be limited to the transmission line ROW. As mentioned above, short-term impacts are estimated as 0.92 acres per structure location. Long-term impacts to forestry resources are caused by the clearing of trees and physical presence of transmission line structures and associated facilities in forest lands. As mentioned above, for the transmission line itself, the footprint of the structure proposed for the project is 33 square feet.

Impacts from Operations, Maintenance, and Emergency Repairs

The Applicant would routinely clear woody vegetation from the transmission line ROW in order to maintain low-stature vegetation that would not interfere with the transmission line. Maintenance and emergency repair activities could result in direct impacts on forest lands from the removal of vegetation, localized physical disturbance, and compaction caused by equipment. Maintenance and emergency repair-related impacts on forestry resources would be short-term and more localized than construction-related impacts.

Mining and Mineral Resources

This section describes mining and mineral resources within the East Section and the potential impacts from the proposed Project as required by MN PUC decision making for the Route Permit.

Mining and mineral resources are defined as areas with a concentration or occurrence of natural, solid, inorganic, or fossilized organic material in such form, quantity, grade, and quality that it has reasonable prospects for commercial extraction. The ROI for the East Section is the same as described for the West Section (Section 5.3.2.3) and includes the anticipated 200-foot ROW of the transmission line and the permanent footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations.

Mining and Mineral Resources in the East Section

Mining contributes more than 15 percent of the economy's total output in this region (Tuck, 2014, reference (141)). There are state mining leases identified in the East Section. Several active and abandoned metallic mineral, iron ore, and taconite mining sites are found along the proposed routes and variations in the East Section. These sites include expired/terminated and active leases for the mining of iron ore and metallic minerals, and to a lesser extent taconite. Potential impacts related to mining and mineral resources from the proposed Project are discussed further in Chapter 6 of this EIS.

In the northwestern portion of the East Section, the Proposed Blue Route diverges from the existing co-located 230 kV and 500 kV transmission lines and transects an area of recent and historic metallic mineral occurrence, leasing, and exploration (Map 5-19). The Effie Variation also crosses areas of mineral occurrence, but follows these co-located 230 kV and 500 kV transmission lines. The proposed routes and variations in the East Section cross active state metallic mineral leases in zones having high potential for metallic mineral resources. A volcanic belt with known metallic mineral occurrences (gold, copper-zinc-lead, iron) is located in the vicinity of Effie and in an area extending approximately 25 miles southeast of Effie. This zone of high mineral potential extends southwest into the Chippewa National Forest and northeast into the Lake Vermilion area. The MnDNR provided comments during the scoping process with concerns regarding the proposed routes and variations that cross these mineral resources as described in Section 5.4.2.3.

The Mesabi Iron Range is located in the southern portion of the East Section. It is an area of known iron resources, along a trend of enriched iron formation which has been developed into economic resources in various locations along the Mesabi Iron Range. While mineral resources are identified in the area (Map 5-19), the MnDNR has stated that the proposed routes do not encumber known state mineral resources (MnDNR 2014, reference (110)).

In the East Section, there are no aggregate sources located within 100 feet from proposed routes and variations; however, there are several sources located within 1,500 feet (Map 5-18). The MnDNR has identified their concern regarding the potential encumbrance of state-owned surface estate mineral resources (peat, sand and gravel aggregate, crushed stone, clay, etc.), which is described in Section 5.3.2.3.

General Impacts

Potential impacts to mining and mineral resources associated with projects of this nature could be either short-term or long-term. The EIS assesses impacts on mining and mineral resources using the MNDNR Division of Lands and Minerals, All State Mineral Leases (2014) mapping to identify areas with mineral leases within the ROW.

Impacts can be mitigated by prudent routing and structure placement and placement of the alignment within the route to avoid any planned mineral mining sites. Potential impacts related to mining and mineral resources are discussed further in Chapter 6 of this EIS.

Impacts from Construction

Short-term impacts are caused by construction activities and are limited to the duration of construction. The construction of transmission lines could affect future mining operations if the structures interfere with access to mineable resources or the ability to remove mineral resources. If there are potentially recoverable mineral reserves in the East Section, construction of the proposed Project could limit the ability to successfully mine these reserves, depending on the route variation and the location of any mineable reserves.

Impacts from Operations, Maintenance, and Emergency Repairs

Maintenance and emergency repair activities would have minimal to no impact on mining and mineral resources from localized physical disturbance caused by the use of maintenance equipment.

Impacts to Future Mining Activity

At a July 15, 2014 tribal consultation meeting at the Seven Clans Red Lake Casino on Red Lake Reservation in Minnesota, the Tribal Historic Preservation Officer of the Bad River Band of Lake Superior Tribe of Chippewa Indians, Wisconsin asked whether the proposed Project is primarily needed to meet increased electricity demand from new or expanded taconite mines in northern Minnesota (located in the East Section) and northern Wisconsin. The underlying concern was that, by enabling more taconite or other mining in the area, the proposed Project could indirectly contribute to cumulative, indirect deleterious impacts on water quality and other regional resources often utilized in mining processes.

Based on the Applicant's testimony at the MN PUC Certificate of Need proceeding, the proposed Project is needed in part to meet increased industrial and mining electricity demand. For example, the Applicant's analyst stated that the proposed Project "will strengthen the transmission system in an area poised for significant economic growth, with attendant electric load growth. The bulk of this load growth is associated with planned mining and industrial expansion on the Iron Range."[78] The proposed Project would also facilitate recent contracts for firm power sales from Manitoba-Hydro to the Wisconsin Public Service Corporation. However, while some of the electricity needed for mining projects in Wisconsin may be supplied by the proposed Project, the proposed Project is not a dedicated project to service increased mining activity.

As summarized in Chapter 3 (No Action alternative), however, if the proposed Project is not constructed, the projected increased industrial demand in the Applicant's service area would still have to be met by other generation sources. Any increased electricity demand in Minnesota would likely be met from many other potential generation sources, including new base-load natural gas generation. In general, the air emissions associated with natural gas turbines would be greater than from importing hydroelectric power through the proposed Project. As to Wisconsin, is not possible to directly connect Wisconsin Public Service electricity contracts with Manitoba Hydro to any particular future mining project in Wisconsin or its potential impacts.

78 Available at: https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=showPoup&documentId={BDF0C5DC-FE91-4CB7-B725-F3C4E8175F49} p. 23.

5.5.3 Archaeology and Historic Architectural Resources

This section describes the setting for archaeological, historic architectural, and Native American resources, collectively referred to as cultural resources, within the East Section and the potential impacts from the proposed Project.

5.5.3.1 Archaeology and Historic Architectural Resources Regulations

A summary of the applicable regulatory requirements and Executive Orders relevant to cultural resources and historic properties are provided in Section 5.3.3.

The ROI for the East Section is the same as described for the West Section (see Section 5.3.3) and includes the direct APE which is the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1 (the proposed Blackberry 500 kV Substation, 500 kV series compensation station, regeneration stations, permanent and temporary access roads, temporary laydown areas, temporary stringing areas, and temporary fly-in sites). It also includes the indirect APE, which includes the direct APE plus a one mile radius on each side of the anticipated alignment of the proposed transmission line or the center of the footprint of the other elements of the proposed Project.

5.5.3.2 Cultural Resources in the East Section

The East Section is comprised primarily of three ecological subsections, the Littlefork-Vermillion Uplands, the St. Louis Moraines, and the Nashwauk Uplands. A fourth ecological subsection, the Tamarack Lowlands, barely protrudes into the extreme southern part of the East Section. The ecological subsections for the East Section are shown on Map 5-2 and are described in more detail in Section 5.5.4.2 and Section 5.5.1.1.

The East Section is composed of two archaeological regions, the Central Lakes Coniferous North and Central Lakes Coniferous Central, which are sub-regions of the greater Central Lakes Coniferous Archaeological Region, as described in Section 5.4.3.2. Prehistoric period settlement patterns and site distribution patterns in the Central Lakes Coniferous North and Central Lakes Coniferous Central sub-regions of the East Section are similar to those described for the Section 5.4.3.2. Additional details from the Paleoindian, Archaic, and Woodland periods is presented in Section 5.3.3.

Historic period archaeological sites and historic architectural or built resources in both the Central Lakes Coniferous North and Central Lakes Coniferous Central archaeological regions are expected to be distributed in the same pattern as was described for the West Section in Section 5.3.3.

Archaeological and historic architectural resources data are shown on Map 5-20 by the number of records found by inventory type (archaeological sites and historic buildings and structures). Detailed data is provided in Appendix P. A more detailed description of the cultural resources present and the impacts within the East Section are provided in Section 6.4.

5.5.3.3 General Impacts

Impacts to archaeological and historic architectural sites could result from the proposed Project both directly and indirectly and are similar to those discussed for the West Section 5.3.3.

Section 6.4 summarizes the potential impacts of the proposed routes and variations on archaeological and historic architectural resources in the East Section, including those resources that are historic properties. As stated above, DOE is consulting with federally-recognized Indian tribes to identify Native American resources and historic properties. Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on archaeological and historic architectural resources. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Construction Impacts

Construction impacts to archaeological sites and historic architectural or built resources in the East Section could result from ROW clearing, temporary construction access roads, temporary construction areas, and vehicle and equipment operations for transmission line construction. A full description of the construction related impacts to archaeological sites and historic architectural or built resources are described in Section 5.3.3. Measures to avoid, minimize and mitigate construction impacts on cultural resources and adverse effects on historic architectural properties are the same as those identified in Section 5.3.3.

Operation, Maintenance, and Emergency Repair Impacts

Impacts to archaeological sites and historic architectural or built resources in the East Section could also result from operation, maintenance, and emergency repairs and would be similar to those described in Section 5.3.3. Measures to avoid, minimize, and mitigate operation, maintenance, and emergency repair impacts on cultural resources and adverse effects on historic architectural properties are the same as those identified in Section 5.3.3.

5.5.4 Natural Environment

This section describes water resources, vegetation, and wildlife, which are present within the East Section and the potential impacts on those resources from construction and operation of the proposed Project.

5.5.4.1 Water Resources

This section describes water resources, including rivers and streams (i.e. watercourses), lakes and ponds (i.e. waterbodies), wetlands, floodplains, and groundwater resources, that occur in the East Section, as shown on Map 5-21, and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning water resources can be found in Section 5.3.4.1.

The ROI for the East Section is the same as described for the West Section (Section 5.3.4.1) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations.

Watercourses and Waterbodies in the East Section

The East Section is located in the Rainy River and Mississippi Headwaters regional watersheds, which are separated by the Laurentian Divide. As such, watercourses on the Rainy River side of the divide flow north and watercourses on the Mississippi Headwaters side of the divide flow to the south. Major watersheds include the Big Fork River, Little Fork River, Prairie-Willow River, and Mississippi Headwaters. Several rivers, streams, and creeks (collectively referred to as watercourses) and drainage ditches traverse the area, including MnDNR PWI watercourses and waterbodies. Watercourses are relatively sparse in the East Section compared to the West and Central sections and their flow paths are generally restricted by the variable topography in the section. Major watercourses include the Bear River, Big Fork River, Little Fork River, Prairie River, Swan River, Valley River, Clearwater Creek, and Day Brook. Due to areas of lower elevation, there are more named waterbodies in the East Section than in the West and Central sections.

The MPCA monitors and assesses Minnesota waters to determine if they meet water quality standards for designated uses. Waters that do not meet their designated uses due to water quality standard exceedances are listed as impaired waters. Table 5-32 lists the impaired waters found in the East Section and summarizes the impairments (stressors) and affected designated uses for each of these impaired waters.

Designated trout streams and lakes in the East Section include the Valley River, Venning Creek, tributaries to the Bear River, Bee Cee Lake, Erskine Lake, Larson Lake, Lucky Lake, Moonshine Lake, Nickel Lake, and the Tioga Mine Pit Lake.

Floodplains in the East Section

Due to the topographic variability, floodplains in the East Section tend to be narrower than in the West or Central sections. FEMA has designated Zone A floodplains along the Big Fork River, Prairie River, and Swan River.

Wetlands in the East Section

Extensive peatlands and large wetland complexes are generally absent in the East Section, though small areas of the Myrtle Lake Peatlands and the Koochiching Peatlands can be found along the northern border of the East Section. As a result of the variable terrain, the East Section has a poorly developed drainage network and small- to medium-sized wetlands are abundant throughout it. The following wetland types are present throughout the East Section: palustrine emergent wetland (PEM), palustrine shrub wetland (PSS), palustrine forested wetland (PFO), and palustrine unconsolidated bottom pond (PUB). No calcareous fens have been identified in the East Section.

General Impacts

Potential construction and operational impacts on water resources that may be caused by construction and operation of the proposed Project are similar to those summarized for the West Section in Section 5.3.4.1.

Table 5-32 Summary of Impaired Waters in the East Section

Watercourse/Waterbody	Impairment (Stressor)	Affected Designated Use
Big Fork River	Mercury in fish tissue	Aquatic consumption
Little Fork River	Mercury in fish tissue, turbidity	Aquatic consumption, aquatic life
Mississippi River	Mercury in fish tissue	Aquatic consumption
Swan River	Mercury in fish tissue	Aquatic consumption
Gale Brook	Aquatic macroinvertebrate bioassessments	Aquatic life
Balsam Lake	Mercury in fish tissue	Aquatic consumption
Bass Lake	Mercury in fish tissue	Aquatic consumption
Blandin Lake	Mercury in fish tissue	Aquatic consumption
Buck Lake	Mercury in fish tissue	Aquatic consumption
Crooked Lake	Mercury in fish tissue	Aquatic consumption
Cutaway Lake	Mercury in fish tissue	Aquatic consumption
Deer Lake	Mercury in fish tissue	Aquatic consumption
Forsythe Lake	Mercury in fish tissue	Aquatic consumption
Little Bass Lake	Mercury in fish tissue	Aquatic consumption
Lawrence Lake	Mercury in fish tissue	Aquatic consumption
Prairie Lake	Mercury in fish tissue, nutrient/ eutrophication biological indicators	Aquatic consumption, aquatic recreation
Little Bear Lake	Mercury in fish tissue	Aquatic consumption
O'Brien Lake	Mercury in fish tissue	Aquatic consumption
Ox Hide Lake	Mercury in fish tissue	Aquatic consumption
Panasa Lake (Lower)	Mercury in fish tissue	Aquatic consumption
Panasa Lake (Upper)	Mercury in fish tissue	Aquatic consumption
Plantation Lake	Mercury in fish tissue	Aquatic consumption
Pokegama Lake	Mercury in fish tissue	Aquatic consumption
Swan Lake (Main)	Mercury in fish tissue	Aquatic consumption
Swan Lake (West Bay)	Mercury in fish tissue	Aquatic consumption
Ruby Lake	Mercury in fish tissue	Aquatic consumption
Snowball Lake	Mercury in fish tissue	Aquatic consumption
Thistledew Lake	Mercury in fish tissue	Aquatic consumption
Trout Lake	Mercury in fish tissue	Aquatic consumption
Wabana Lake	Mercury in fish tissue	Aquatic consumption
Wolf Lake	Mercury in fish tissue	Aquatic consumption

Source: MPCA 2014, reference (118); MPCA 2014, reference (119)

The potential impacts of the proposed routes and variations on water resources in the East Section are discussed in Section 6.4.

Impacts from Construction

Potential construction impacts on water resources are similar to those summarized for the West Section in Section 5.3.4.1.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repairs on water resources are similar to those summarized for the West Section in Section 5.3.4.1.

5.5.4.2 Vegetation

This section describes the vegetation resources within the East Section and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning vegetation resources can be found in Section 5.3.4.2.

The ROI for the East Section is the same as described for the West Section (Section 5.3.4.2) and includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations.

Vegetation in the East Section

According to the ECS, the East Section is primarily located in three subsections of the Laurentian Mixed Forest Province (MnDNR 2015, reference (92)). The Littlefork-Vermillion Uplands subsection, which is in the Northern Minnesota and Ontario Peatlands section, is located across the northern portion of the East Section (Map 5-2). The St. Louis Moraines subsection, which is in the Northern Minnesota Drift and Lake Plains section, covers the majority of the East Section (Map 5-2). The Nashwauk Uplands subsection, which is in Northern Superior Uplands section, covers the eastern portion of the East Section (Map 5-2). In addition, small portions of the Chippewa Plains and Tamarack Lowlands subsections, both of which are in the Northern Minnesota Drift and Lake Plains section, are present in the west and south of the East Section, respectively (Map 5-2). However, because neither of these subsections is crossed by a proposed route or variation, they are not discussed here.

The Littlefork-Vermillion Uplands subsection is a transition zone between the vast peatlands to the west and the shallow bedrock controlled, clayey soils to the east. This subsection contains a rich variety of vegetation types, much of it occupied by aspen-birch forest trending toward white pine, white spruce, and balsam fir. The eastern portion of the subsection is dominated by white pine, red pine, and jack pine dominated forest. Poor and rich fens, black spruce bog, and cedar-black ash swamp are typical in lowlands (MnDNR 2015, reference (92)).

The St. Louis Moraines subsection is dominated by steep slopes on end moraine settings. White and red pine forests historically dominated the northern portions of the subsection, whereas northern hardwood and aspen forest dominated moraines to the south. Mixed deciduous and coniferous forests were common on moraines. Quaking aspen is currently the most dominant tree species in the subsection (MnDNR 2015, reference (92)).

The Nashwauk Uplands subsection is dominated by Giant's Ridge, a narrow 200- to 400-foot-high bedrock feature extending northeast to southwest through the subsection. Glacial outwash plains, rolling till plains, and moraines of the Rainy Lobe glacier are the predominant landforms. Quaking aspen is currently the most dominant tree species in the subsection (MnDNR 2015, reference (92)).

Based on USGS GAP data, the variation areas in the East Section are primarily comprised of upland forests and lowland swamps. Additional land cover types present in the East Section include herbaceous agricultural, open water, developed/urban land, and disturbed or modified land (Map 5-19; Appendix E).

Several state Forests are present in the East Section, including the Koochiching State Forest in the northern portion of the East Section, the George Washington State Forest in the central portion of the East Section, and a small part of the Bowstring State Forest in the western portion of the East Section (Map 5-19). The Chippewa National Forest is also located in the western part of the East Section; however none of the proposed routes or variations would come within a mile of it (Map 5-19). In addition, sensitive ecological resources, such as WMAs, Important Bird Areas, and MBS Sites of Biodiversity Significance (see Sections 5.5.4.3 and 5.5.5) are located within or adjacent to variation areas in the East Section.

General Impacts

Potential construction and operation-related short-term and long-term impacts on existing vegetation in the East Section are similar to those summarized for the West Section in Section 5.3.4.2.

Section 6.4 summarizes the potential impacts of the proposed routes and variations on vegetation in the East Section.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on vegetation. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

Potential construction impacts on existing vegetation in the East Section are similar to those summarized for the West Section in Section 5.3.4.2).

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repairs on existing vegetation in the East Section are similar to those summarized for the West Section in Section 5.3.4.2.

5.5.4.3 Wildlife

This section describes the wildlife resources that occur within the East Section and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning wildlife resources can be found in Section 5.3.4.3.

The ROI for the East Section is the same as described for the West Section (Section 5.3.4.3) and includes the anticipated 200-foot ROW and the footprint of the other elements of the proposed Project, including the proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations.

Wildlife in the East Section

The landscape types and vegetation communities throughout the East Section of the proposed Project provide forage, shelter, nesting, overwintering, and stopover habitat for a wide range of resident and migratory wildlife species. Habitat types in the East Section primarily consist of various forested communities.

As discussed in Section 5.5.4.2, the East Section is located within three ECS subsections classified by the MnDNR and USFS (MnDNR 2015, reference (92)); the Littlefork-Vermillion Uplands, the St. Louis Moraines, and the Nashwauk Uplands subsections (Map 5-2). The MnDNR's comprehensive wildlife plan, *Tommorrow's Habitat for the Wild and Rare an Action Plan for Minnesota Wildlife* (MnDNR 2006, reference (125)), which corresponds to the ECS native plant communities, was used to summarize the wildlife likely present in the three ecological subsections in the East Section of the proposed Project. Each ECS subsection identifies SGCN, which are those species whose populations are rare, declining, or vulnerable in Minnesota. Approximately half of the SGCN are also Minnesota state-listed species (MnDNR 2006, reference (125)).

Native community types located within the Littlefork-Vermillion Uplands subsection provide habitat for species associated with lowland and upland conifer and mixed conifer deciduous forest vegetation communities. Forested community types within this subsection provide habitat for bald eagle, Canada lynx, great gray owl, boreal owl, and numerous game species such as ruffed grouse and white-tailed deer. Wetlands provide habitat for yellow rail, trumpeter swan, red-necked grebe, and a variety of waterfowl. Approximately 67 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

Native community types within the St. Louis Moraines subsection provide habitat for bald eagle, Canada lynx, northern goshawk, red-shouldered hawk, wood thrush, Canada warbler, four-toed salamander, and numerous game species such as ruffed grouse and white-tailed deer. Approximately 74 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

Native community types within the Nashwauk Uplands subsection provide habitat for bald eagle, gray wolf, northern goshawk, gray jay, Connecticut warbler, veery, black-billed cuckoo, Canada warbler, white-throated sparrow, osprey, Nabakov's blue, brook lamprey, and numerous game species such as ruffed grouse and white-tailed deer. Approximately 60 species designated by either the federal or state government as endangered, threatened, special concern, or SGCN might occur within land types present within this subsection.

In addition to the natural wildlife habitat present throughout the East Section, areas of managed wildlife habitat are also present within the vicinity of the variation areas, including WMAs, none of which are in close proximity to the proposed routes or variations; the Chippewa Plains Important Bird Area, along the western part of the East Section; and a few MnDNR-designated shallow lakes in the Balsam and Blackberry variation areas (Map 5-22) Section 5.3.4.3 provides additional information on each of these wildlife resources.

The northern portion of the East Section is USFWS-designated critical habitat for gray wolf (Map 5-22); Section 5.3.5 provides further discussion of gray wolf critical habitat. The East Section also contains several State Forests (discussed in Section 5.5.4.2), and sensitive ecological resources (discussed in Section 5.5.5), all of which provide habitat for common and rare wildlife species.

General Impacts

Potential construction and operation-related short-term and long-term impacts on wildlife in the East Section are similar to those summarized for the West Section in Section 5.3.4.3.

Section 6.4 summarizes the potential impacts of the proposed routes and variations on wildlife in the East Section. Sections 5.5.4.2 and 6.4 (Vegetation) discuss potential impacts on vegetation, Sections 5.5.4.1 and 6.4 (Water Resources) discuss potential impacts on

wetland habitat, and Sections 5.5.5 and 6.4 (Rare and Unique Natural Resources) discuss potential impacts on sensitive ecological resources used by wildlife.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on wildlife. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

Potential construction impacts on wildlife in the East Section are similar to those summarized for the West Section in Section 5.3.4.3.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repairs on wildlife in the East Section are similar to those summarized for the West Section in Section 5.3.4.3.

5.5.5 Rare and Unique Natural Resources

This section describes the rare and unique natural resources, including federal and state protected species and rare communities, which are present within the East Section and the potential impacts on those resources from construction and operation of the proposed Project.

Federal and state regulations concerning rare and unique natural resources can be found in Section 5.3.5.

The ROI for an analysis of impacts to federally- and state-listed species includes a one-mile buffer surrounding the proposed routes and variations in order to obtain a broad view of species that may be present across the proposed Project, since no formal surveys have been conducted for the proposed Project. The ROI for the analysis of impacts to rare communities includes the anticipated 200-foot ROW of the proposed transmission line and the footprint of the other elements of the proposed Project described in Section 2.1: proposed Blackberry 500 kV Substation, 500 kV series compensation station, and regeneration stations.

5.5.5.1 Federally-Listed Species in the East Section

The USFWS technical assistance website was reviewed to determine if any federally-listed species or designated critical habitats are known to be present within Koochiching and Itasca counties, where the East Section is located (USFWS 2015, reference (127)). The USFWS lists three species as occurring in Koochiching and Itasca counties, including the federally threatened gray wolf (*Canis lupus*), Canada lynx (*Lynx canadensis*), and northern long-eared bat (*Myotis septentrionalis*) (USFWS 2015, reference (127)); Table 5-33).

Table 5-33 Federally-listed Species Known to Occur in Koochiching and Itasca Counties

Scientific Name	Common Name	Federal Status	State Status
Canis lupus	Gray wolf	Threatened	Special Concern
Lynx canadensis	Canada lynx	Threatened	Special Concern
Myotis septentrionalis	Northern long-eared bat	Threatened	Special Concern

Source: USFWS 2015, reference (127)

Designated-critical habitat associated with federally-listed species consists of "the specific areas within the geographical area occupied by the species, at the time it is listed…on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection" (50 CFR 1533[b][2]).

Gray wolf. The gray wolf was federally listed as an endangered species in 1974 and was reclassified as threatened in 1977 (42 Federal Register 29527-29532). In 2011, the wolf was delisted by the USFWS (76 Federal Register 57943-57944). However, in 2014, a federal court reversed the USFWS decision to delist the gray wolf, restoring federal threatened status and designated critical habitat in Minnesota. Gray wolves occupy a diversity of habitats, including forests, prairies, and swamps (USFWS 2012, reference (127)). Designated critical habitat for gray wolf is present in the northern portion of the East Section (Map 5-22).

Canada lynx. The Canada lynx was listed as a federally threatened species in several states in the Northeast, Great Lakes Region (including Minnesota), and Southern Rockies in 2000 (65 Federal Register 16052-16086). Canada lynx inhabit boreal and mixed coniferous and deciduous forests, where snowshoe hare, their preferred diet, are present (USFWS 2013, reference (127)). The nearest designated critical habitat for lynx is at least 17 miles east of the proposed routes or any variation in the East Section.

Northern long-eared bat. The northern long-eared bat was proposed for listing as a federally endangered species in 2013 (78 Federal Register 61046-61080). In April of 2015, the USFWS listed the northern long-eared bat as federally threatened (80 Federal Register 18023-18028). The northern long-eared bat inhabits caves and mines in winter;

Table 5-34 State-Threatened and Special Concern Species Documented within One Mile of the Proposed Routes and Variations in the East Section

Scientific Name	Common Name	Federal Status	State Status	Type	Associated Habitat
Eleocharis robbinsii	Robbin's Spike-rush	None	Threatened	Vascular Plant	Shallow soft-water ponds and lakes.
Platanthera flava var. herbiola	Tubercled Rein-orchid	None	Threatened	Vascular Plant	Wet prairies and meadows, swales in mesic prairies, or the sandy or peaty habitats along the edges of marshes, swamps, or lakeshores.
Spiranthes casei var. casei	Cases's Ladies'-tresses	None	Threatened	Vascular Plant	Disturbance related habitats including drained tailing basins within early *successional forest.*
Carex ormostachya	Necklace Spike Sedge	None	Special Concern	Vascular Plant	Sporadically in the moderate shade of upland hardwood and hardwood-conifer forests.
Najas gracillima	Thread-like Naiad	None	Special Concern	Vascular Plant	Clear, healthy softwater lakes.
Najas guadalupensis ssp. olivacea	Guadalupe waternymph	None	Special Concern	Vascular Plant	Lakes, ponds, rivers, and streams.
Accipiter gentilis	Northern Goshawk	None	Special Concern	Bird	Large tracts of mature, closed canopy, deciduous, coniferous, and mixed forests with an open understory
Lasmigona compressa	Creek Heelsplitter	None	Special Concern	Mussel	Creeks, small rivers, and the upstream portions of large rivers.
Ligumia recta	Black Sandshell	None	Special Concern	Mussel	Riffle and run areas of medium to large rivers.

Source: MnDNR 2014, reference (132)

in summer northern long-eared bats roost in live and dead trees with loose, flakey, or shaggy bark, crevices, or hollows (USFWS 2015, reference (129)). The USFWS has not identified designated critical habitat for the northern long-eared bat at this time.

Additional information on federally-listed species is available in the Biological Assessment was prepared to assist in determining the potential impacts of the proposed Project on federally-listed species and to facilitate ESA Section 7 consultation (Appendix R).

5.5.5.2 State Listed Species in the East Section

The MnDNR NHIS database was queried in January of 2015 to obtain the locations of rare species documented within the East Section (MnDNR 2014, reference (132)). Additional information on the NHIS database is provided in Section 5.3.5.

Because no formal surveys for rare species have been conducted for the proposed Project, a one-mile buffer surrounding the proposed routes and variations in the East Section was used to obtain a broad view of the rare species that may be present across this portion of the proposed Project. The NHIS database documents the following three state-threatened species within one-mile of the proposed routes and variations in the East Section: state-threatened robbin's spikerush (*Eleocharis robbinsii*), tubercled rein-orchid (*Platanthera flava var. herbiola*), and Cases's ladies' tresses (*Spiranthes casei var. casei*) (Table 5-34). In addition to these state-threatened species, several state-special concern species have been documented within one-mile of the proposed routes and variations in the East Section; these include three vascular plants, one bird, and two mussels. State-threatened and special concern species and their associated habitats are summarized below in Table 5-34. Species tracked in the NHIS database, as described in Section 5.3.5, that have been documented within one mile of the proposed routes and variations in the East Section are summarized in Appendix F.

According to the NHIS database, there are eight MnDNR-designated colonial waterbird nesting sites in the East Section. Colonial waterbird nesting sites are documented locations of large groups of nesting waterbirds; these locations are generally found in association with trees and emergent wetland vegetation.

5.5.5.3 State Rare Communities in the East Section

Several rare communities have been identified within or adjacent to the variation areas in the East Section; these include SNAs, MBS Sites of Biodiversity Significance, and MnDNR-designated Ecologically Important Lowland Conifer stands (Map 5-23). In addition to these rare resources, MBS native plant communities and MnDNR-designated areas of High Conservation Value Forest are also likely present in the East Section; however, as mentioned in Section 5.3.5, the MnDNR is in the process of mapping these resources for the counties in the East Section and data are currently unavailable (MnDNR 2014, reference (134)).

Many rare communities present in the East Section are located within the George Washington State Forest or Koochiching State Forest (Map 5-19 and Map 5-23). State forests are discussed in Section 5.5.4.2. Other resources that may provide potential habitat for rare species, such as Important Bird Areas, are discussed in Section 5.5.4.3 and shown on Map 5-22.

Scientific and Natural Areas

There are six SNAs located in the East Section, including Myrtle Lake Peatland, Botany Bog, Chisholm Point Island, Ladies Tresses Swamp, Potato Lake, and Wabu Woods (Map 5-23). No SNAs are located within 1,500 feet of any proposed routes or variations in the East Section (Map 5-23). See Section 5.3.5 for additional information on SNAs.

MBS Sites of Biodiversity Significance

Several areas mapped by the MBS as Sites of Biodiversity Significance are located throughout the East Section (Map 5-23). Mapping of Sites of Biodiversity Significance is only preliminary in Koochiching and Itasca counties. Because of this, biodiversity significance ranks, as summarized in See Section 5.3.5, have not been designated in every location in the East Section; these areas are designated "rank unknown" and primarily occur in Koochiching County on Map 5-23. Sites of all levels of biodiversity significance are present in the East Section. However, for discussion purposes in Section 6.4, biodiversity significance ranks are not distinguished from one another because of the preliminary status and/or unknown ranks. All SNAs in the East Section are also MBS Sites of Biodiversity Significance.

The MBS Sites of Biodiversity Significance ranked outstanding and high likely contain several native plant communities and areas designated as areas of High Conservation Value Forest; however, as mentioned above, these resources have not yet been mapped and are currently unavailable. See Section 5.3.5 for additional information on MBS Sites of Biodiversity Significance.

Ecologically Important Lowland Conifers

The MnDNR has identified several Ecologically Important Lowland Conifer stands specifically targeted for protection in the East Section. No Ecologically Important Lowland Conifer stands have been identified within the ROW of the proposed routes or variations in the East Section. See Section 5.4.5 for additional information on Ecologically Important Lowland Conifer stands.

5.5.5.4 General Impacts

Potential construction and operation-related short-term and long-term impacts on rare and unique natural resources in the East Section are similar to those summarized for the West Section in Section 5.3.5. The potential impacts of the proposed routes and variations on rare and unique natural resources in the West Section are discussed further in Section 6.4.

Section 2.13 summarizes the Applicant proposed measures to avoid, minimize, or mitigate impacts on rare and unique natural resources. These Applicant proposed measures are potential MN PUC Route Permit conditions.

Impacts from Construction

Potential construction impacts on rare and unique natural resources in the East Section are similar to those summarized for the West Section in Section 5.3.5 with the exception of potential impacts on critical habitat designated for gray wolf.

Removal of forested land in the ROW during construction would result in habitat fragmentation, which could reduce the quality of critical habitat designated for gray wolf in the Central Section. The effects of fragmentation on gray wolves would generally be greatest where new corridors are created, rather than where the transmission line would parallel an existing corridor, where the forest has already been fragmented.

Impacts from Operation, Maintenance, and Emergency Repairs

Potential impacts from operation, maintenance, and emergency repairs on rare and unique natural resources in the East Section are similar to those summarized for the West Section in Section 5.3.5.

Operation, maintenance, and emergency repairs are not likely to result in additional impacts to critical habitat designated for gray wolf beyond the impacts that would likely result from construction, as described above.

5.5.6 Corridor Sharing

This section describes corridor sharing opportunities within the East Section and the potential impacts from the proposed Project. Corridor sharing is one of the factors the MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4200, subparts H and J). See Section 5.3.6 for more information regarding corridor sharing.

The ROI for the East Section is the same as described for the West Section (Section 5.3.6.1) and includes infrastructure corridors within approximately 0.25 miles of the proposed routes and variations.

5.5.6.1 Corridor Sharing in the East Section

The corridor sharing opportunities in the East Section are shown on Map 5-24. These opportunities are located where the ROW for the proposed routes and variations would parallel the corridor of an existing transmission line, field or section line, roadway, or other infrastructure. Where a new transmission line parallels an existing corridor, it generally reduces the amount of additional impacts land under private, corporate, state, or federal ownership. In addition, it may reduce visual impacts as described in Section 5.3.1.1.

In the West Section, the proposed route and variations parallel corridors including existing 230 kV and 500 kV transmission lines, roads, field lines, trails, PLSS, combinations of these corridors, or no corridor. Additional details related to corridor sharing in the East Section for the proposed Project are discussed further in Chapter 6 of this EIS.

5.5.6.2 Associated Facilities

Routing options would be coupled with associated facilities, which would create additional ROW sharing considerations where local lines would need to be reconfigured to extend to the proposed Blackberry Substation. In the southern portion of the East Section, just before the Proposed Blue Route and the Proposed Orange Route enter the proposed Blackberry 500 kV Substation, the Proposed Blue Route would share a corridor with an existing 230 kV transmission line and the Proposed Orange Route would share a corridor with an existing transmission line. Additional details related to corridor sharing in the East Section for the proposed Project are discussed further in Chapter 6 and Chapter 7 of this EIS.

5.5.6.3 General Impacts

As discussed in Section 5.3.6.2, corridor sharing would minimize potential impacts to the affected environment by minimizing the proliferation of new utility ROW and, where ROW sharing is possible, reducing the overall ROW footprint of impact. Section 5.3.6.1 provides additional discussion of ROW sharing and associated approvals. See Section 5.3.7 for reliability issues associated with corridor sharing.

As discussed in Section 5.3.6, by following existing corridors, and reducing the need to create new transmission line corridors for the proposed Project, potential impacts to human settlements, land-based economies, and the natural environment would be minimized.

Since corridor sharing is considered to be a measure to reduce impacts on resources, no additional adverse impacts are anticipated due to corridor sharing.

Impacts from Construction

As discussed in Section 5.3.6.2 sharing or paralleling existing infrastructure would likely require coordination during construction and acquiring necessary approvals from the ROW owner (like a railroad) or the agency overseeing use of a particular ROW (like MnDOT).

Impacts from Operation, Maintenance, and Emergency Repairs

As discussed in Section 5.3.6.2, sharing or paralleling existing infrastructure may require coordination for maintenance or emergency repair and may require approvals from the ROW owner (like a railroad) or the agency overseeing use of a particular ROW.

5.5.7 Electric System Reliability

This section describes the electrical system reliability within the East Section and the potential impacts on those resources from the proposed Project. Electrical system reliability is one of the factors MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4200, subpart K). See Section 5.3.7 for more information regarding electrical system reliability.

NERC has established mandatory reliability standards for American utilities. In addition, the Applicant has stated their purpose and need as related to electrical reliability. For a more detailed discussion

of concepts related to electrical reliability, please see Section 5.3.7.

The ROI for the East Section is the same as described for the West Section (Section 5.3.7) and includes the corridors for the existing transmission lines.

5.5.7.1 Electrical System Reliability in the East Section

The same existing 500 kV transmission line (Riel-Forbes) and 230 kV transmission lines that cross the West and Central Sections also cross the East Section (Map 5-18). The transmission lines enter separately into the north-central portion of the East Section and are co-located within a corridor after a few miles. The Proposed Orange Route is not co-located with an existing transmission line where it enters the East Section. The Proposed Blue Route is co-located with the existing 230 kV transmission line until it converges with the existing 500 kV transmission line.

The Effie Variation in the Effie Variation Area would require the proposed 500 kV transmission line to parallel the co-located 500 kV and 230 kV transmission lines; resulting in three high voltage lines running in adjacent ROWs. The proposed transmission line would be adjacent to, but not within, the existing transmission line ROWs. The Proposed Orange Route and Effie Variation would not cross the existing transmission lines, but the Proposed Blue Route would cross the existing 500 kV transmission line once.

The Proposed Blue Route and the Proposed Orange Route in the Balsam Variation Area would require the proposed 500 kV transmission line to parallel co-located existing 115 kV transmission lines; resulting in three high voltage lines running in adjacent ROWs. The proposed transmission line would be adjacent to, but not within, the existing transmission line ROWs. The Proposed Blue Route and Proposed Orange Route would cross one of the existing 115 kV transmission lines once and the other existing 115 kV transmission line twice. The Balsam Variation would cross one of the existing 115 kV transmission lines once.

The Proposed Orange Route in the Blackberry Variation Area would require the proposed 500 kV transmission line to parallel two co-located existing 115 kV transmission lines and the Proposed Blue Route would parallel co-located existing 115 kV and 230 kV transmission lines; resulting in three high voltage lines running in adjacent ROWs. The proposed transmission line would be adjacent to, but not within, the existing transmission line ROWs. The Proposed Orange Route and Proposed Blue Route would cross two co-located existing 115 kV transmission lines prior to entering the proposed Blackberry Substation.

As a result, in the northern portion of the East Section, there would be two transmission lines co-located within a corridor. Based on information provided by the Applicant, the likelihood of an actual event severely impacting two paralleling transmission lines can be reduced by incorporating appropriate transmission line design considerations into the engineering of the proposed Project. As summarized in Section 5.3.7.2, the Applicant has proposed a design and operation modifications to reduce the risk of simultaneous outages where the proposed Project would be constructed in parallel with another high-voltage transmission line. Threfore, no impacts are expected on electrical reliability by constructing two paralleling transmission lines.

However, in the Effie, Balsam, and Blackberry variation areas, there would be three transmission lines co-located within the same corridor. The configuration may decrease the reliability of the proposed Project. When facilities are located in close proximity, there is a greater risk that a single event can take out multiple lines. Additionally, the close proximity of the lines can make repairing the lines more difficult. These difficulties could increase outage times, should an outage occur. Potential adverse impacts may be possible for three variation areas in the East Section resulting from the construction and operation of three high voltage transmission lines.

5.5.7.2 General Impacts

Construction, operation, maintenance, or emergency repairs of the proposed Project could interfere with the operation of existing transmission lines as it may be difficult to maintain the appropriate separation distance required for clearance and safety issues and are similar to the described within the West Section (Section 5.3.7.2). Mitigation in the East Section is similar to mitigation described for the West Section and is described in Section 5.3.7.2.

Impacts from Construction

Construction of the proposed Project could interfere with the operation of existing transmission lines as it may be difficult to maintain the appropriate separation distance required for clearance and safety issues. Potential impacts related to electrical system reliability from construction and operation of the proposed Project in the East Section are discussed further in Chapter 6 of this EIS.

Table 5-35 Proposed Routes and Variations in the East Section

Variation Area	Variation Names in the EIS	Cost (Total)	Cost (per mile)	Length (mi)
Effie	Proposed Blue Route	$46,649,600	$1,135,027	41.1
	Proposed Orange Route	$49,488,323	$1,109,604	44.6
	Effie Variation	$57,353,305	$1,149,365	49.8
East Bear Lake	Proposed Orange Route	$9,736,790	$1,090,346	8.9
	East Bear Lake Variation	$13,279,079	$1,264,674	10.5
Balsam	Proposed Blue Route	$15,121,621	$1,172,219	12.9
	Proposed Orange Route	$16,018,490	$1,169,233	13.7
	Balsam Variation	$19,502,472	$1,095,644	17.8
Dead Man's Pond	Proposed Blue Route	$2,873,223	$1,306,011	2.2
	Dead Man's Pond Variation	$4,409,841	$1,934,141	2.3
Blackberry	Proposed Blue Route	$8,380,680	$1,540,566	5.4
	Proposed Orange Route	$10,148,060	$1,663,616	6.1

Source: Minnesota Power 2014, reference (9)

Note(s): Totals may not sum due to rounding.

Impacts from Operation, Maintenance, and Emergency Repairs

Operation, maintenance, or emergency repairs of the proposed Project may interfere with the operation of existing transmission lines as it may be difficult to maintain the appropriate separation distance required for clearance and safety issues. Potential impacts related to electrical system reliability from operation, maintenance, or emergency repairs of the proposed Project for alternative routes in the East Section are discussed further in Chapter 6 of this EIS.

5.5.8 Costs of Constructing, Operating, and Maintaining the Facility which are Dependent on Design and Route

This section of the EIS summarizes the costs of constructing, operating, and maintaining the facility which are dependent on design and route of the Proposed Project. . Cost evaluation is one of the factors the MN PUC is required to consider in determining which route to select and permit (Minnesota Rules, part 7850.4100, subpart L). A summary of the costs associated with constructing the proposed routes and variations in the West Section is provided in Table 5-35.

The Applicant developed these cost estimates based on an estimated cost per mile for the general structure type planned for each proposed route or variation. The cost estimates have a range of plus or minus 30 percent. Since there is a lack of certainty regarding property acquisition, access costs, or segment-specific design criteria (i.e. increased return period where the proposed route or variation parallels existing corridors) these are not full construction estimates and were developed for comparative purposes only and a contingency has not been built into these numbers because it would require further engineering and analysis.

The cost for routine maintenance would depend on the topology and the type of maintenance required, but typically runs from $1,100 to $1,600 per mile annually (Minnesota Power 2013, reference (135)). Using the $1,600 per mile for operation and maintenance, the estimated cost would range from $4,000 to $80,000 annually for these alternatives in the East Section.

This page intentionally left blank