Draft Environmental Impact Statement

The human and environmental impacts of constructing and operating the Mankato – Mississippi River 345 kV Transmission Line and associated substations

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Xcel Energy proposes to construct and operate approximately 130 miles of new 345 kV transmission line from the existing Wilmarth Substation in Mankato to a point near the existing West Faribault Substation (Segment 1 – approximately 48 to 54 miles long), to the existing North Rochester Substation near Pine Island (Segment 2– approximately 34 to 42 miles long), and from the existing North Rochester Substation near Pine Island to the Mississippi River near Kellogg, Minnesota (Segment 3 – approximately 43 miles long). Segment 3 would be the construction of a 345 kV transmission line in place of an existing 161 kV transmission line; this would create a double-circuited 345 kV line. Segment 3 consists of one proposed route, as this segment was permitted by the Commission as part of the CapX2020 Hampton – La Crosse Project. The Project also proposes approximately 20 miles of new 161 kV transmission line from the existing North Rochester Substation southeast to a connection point with the existing 161 kV Chester transmission line (Segment 4). Additional information is available on the Commission website at: https://mn.gov/puc/activities/energy-facilities/power-plants-transmission-lines/tranche-one/mankato-to-mississippi/

Document Availability

This environmental impact statement and other materials related to this project are available on the Department of Commerce project webpage: **https://apps.commerce.state.mn.us/web/project/15507**

Alternative Formats

This document can be made available in alternative formats, that is, large print or audio, by calling (651) 539-1530 (voice).

Project Mailing List

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Abbreviations

AC	alternating current
AGL	above ground level
AIMP	Agricultural Impact Mitigation Plan
ALJ	administrative law judge
AMA(s)	aquatic management areas
AMSL	above mean sea level
APC	adjusted production cost
AQI	air quality index
bgs	below ground surface
BMP(s)	best management practices
BWSR	Board of Water and Soil Resources
CH_4	methane
CO	carbon monoxide
CO_2e	carbon dioxide equivalent
Commission	Minnesota Public Utilities Commission
CREAT	climate resilience evaluation and awareness tool
CREP	Conservation Reserve Enhancement Program
dB	decibel
dBA	decibel scale
DME	Dakota, Minnesota, and Eastern
DNR	Minnesota Department of Natural Resources
DWSMA	drinking water supply management areas
ECS	Ecological Classification System
EERA	Energy Environmental Review and Analysis
EIS	environmental impact statement
EJ	environmental justice
EMF	electric magnetic fields
ENM	Early Notification Memo
EPA	Tribal Historic Preservation Offices
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FEMA	Federal Emergency Management Administration
FPPA	Farmland Protection Policy Act
Ft	feet
G	gauss
GBCA(s)	Grassland Bird Conservation Areas
GHG	greenhouse gas
GNSS	Global Navigation Satellite System
GPS	amplitude modulated

HVDC	high voltage direct current
HVTL	high-voltage transmission line
ICD(s)	implantable cardioverter defibrillators
in	inch
IPaC	information for Planning and Consultation
kV	kilovolt
kV/m	kV per meter
LGU(s)	local units of government
LRTP	long range transmission planning
LRTP4	long range transmission planning project 4
MDA	Minnesota Department of Agriculture
mG	milliGauss
MIAC	Minnesota Indian Affairs Council
MISO	Midcontinent Independent System Operator
MNDoT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MWI	Minnesota Well Index
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAC	Noise Area Classification
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NHIS	Natural Heritage Information System
NLCD	National Landcover Database
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NPDES/SDS	national pollutant discharge elimination system/sanitary disposal
NRHP	system National Register of Historic Places
O_3	ozone
OAH	Office of Administrative Hearings
OSA	Office of the State Archaeologist
Pb	lead
PIIC	Prairie Island Indian Community
PM_{10}	particulate matter
PSD	prevention of significant deterioration
PWI	public waters inventory
PWP	permanent wetlands preserves
RIM	Reinvest in Minnesota
ROI	regions of influence
ROW(s)	rights-of-way
RTK GPS	real-time kinematic GPS

RTK	real-time kinematic
SF_6	sulfur hexafluoride
SGCN	species in greatest conservation need
SHPO	State Historic Preservation Office
SNA(s)	scientific and natural areas
SO_2	sulfur dioxide
SSA	sole source aquifer
SSP	shared socioeconomic pathway
SWP	source-water protection
SWPPP	Stormwater Pollution Prevention Plan
TCP(s)	Traditional Cultural Properties
THPO	Tribal Historic Preservation Offices
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
WCA	Wetland Conservation Act
WHAF	Watershed Health Assessment Framework
WHPA	wellhead protection area
WMA(s)	wildlife management areas

Executive Summary

The Minnesota Department of Commerce (Department) prepared this environmental impact statement (EIS) for the Mankato to Mississippi River 345 kV Transmission Line Project (project). The project is proposed by Northern States Power Company, doing business as Xcel Energy (applicant). The EIS evaluates the potential human and environmental impacts of the project and possible mitigation measures, including routing alternatives. Additionally, it evaluates alternatives to the project itself.

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

Need for the Project

The project is needed as part of a broader regional solution to reduce thermal loading, enable future generation, and improve transfer voltage stability. The broader regional solution is required, given the evolving energy landscape (driven in part by state and federal energy policy) and ongoing changes to Minnesota's generation portfolio, which will require increasing the capacity of the existing high-voltage transmission system in the region. These changes would support existing generation and new generation projects being delivered to load centers efficiently and economically.

When defining the purpose of the project for this EIS, the Department's Energy Environmental Review and Analysis (EERA) unit staff referred to the joint certificate of need application and route permit application. The purpose of the project is to construct a high-voltage transmission line (HVTL) to provide additional transmission capacity to reduce congestion and to improve electric system reliability throughout the region as more renewable energy resources are added to the system.

Overview of Project and Routing Alternatives

The applicant proposed to construct approximately 130 miles of new 345 kV transmission line between the Wilmarth Substation in Mankato, Minnesota, and the Mississippi River near Kellogg, Minnesota, and a new, approximately 20-mile 161 kV transmission line between the North Rochester Substation near Pine Island, Minnesota, and an existing transmission line northeast of Rochester, Minnesota.

The project consists of three major components: (1) approximately 130 miles of new 345 kV HVTL, (2) approximately 20 miles of new 161 kV HVTL, and (3) upgrades to existing substations.

The project consists of four segments:

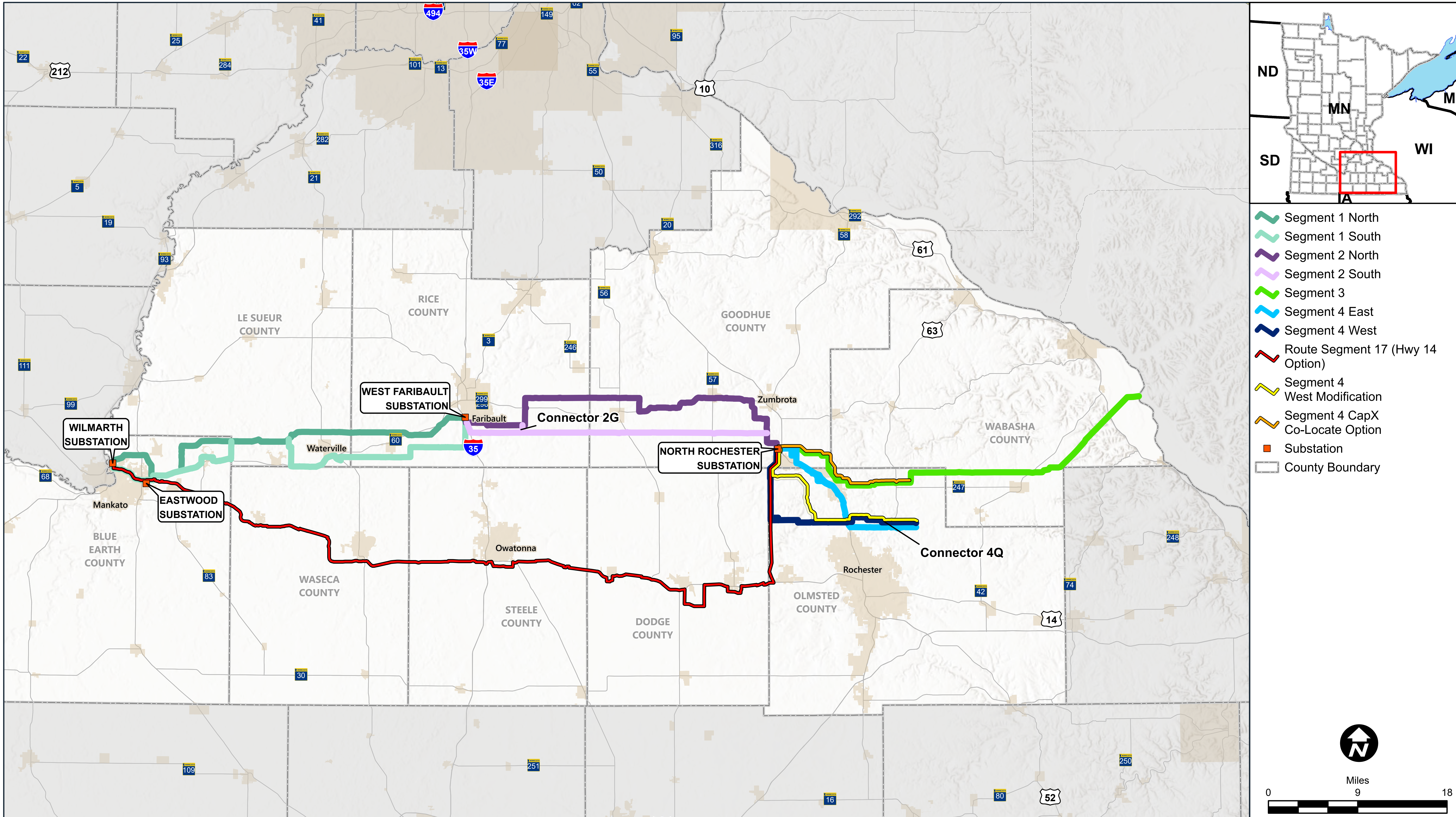
- Segment 1: a new 48-to-54-mile 345 kV transmission line between the Wilmarth substation and a point near the West Faribault Substation.
- Segment 2: a new 34-to-42-mile 345 kV transmission line from a point near the existing West Faribault Substation to the existing North Rochester Substation.
- Segment 3: conversion of 27 miles of existing, double-circuit 161/345 kV transmission line to 345/345 kV operation and installation of a new 16-mile long 345 kV circuit on the existing 345/345 kV double-circuit capable structures between the existing North Rochester Substation and the Mississippi River.
- Segment 4: a new 20-to-24-mile 161 kV transmission line between the existing North Rochester Substation and the existing 161 kV Chester Line northeast of Rochester.

The applicant proposed two alternatives for each segment, with the exception of Segment 3. The applicant-proposed segments are referred to as Segment 1 North, Segment 1 South, Segment 2 North, Segment 2 South, Segment 3, Segment 4 East, and Segment 4 West (Map ES-1).

The Department issued a scoping decision on December 2, 2024. The scoping decision identified the segments and alternatives (route segments and alignment alternatives) for evaluation in the EIS. Alternatives are described in relation to their associated segment with one exception. Route Segment 17 (Hwy 14 Option), if selected, would replace Segments 1 and 2 and is therefore associated with two segments instead of one (Map ES-1). A relative merits analysis was conducted for each segment based on the routing factors outlined in Minnesota statute and rule. The EIS also includes a discussion of potential route options for the 345 kV transmission line and the 161 kV transmission line replacement.

The project also includes upgrades at the Wilmarth Substation and North Rochester Substation. Additionally, modifications to the Eastwood Substation are possible depending upon the route selected.

The applicant requested a route width of 1,000 feet, with some areas having a route width wider than 1,000 feet. These areas are typically near substations or locations with routing constraints. The applicant requested a final right-of-way (ROW) width of 150 feet for Segments 1 to 3 and 100 feet for Segment 4.



PROJECT OVERVIEW

Map ES. 1

The Public's Role

During scoping, you told EERA representatives your concerns about the project so that we could collect the right facts. At the upcoming hearing, you can tell us what those facts mean and if you think we have represented them correctly. Your help in pulling together the facts and determining what they mean helps the Commission make informed decisions regarding the project.

The State of Minnesota's Role

In Minnesota, the Commission determines whether certain transmission lines are needed by the state and, if so, where they should be located. As such, the applicant must obtain two approvals from the Commission for the project, a certificate of need and a route permit. The Commission has before it two distinct considerations: (1) whether the proposed project is needed, or whether some other project would be more appropriate for the state of Minnesota (for example, a project of a different type or size, or a project that is not needed until further into the future), and (2) if the proposed project is needed, where should it be located.

To help the Commission with its decision-making and to allow for a fair and robust representation of the issues, the state of Minnesota has set out a process for the Commission to follow when making decisions. For this project this process requires: (1) the development of an EIS and (2) hearings before an administrative law judge (Minnesota Statutes § 216B and 216E). The purpose of the EIS is to describe the potential human and environmental impacts of the project ("the facts"); the purpose of the hearings is to allow individuals to advocate, question, and debate what the Commission should decide about the project ("what the facts mean"). The entire record developed in this process — the EIS and the report from the administrative law judge, including all public input and testimony — is available to the Commission when it makes its decisions on the applicant's certificate of need and route permit applications.

Certificate of Need Criteria

The Commission must determine whether the project is needed or if another project or no project at all would be more appropriate for the state of Minnesota. In making its decision, the Commission must consider the following factors in their decision to grant a certificate of need (Minnesota Rules 7849.0120):

- The probable result of denial would be an adverse effect on the future adequacy, reliability, or efficiency of energy supply to the applicant, to the applicant's customers, or to the people of Minnesota and neighboring states.
- A more reasonable and prudent alternative to the proposed facility has not been demonstrated by a preponderance of the evidence on the record.
- The proposed facility, or a suitable modification of the facility, will provide benefits to society in a manner compatible with protecting the natural and socioeconomic environments, including human health.

- The record does not demonstrate that the design, construction, or operation of the proposed facility, or a suitable modification of the facility, will fail to comply with relevant policies, rules, and regulations of other state and federal agencies and local governments.

If the Commission determines that the applicant has met these criteria, it will grant a certificate of need.

The Commission's certificate of need decision determines the type of project, the size of the project, and the project's starting and ending points. The Commission could place conditions on the granting of a certificate of need; likewise, it has discretion to approve the project as proposed or with modifications. If the Commission denies the certificate of need, this indicates that the Commission believes that a more reasonable and prudent alternative is to not build the project (the "no-build alternative"). Within 12 months of the submission of a certificate of need application, the Commission must approve or deny a certificate of need for the project (Minnesota Statutes § 216B.243). The Commission may extend this time if it has good cause.

Alternatives to the Project

An alternative to the project is feasible if it can be engineered, designed, and constructed and is also available (the alternative is readily obtainable and at the appropriate scale). Furthermore, Minnesota Rules 4410.2300, subpart G states that an alternative can be excluded from detailed analysis in an EIS if "it would not meet the underlying need for or purpose of the project, it would likely not have any significant environmental benefit compared to the project as proposed, or another alternative, of any type, that will be analyzed in the EIS would likely have similar environmental benefits but substantially less adverse economic, employment, or sociological impacts."

In addition to the system alternatives considered for a proposed new HVTL required per Minnesota Rules 7849.1500, the following specific system alternatives were identified during scoping and included by the Commission in its scoping decision:

- Chester Junction system alternative; and
- 230 kV System alternative.

Potential human and environmental impacts of the following system alternatives are discussed in the EIS:

- No-build
- Demand side management
- Purchased power
- Transmission line of a different size or using a different energy source than the source proposed by the applicant, including a 230 kV alternative
- Upgrading existing facilities
- Generation rather than transmission;

- Use of renewable energy sources
- The Chester Junction system alternative

Route Permit Criteria

The Commission is charged with selecting transmission line routes that minimize adverse human and environmental impacts while ensuring electric power system reliability and integrity. Minnesota Statute § 216E.03 identifies factors that the Commission must consider when designating transmission lines routes, including minimizing environmental impacts and minimizing human settlement and other land-use conflicts. Minnesota Rules 7850.4100 lists 14 factors for the Commission to consider when making a decision on a route permit:

A. Effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation and public services.
B. Effects on public health and safety.
C. Effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining.
D. Effects on archaeological and historic resources.
E. Effects on the natural environment, including effects on air and water quality resources and flora and fauna.
F. Effects on rare and unique natural resources.
G. Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity.
H. Use or paralleling of existing right-of-way (ROW), survey lines, natural division lines, and agricultural field boundaries.
I. Use of existing large electric power generating plant sites.
J. Use of existing transportation, pipeline, and electrical transmission systems or ROWs.
K. Electrical systems reliability.
L. Costs of constructing, operating, and maintaining the facility, which are dependent on design and route.
M. Adverse human and natural environmental effects that cannot be avoided.
N. Irreversible and irretrievable commitments of resources.

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

The Commission is charged with making a final decision on a route permit within 12 months after finding the route permit application complete. The Commission may extend this time limit for up to three months for just cause or upon agreement of the applicant.

Potential Impacts and Mitigation

Project construction and operation will impact human and environmental resources. Potential impacts are measured on a qualitative scale based on an expected impact intensity level; the impact intensity level takes mitigation into account.

Potential impacts on human and environmental resources are analyzed within specific geographic areas called regions of influence (ROI). The ROI is the geographic area where the project might exert some influence and is used as the basis for assessing potential impacts. ROIs vary by resource and potential impact. This EIS uses the ROW, route width, local vicinity (within 1,600 feet), project area (within one mile), or nine-county area as the ROI.

Some impacts are anticipated to be minimal or do not vary significantly. These include:

- Impacts on human settlements (factor A) - cultural values, environmental justice, noise, property values, socioeconomics, transportation, and public services.
- Impacts on public health and safety (factor B) - EMF, implantable medical devices, stray voltage, public and worker safety, stray voltage, induced voltage, and electronic interference.
- Impacts on the natural environment (factor E) - air quality, climate, geology and topography, floodplains, groundwater, and soils.

Human Settlement

Transmission lines have the potential to negatively impact human settlements through a variety of means. Impacts to human settlements resulting from the project are anticipated to range from minimal to significant depending on the route selected. Impacts to human settlements could be minimized by prudent routing (that is by choosing alternatives that avoid residences, businesses, and other places where citizens congregate). Impacts could also be mitigated by limiting the aesthetic impacts of the structures themselves and by using structures which are, to the extent possible, harmonious with human settlements and activities (e.g., double-circuiting where possible).

Aesthetics

Aesthetic impacts are subjective, and the potential impacts can vary widely and be unique to each person. Impacts can be minimized by selecting routes that are located away from residences and places where people congregate or by double-circuiting or paralleling existing transmission lines where elements of the built environment already partly define the viewshed. Following other infrastructure, such as roads and railroads, would also be expected to reduce potential impacts but not to the same extent as double-circuiting or paralleling existing transmission lines.

Impacts are largely assessed by reviewing the number of nearby residences and opportunities for ROW sharing or paralleling. Throughout the project, there is variability in the number of nearby residences and opportunities for sharing or paralleling existing ROW. Typically, the route segments that parallel the most existing roadways are also the route segments with the highest counts of nearby residences. Generally, there are opportunities for double-circuiting existing transmission lines project wide, but these areas can also have concentrated residences within the local vicinity.

Overall, aesthetic impacts are anticipated to be minimal to moderate, with a few areas subject to more significant impacts. State water trails and recreational trails are crossed by route segments in multiple regions and in limited cases the proposed HVTL would introduce new infrastructure in an otherwise undeveloped area resulting in more significant aesthetic impacts. In many areas the opportunity for double-circuiting has the potential to minimize aesthetic impacts; however the existing viewshed would most often be impacted with the replacement of the existing poles to taller poles.

Displacement

Displacement occurs when a residence or building is required to be removed within the ROW for construction of the project. Residential structures are present within the ROW and could be avoided by selecting an alternative or modifying the alignment of the transmission line around the residence. The applicant indicated no displacement would occur. Some non-residential structures are present within the ROW and could potentially stay if the activities taking place in these buildings are compatible with the safe operation of the line.

Displacement of non-residential structures can be avoided by adjusting the placement of transmission line structures, using specialty structures, increasing structure height, or by modifying the ROW location. The applicant would work with landowners on a case-by-case basis to address potential displacement. The applicant might need to conduct a site-specific analysis to determine if a building would need to be displaced. Building owners would be compensated by the applicant for any buildings that are displaced.

Land Use and Zoning

The ROI for land use and zoning is the ROW. If a route permit is issued, it would supersede and preempt zoning restrictions, building or land use rules. However, to assess human settlement impacts, potential land use and zoning impacts are addressed by evaluating the project against local land use and zoning ordinances. Impacts to planning and zoning are anticipated to be minimal throughout the project. The greatest potential for impacts to land use and zoning occurs near more populated areas and municipalities.

Recreation

Few recreational resources are present within the ROI (route width). Intermittent and localized indirect impacts could occur during construction; long-term impacts during operation could occur in the form of aesthetic impacts. Most recreational resources are long linear features (state water trails and recreational trails) that are crossed by all alternatives and cannot be avoided. These would be subject to aesthetic impacts.

Other recreational resources that are present include publicly accessible lands (local parks, Wildlife Management Areas, Waterfowl Production Areas, state game refuges, and a state forest), a golf course and snowmobile trails. Three recreational resources noted by the public during scoping and subject to impacts are all in close proximity to Segment 4 West and include a private airstrip, the Rochester Archery Club, and the Rochester Aero Model Society.

Land-based Economies

Impacts to land-based economies within the ROI (route width) are primarily associated with agriculture. During construction, impacts would include the limited use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Permanent impacts would also occur when the footprint of the transmission line structures directly impedes agricultural production and directly impedes efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, irrigating, and harvesting of fields.

The majority of the land within the project area is used for agricultural purposes. Implementation of the Agricultural Impact Mitigation Plan (AIMP) and prudent routing (sharing or paralleling existing infrastructure and paralleling division lines) could help minimize potential impacts.

Impacts to mining would be minimal. An active bedrock quarry appear is present within the ROI of Segment 4 West; impacts could be avoided. No other operational impacts to mining were identified.

Impacts to tourism would be negligible. There are limited recreational resources within the route width; therefore, any direct impacts to recreation that would cause an indirect impact to tourism-based economies are anticipated to be negligible

No new impacts to forestry resources are anticipated.

Archaeological and Historic Resources

The ROI for archaeological and historic resources is the route width. An understanding of potential impacts is assessed through identification of documented archaeological and historic resources within one mile of the alternatives. Archaeological resources are present throughout the project area, including unevaluated sites for the NRHP and potential historic cemeteries (however, the exact locations of the cemeteries is unknown). Previously documented NRHP-eligible historic architectural resources and historic architectural resources which are unevaluated for the NRHP are also present. Eligible or unevaluated sites include trails, bridges, a railroad, culverts, farmsteads, an artifact scatter, and lithic scatters. Most sites are concentrated near waterbodies, watercourse bluffs, and watercourse contours.

Some resources are unevaluated for listing on the National Register of Historic Places within the route widths. This includes at least one precontact burial mound within the route width of Segment 3. Burial mounds have the potential to be culturally significant to tribal communities; thus, THPOs, MIAC, and/or tribal community members may have an interest in consultation pertaining to the site. MIAC recommended monitoring during construction activities.

Additional cultural resources, beyond those identified in existing records, might be identified during future survey efforts prior to construction.

Direct and indirect impacts could occur from construction and operation of the project. Direct impacts to archaeological and historic resources could result from construction activities such as ROW clearing, placement of structures, temporary construction areas, and vehicle and equipment operation. Direct impacts to historic resources could occur if the project is located near or within view of a resource (typically a historic building, structure, or traditional cultural properties).

The preferred means of mitigating impacts to cultural resources is prudent routing or structure placement by avoiding known archaeological and historic resources. The applicant committed to additional research to identify cultural resources and cemeteries such as continued coordination with SHPO and Tribal Nations to design an appropriate survey strategy for the project. The survey strategy would be expected to result in both a Phase I Cultural Resource Reconnaissance survey and an Architectural History Inventory (Phase I Survey). The applicant also committed to developing an Unanticipated Discoveries Plan, which will outline protocol and mitigation measures, should archaeological resources or human remains be encountered during project construction.

Natural Environment

Public and Designated Lands

Public and designated lands present within the ROI (ROW) are limited. Public lands (local, state, or federal level) and conservation easements within the ROI are identified and qualitatively assessed for potential impact. Public lands within the ROI include Wildlife Management Areas, an Aquatic Management Area, a Scientific and Natural Area, and a state forest – all of which are owned by the DNR. The Upper Mississippi River National Wildlife and Fish Refuge is located within the ROI of Segment 3, which is owned by the U.S. Fish and Wildlife Service. In many places, the anticipated alignment crosses these public lands in areas where the project could be double-circuited.

Designated lands with easements within the ROI throughout the ROI include Conservation Reserve Enhancement Program (CREP) and RIM easements. In most cases, these easement areas abut the anticipated alignment and could potentially be avoided depending upon the final alignment, or could be double-circuited with an existing line. Other easements include a Permanent Wetlands Preserves Program easement crossed by the anticipated alignment of Segment 1 South and a Forest Legacy Program easement (at an existing crossing location) crossed by the anticipated alignment of Segment 1 North (at a new crossing location that could potentially be avoided depending upon the final alignment).

The applicant avoided areas with designated easements as practicable and identified these areas as a routing constraint in the joint certificate of need application and route permit application. If easements are crossed, the applicant would work with landowners to determine measures to avoid and minimize impacts on these agricultural resources and to avoid interfering with landowner participation in the CREP, PWP, Forest Legacy, or RIM programs. Additionally, the applicant would continue to coordinate potential easement crossings with BWSR.

Rare and Unique Natural Resources

Rare and unique natural resources encompass protected species and sensitive ecological resources. The ROI for protected species is the project area (1 mile) and the ROI for sensitive ecological resources is the route width. Potential direct and indirect impacts to protected species could occur should they be present within or near the ROW during construction or maintenance activities. While more mobile species would leave the area to nearby comparable habitats, non-mobile species, such as vascular plants or nesting birds, could be directly impacted. Construction activities also have the potential for direct impacts to sensitive ecological resources if they are subject to construction disturbance. Long-term impacts would involve permanent clearing of vegetation in areas identified as sensitive ecological resources which could indirectly impact any protected species associated with these habitats.

Impacts to protected species are evaluated by reviewing documented occurrences of these species within the ROI. Potential impacts to sensitive ecological resources, which could provide suitable habitat for protected species, are evaluated by assessing the presence of these resources within the ROI. Several measures could be implemented to avoid, minimize, or mitigate impacts to protected species and sensitive ecological resources, including those provided in the Minnesota Department of Natural Resources (DNR) Natural Heritage Review response for the project.

The Natural Heritage Information System database identified records for several state-threatened or endangered species within 1 mile of alternative; three of these species are also protected at the federal level. Some of these state-threatened and endangered species have been documented within the ROW of various alternatives, including the state-endangered loggerhead shrike (*Lanius ludovicianus*; Segment 1 and Route Segment 17); the state-endangered Blanchard's cricket frog (Acris blanchardi; Route Segment 17 and Segment 4); the state-endangered crystal darter (*Crystallaria asprella*; Segment 3); the state-endangered rock pocketbook (*Arcidens confragosus*; Segment 4); the state-threatened Blanding's turtle (*Emydoidea blandingii*; Segment 1, Segment 3, and Segment 4); the state-threatened hair-like beak rush (*Rhynchospora capillacea*; Segment 1); the six state-threatened mussel species: mucket (*Actinonaias ligamentina*; Segment 1 and Route Segment 17), spike (*Eurynia dilatate*; Segment 1 and Route Segment 17), fluted-shell (*Lasmigona costata*; Segment 1 and Segment 4), ellipse (*Venustaconcha ellipsiformis*; Segment 1), butterfly (*Ellipsaria lineolate*; Segment 3), and elktoe (*Alasmidonta marginata*; Segment 4); the state-threatened glade mallow (*Napaea dioica*; Route Segment 17 and Segment 4); the state-threatened tubercled rein orchid *(Platanthera flava* var. *herbiola*; Route Segment 17, Segment 3, Segment 4); the state-threatened edible valerian (*Valeriana edulis* var. *ciliata*; Route Segment 17); and the state-threatened timber rattlesnake (*Crotalus horridus*; Segment 3).

Formal protected species surveys have not been conducted for the project; as such, it is possible that additional protected species could be present where suitable habitat is available within the ROI. Prior to construction, the applicant could be required to conduct field surveys in coordination with the United States Fish and Wildlife Service and DNR for the potential presence of protected species.

The DNR has established several classifications for sensitive ecological resources across the state, many of which are located within the ROI, including a Scientific and Natural Area (Segment 1), designated old growth (Segment 1), Sites of Biodiversity Significance (all four segments and Route Segment 17), native plant communities (all four segments and Route Segment 17), railroad rights-of-way prairies (Segment 2 and Route Segment 17), and Lakes of Biological Significance (Segment 1, Segment 3, and Route Segment 17).

Soils

Impacts to soils within the ROW are unavoidable but can be minimized and mitigated. Common soil impacts include rutting, compaction, and erosion. Potential impacts would be short-term during construction. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicant would grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicles trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored in suitable location. Disturbed areas would be promptly seeded after construction. The applicant would obtain a NPDES/State Disposal System Construction Stormwater Permit from the Minnesota Pollution Control Agency and develop a Stormwater Pollution Prevention Plan.

Surface Water

The ROI for surface water is the route width. Direct impacts caused by structures placed in surface waters would be avoided by spanning surface waters. Direct impacts to other resources can cause indirect impacts to surface waters. For example, construction activities near surface waters could cause riparian vegetation disturbance and surface erosion, which can lead to runoff impacting surface waters. Impacts to surface waters could be avoided by prudent routing, selecting the routes that cross the fewest watercourses, waterbodies, or special or impaired waters or selecting routes where existing ROW is already present. All watercourses and waterbodies would be spanned and no in-water work would occur as a result of the project.

Several watercourses intersect the project, many of which are designated as public watercourses in the Public Waters Inventory (PWI) and are also classified as impaired waters. Major watercourses that intersect the project include the Cannon River, Zumbro River, Straight River, and the Mississippi River. The anticipated alignments in all four segments and Route Segment 17 would cross perennial, intermittent, and/or ephemeral watercourses. In some segments, a particular alternative has more watercourse crossings than others, while in other segments alternatives have a similar amount of watercourse crossings. None of the watercourses crossed by the alternatives in all four segments and Route Segment 17 are designated as Outstanding Resource Value Waters. The anticipated alignments in Segment 3 and Route Segment 17 would cross designated trout streams, East Indian Creek, Snake Creek, and an unnamed creek in Segment 3 and Tompkins Creek in Route Segment 17. The anticipated alignment for Segment 3 also crosses the Mississippi River, which is a Section 10 navigable water.

Waterbodies are sparsely scattered throughout the project, many of which are PWI water basins and/or listed as impaired waters. With the exception of Segment 2, alternatives in all segments and Route Segment 17 would cross waterbodies, with Segment 1 crossing the most. Both Segment 1 North and Segment 1 South would cross waterbodies that are greater than 1,000 feet wide (e.g., Eagle Lake) and could require placement of structures within them if they cannot be spanned.

In many situations watercourse and waterbody crossings occur in a location where there is an existing transmission line, thereby minimizing impacts associated with new crossings.

Vegetation

The ROI for vegetation is the ROW. Potential short-term impacts on vegetation, such as clearing, compacting, or otherwise disturbing vegetation, could occur during construction and maintenance activities. Potential long-term impacts on vegetation would occur where structures are located or where conversion of forested vegetation to low-growing vegetation would be required. Impacts would be localized, and unavoidable. Impacts to vegetation are primarily evaluated by examining vegetative landcover types within the ROW. Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation.

Most of the existing vegetation in the ROW across all four segments and Route Segment 17 consists of herbaceous agricultural vegetation. Forested vegetation is present within the ROW of all alternatives across all four segments and Route Segment 17. However, for the most part, alternatives intersect forested vegetation in areas where forest fragmentation has already occurred as a result of existing transmission line or road rights-of-ways. However, there are a few situations (e.g., Segment 4) where an alternative would be routed through a forested area where an existing corridor does not exist.

Wetlands

The ROI for wetlands is the route width. Impacts to wetlands are evaluated by examining wetland types, sizes, and potential for spanning. Localized direct impacts to wetlands would include vegetation clearing, movement of soils, and construction traffic which could alter or impair wetland function. Forested wetlands would be subject to permanent impacts given their conversion to non-forested wetlands. Wetland crossings longer than 1,000 feet for Segment 1 through 3 and longer than 700 feet for Segment 4 might require one or more structures to be placed in the wetland, resulting in small, localized permanent wetland impacts. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by selecting an alternative with fewer forested wetlands in the ROW.

The USFWS National Wetlands Inventory (NWI), as updated by the DNR, identifies numerous wetland complexes and small isolated wetlands throughout the ROI in all four segments and Route Segment 17. The alternatives in all four segments and Route Segment 17 would cross wetlands, with most wetland acreage consisting of non-forested wetland communities. Anticipated alignments in all four segments and Route Segment 17 could require crossing wetlands that are too wide to span.

Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width. Potential short-term, localized impacts could occur from displacement during construction or maintenance activities. Potential long-term impacts could occur as a result of habitat loss, conversion, or fragmentation. Impacts to wildlife and wildlife habitat are assessed by considering wildlife inhabiting the ROI as well as evaluating the presence of potential wildlife habitat within the ROI. Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife and wildlife habitat.

Wildlife inhabiting the ROI are typical of those found in disturbed habitats associated with agriculture and rural and suburban development. Watercourses and waterbodies, and areas of natural vegetation, such as wetlands, forested areas, and open herbaceous areas, also provide habitat for wildlife in the area.

Several lands that are preserved or managed for wildlife and associated habitat are scattered throughout the project and intersected by the ROI of alternatives, including DNR Wildlife Management Areas (Segment 1, Segment 2, and Segment 3), DNR state game refuges (Segment 1 and Route Segment 17), DNR Aquatic Management Areas (Segment 1), DNR-designated shallow wildlife lakes (Segment 1 and Route Segment 17), USFWS Grassland Bird Conservation Areas (Segment 1, Segment 2, Segment 4, and Route Segment 17), USFWS Waterfowl Production Areas (Segment 1), USFWS National Wildlife Refuge (Segment 3), National Audubon Society Important Bird Areas (Segment 1 and Segment 3), and DNR Wildlife Action Network corridors (all four segments and Route Segment 17).

1 Introduction

The Department of Commerce (Department) prepared this environmental impact statement (EIS) on behalf of the Minnesota Public Utilities Commission (Commission) for the Mankato to Mississippi River 345 kV Transmission Line Project (project). The project is proposed by Northern States Power Company, doing business as Xcel Energy (applicant). It is anticipated that portions of the project would either be individually or jointly owned by Xcel Energy, Dairyland Power Cooperative, Southern Minnesota Municipal Power Agency, and the City of Rochester, Minnesota, acting through its Public Utility Board (collectively, Joint Utilities); however, the applicant is Xcel Energy. This EIS evaluates the potential human and environmental impacts of the project and possible mitigation measures, including route and alignment alternatives. Additionally, it evaluates alternatives to the project itself.

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

1.1 Project Purpose and Transmission System Congestion Concerns

Over the past decades, the generation mix in Minnesota and surrounding states has dramatically shifted from relying primarily on coal and nuclear generation resources to a more diverse generation mix that includes increasing amounts of renewable energy, including wind and solar generation. During this energy transition, the system may also need to rely on other types of generation resources, such as combined cycle generation. These changes in electrical generation have implications for the transmission system, including the need for additional transmission capacity to deliver energy to load centers.

Outlets for renewable energy in Minnesota and North and South Dakota are needed in southern Minnesota, which is a nexus between the significant renewable generation resources in Minnesota and North and South Dakota, the regional load center of the Twin Cities, and additional load centers further east in Wisconsin. During periods when there is high renewable generation output in southwestern Minnesota and northwestern Iowa, there are overloads on several 345 kilovolt (kV) transmission lines and substation transformers in southern Minnesota. The project would provide additional transmission capacity to relieve these overloads. The project would also strengthen existing generation outlets towards load centers in Wisconsin and areas to the south.

When defining the purpose of the project for this EIS, the Department's Energy Environmental Review and Analysis (EERA) unit staff referred to the joint certificate of need application and route permit application. The purpose of the project is to construct a high-voltage transmission line (HVTL) to provide additional transmission capacity to reduce congestion and to improve electric system reliability throughout the region as more renewable energy resources are added to the system. The need for the project is discussed in Section 4.1.

1.2 Project Description

The project consists of three major components: (1) approximately 130 miles of new 345 kV HVTL, (2) approximately 20 miles of new 161 kV HVTL, and (3) upgrades to existing substations.

The project consists of four segments:

- Segment 1: a new 48-to-54-mile 345 kV transmission line between the Wilmarth substation and a point near the West Faribault Substation.
- Segment 2: a new 34-to-42-mile 345 kV transmission line from a point near the existing West Faribault Substation to the existing North Rochester Substation.
- Segment 3: conversion of 27 miles of existing, double-circuit 161/345 kV transmission line to 345/345 kV operation and installation of a new 16-mile long 345 kV circuit on the existing 345/345 kV double-circuit capable structures between the existing North Rochester Substation and the Mississippi River.
- Segment 4: a new 20-to-24-mile 161 kV transmission line between the existing North Rochester Substation and the existing 161 kV Chester Line northeast of Rochester.

Additional information describing the four segments is provided in Section 3.1. The applicant-proposed segments traverse Blue Earth, Le Sueur, Waseca, Rice, Steele, Dodge, Goodhue, Olmsted, Winona, and Wabasha counties in Minnesota (Map 1).

The project also includes upgrades at the Wilmarth Substation and North Rochester Substation. Additionally, modifications to the Eastwood Substation are possible depending upon the route selected. Additional information regarding the potential upgrades is provided in Section 3.2.2.

1.3 State of Minnesota’s Role

Minnesota needs the public’s help to make an informed decision.

In Minnesota, the Commission determines whether specific transmission lines are needed by the state and, if so, where they should be located. As such, the applicant must obtain two approvals from the Commission for the project: a certificate of need and a route permit.

The applicant filed a joint certificate of need application and route permit application on April 2, 2024. The certificate of need process is discussed in Section 2.1; the route permit process is discussed in Section 2.2. The Commission directed joint proceedings to be held on the certificate of need application and the route permit application on June 26, 2024 (reference (1)).

With this joint proceeding, the Commission has before it two distinct considerations: (1) whether the proposed project is needed or whether some other project would be more appropriate for the state of Minnesota (for example, a project of a different type or size, or a project that is not needed until further into the future), and (2) if the proposed project is needed, where should it be located.

To help the Commission with its decision-making and to allow for a fair and robust airing of the issues, the state of Minnesota has set out a process for the Commission to follow in making its decisions. This process requires (1) the development of an EIS and (2) hearings before an administrative law judge (Minnesota Statutes § 216B and 216E). The purpose of the EIS is to describe the potential human and environmental impacts of the project ("the facts"); the purpose of the hearings is to allow individuals to advocate, question, and debate what the Commission should decide about the project ("what the facts mean"). The entire record developed in this process—the EIS and the report from the administrative law judge, including all public input and testimony—is available to the Commission when it makes its decisions on the applicant's joint certificate of need application and route permit application.

1.4 Public Hearings

Public hearings will be held in the project area and virtually. You can provide comments on this draft EIS either at a hearing or as part of the associated comment period. Your input on the draft EIS will be incorporated into a final EIS. An administrative law judge (ALJ) will consolidate public comments, prepare a report, and make a recommendation for the Commission to consider. The Commission will then review the record and decide whether to grant a routing permit.

With the draft EIS complete and made available, a public comment period is now open. Public hearings will be held in the project area to allow for public comments on the draft EIS and other issues related to the project. Comments received on the draft EIS will be saved in Appendix A. EERA staff will respond to substantive comments received and incorporate your input on the draft EIS into the final EIS as appropriate and consistent with the scoping decision.

Following the publication of the final EIS and the close of the comment period concerning EIS adequacy, supplemental party filings may be completed. The ALJ will then submit its report and a recommendation to the Commission. The record developed during this process – including public input – will be available to the Commission when it makes its permit decisions. More information on this process is available in Chapter 2.

The Commission is expected to make permit decisions in late 2025.

1.5 Organization of Environmental Impact Statement

This EIS is based on the applicant's joint certificate of need application and route permit application, public comments received during the scoping period for this EIS, and input from the Commission. The project has been divided into four segments (Map 1) which are further described in Chapter 3. Potential human and environmental impacts are discussed for each segment within their own chapter. The EIS addresses the matters identified in the scoping decision for this project (Appendix B).

1.6 Sources of Information

The primary sources of information for this EIS are the joint certificate of need application and route permit application submitted by the applicant. Additional sources include new information provided by the applicant and information from relevant federal and state environmental review documents for similar projects. Additionally, spatial data was used as available publicly or through established license agreements (Appendix C). Unless otherwise noted, URL addresses were current as of November 21, 2024.

1.7 Additional Information

For additional information, don't hesitate to contact the Commission or Department staff. If you would like more information or if you have questions, please contact the Commission staff: Cezar Panait (cezar.panait@state.mn.us), (651) 201-2207; or Department staff: Rich Davis (richard.davis@state.mn.us), (651) 539-1846.

Project documents, including the joint certificate of need application and route permit application, can be found on eDockets at https://www.edockets.state.mn.us/documents by searching "22-532" or "23-157" in the Docket # field. Information is also available on the Department webpage: https://apps.commerce.state.mn.us/web/project/15507.

2 Regulatory Framework

The project requires two approvals from the Commission: a certificate of need and a route permit. The project will also require approvals from other state and federal agencies with permitting authority for actions related to the project.

2.1 Certificate of Need

Construction of a large energy facility in Minnesota requires a certificate of need from the Commission (Minnesota Statute § 216B.243). The project, a 345 kV transmission line with a proposed length of approximately 130 miles, meets the definition of a large energy facility and requires a certificate of need. The applicant filed a joint certificate of need and route permit application on April 2, 2024. The Commission accepted the application as complete and authorized use of informal proceedings for developing the record on June 26, 2024 (reference (1)).

2.1.1 Certificate of Need Criteria

The Commission must determine whether the project is needed or if another project or no project at all would be more appropriate for the state of Minnesota. In making its decision, the Commission must consider the following factors in its decision to grant a certificate of need (Minnesota Rules 7849.0120):

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

If the Commission determines that the applicant has met these criteria, it will grant a certificate of need.

The Commission's certificate of need decision determines the type of project, the size of the project, and the project's starting and ending points. The Commission could place conditions on the granting of a certificate of need; likewise, it has discretion to approve the project as proposed or with modifications. If the Commission denies the certificate of need, this indicates that the Commission believes that a more reasonable and prudent alternative is to not build the project (the "no-build alternative," see Section 4.2.1).

Within 12 months of the submission of a certificate of need application, the Commission must approve or deny a certificate of need for the project (Minnesota Statutes § 216B.243). The Commission may extend this time if it has good cause.

2.2 Route Permit

In Minnesota, an HVTL is a "conductor of electric energy and associated facilities designed for and capable of operating at a nominal voltage of 100 kilovolts or more" (Minnesota Rules 7850.1000, subpart 9). Construction of an HVTL requires a route permit from the Commission (Minnesota Statute § 216E.03). The project includes a 345 kV HVTL and a 161 kV HVTL that meet this definition and, therefore, require a route permit from the Commission. The applicant filed a joint certificate of need and route permit application on April 2, 2024. The Commission accepted the application as complete on June 26, 2024.

The route permit supersedes and preempts all zoning, building, and land-use regulations promulgated by local units of government (Minnesota Statute § 261E.10). The project also requires approvals (for example, permits, licenses, etc.) from other state agencies and federal agencies with permitting authority for specific resources (for example, the waters of Minnesota).

2.2.1 Route Permit Criteria

The Commission is charged with selecting transmission line routes that minimize adverse human and environmental impacts while ensuring electric power system reliability and integrity. Route permits issued by the Commission include a permitted route and anticipated alignment, as well as conditions specifying construction and operation standards.

Minnesota Statute § 216E.03 identifies factors that the Commission must consider when designating transmission line routes, including minimizing environmental impacts and minimizing human settlement and other land-use conflicts. Minnesota Rules 7850.4100 lists 14 factors for the Commission to consider when making a decision on a route permit:

A. Effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation and public services.
B. Effects on public health and safety.
C. Effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining.
D. Effects on archaeological and historic resources.
E. Effects on the natural environment, including effects on air and water quality resources and flora and fauna.
F. Effects on rare and unique natural resources.
G. Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity.

H. Use or paralleling of existing right-of-way (ROW), survey lines, natural division lines, and agricultural field boundaries.
I. Use of existing large electric power generating plant sites.
J. Use of existing transportation, pipeline, and electrical transmission systems or ROWs.
K. Electrical systems reliability.
L. Costs of constructing, operating, and maintaining the facility which are dependent on design and route.
M. Adverse human and natural environmental effects which cannot be avoided.
N. Irreversible and irretrievable commitments of resources.

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

The Commission is charged with making a final decision on a route permit within 12 months after finding the route permit application complete. The Commission may extend this time limit for up to three months for just cause or upon agreement of the applicant.

2.3 Eminent Domain

If a certificate of need and route permit are issued by the Commission, the applicant could exercise the power of eminent domain to acquire land for the project (see Section 3.3.2 for additional information regarding ROW acquisition and eminent domain).

2.4 Environmental Review

Environmental review informs the Commission's permit decisions. It calls attention to potential impacts and possible mitigation measures associated with the project and provides opportunities for public involvement.

2.4.1 Environmental Impact Statement

An EIS describes and analyzes the potential human and environmental impacts of a project and possible mitigation measures, including alternatives to the project. It does not advocate or state a preference for a specific alternative. Instead, it analyzes and compares alternatives so that citizens, agencies, and governments can work from a common set of facts.

Before the Commission makes a final decision on a route permit, it must determine whether the EIS for the project is adequate (Minnesota Rules 7850.2700).

When there are two decisions before the Commission for a single transmission line project—a certificate of need and a route permit—the environmental review required for each application may be combined. For this project, the Commission has authorized the Department to combine the environmental reviews required for the certificate of need and route permit. Thus, the Department is developing a combined EIS—an EIS that addresses both the certificate of need and route permit applications. The Office of Administrative Hearings (OAH) will also hold joint public hearings for the certificate of need and route proceedings.

2.4.2 Scoping

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

During scoping, Commission and Department staff gathered input on the scope of the EIS through seven public scoping meetings and an associated comment period. Five of the meetings were in-person; two meetings were virtual. The scoping meetings occurred on:

- July 8, 2024, in Mankato and Waterville
- July 9, 2024, in Faribault and Pine Island
- July 10, 2024, in Kellogg
- July 11, 2024 (two virtual meetings)

Approximately 195 people in total attended the scoping meetings. Thirty-three individuals provided verbal comments at the public meetings.

A 38-day comment period, which closed on August 1, 2024, provided an opportunity to submit written comments on potential impacts and mitigation measures for consideration in the scope of the EIS. A total of 63 written comments[1] were received during the comment period, nine of which were from local units of governments and state agencies. The remaining comments were received from: Citizens for Environmental Rights and Safety, F.H. Holding LLC, Rochester Archery Club, Xcel Energy, and individual members of the public. Scoping comments directly informed development of the alternatives.

Department staff provided a summary of the scoping process to the Commission and an opportunity for the Commission to comment on the alternatives to study in the EIS. The Commission concurred with the Department's recommendations regarding the alternatives to carry forward for study in the EIS. The Commission also recommended one additional alternative (Appendix D).

[1] [PUBLIC COMMENT--COVER LETTER - AFFIDAVIT - SERVICE LISTS], 0249-210198-04 [PUBLIC COMMENTS 1-26], 20249-210198-06 [PUBLIC COMMENTS 27-49], 20249-210198-08 [PUBLIC COMMENTS 50-96]).

The Department issued a scoping decision on December 2, 2024 (Appendix B). The scoping decision identified the segments and alternatives (route segments and alignment alternatives) for evaluation in the EIS. EERA staff provided notice of the scoping decision to those persons on the project mailing list and to landowners along the alternatives newly proposed during the scoping process. Based on the scoping decision, EERA staff prepared this EIS.

EERA staff issued this draft on May 5, 2025. The EIS is issued in draft form so that it can be improved through public comment. Members of the public can provide comments on this draft EIS in writing or in the public hearings being held for the project. Timely, substantive comments received during the comment period will be included in a final EIS along with the responses to the comment and revision to the draft EIS as appropriate. The draft and final EIS will be entered into the records for these proceedings so they can be used by the Commission in making decisions about the project.

2.5 Public Hearings

Prior to the close of the comment period on the draft EIS, an ALJ from the OAH will preside over hearings held in the project area. The hearings will address the need for the project (certificate of need) and, if needed, the most appropriate location for the project (route permit). At these hearings, citizens, agencies, and governmental bodies will have an opportunity to submit comments, present evidence, and ask questions. Citizens can advocate for what they believe is the most appropriate route for the project and for any conditions to include in a route permit. After the public hearings, an evidentiary hearing will be held in Saint Paul, Minnesota. The ALJ will submit a report to the Commission with findings of fact, conclusions of law, and recommendations regarding a certificate of need and a route permit for the project.

2.6 Commission Decision

After considering the entire record, including the final EIS, input received during the hearings, and the ALJ's findings and recommendations, the Commission will determine whether to grant a certificate of need for the project as proposed, grant a certificate of need contingent upon modifications to the project, or deny the certificate of need. The Commission may also place conditions on the granting of a certificate of need.

If a certificate of need is granted, the Commission will also determine the route for the transmission line. Route permits include a permitted route and an anticipated alignment, as well as conditions specifying construction and operating standards. Route permits also typically include mitigation plans and project-specific mitigation measures.

Decisions by the Commission on the certificate of need and route permit applications are anticipated in late 2025.

2.7 Other Permits and Approvals

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

However, several federal, state, and local permits would be required for constructing and operating of the project. All permits subsequent to the issuance of a route permit and necessary for the project must be obtained by the applicant. The information in this EIS may be used by the subsequent permitting agencies as part of their environmental resource impact evaluation for permitting.

2.7.1 Tribal Coordination

As noted in the route permit application, the applicant has notified and engaged with multiple tribes and met with the Prairie Island Indian Community (PIIC). PIIC submitted a comment during scoping[2], noting the planned future development of a PIIC-owned property referred to as Elk Run, crossed by Segment 4 East. The planned development is further discussed in Section 10.5.5. One alternative from scoping, Route Segment 12, which is referred to in the EIS as Segment 4 CapX Co-Locate Option (Section 3.1.5.6), purposefully avoids the property.

The Minnesota Indian Affairs Council (MIAC) and the state archaeologist are the regulators of burial mounds and cemeteries per Minnesota Statute § 307.08. MIAC noted the documented burial mound site Alpha Site 21WBh, which is further discussed in Section 9.8.3.

2.7.2 Federal Approvals

Table 2-1 lists federal permits and approvals that could be required for the project, depending on the final design. The U.S. Army Corps of Engineers (USACE) regulates potential impacts to jurisdictional waters of the United States. Dredged or fill material, including material that moves from construction sites into these waters, could impact water quality. The USACE requires permits for projects that might cause such impacts. The USACE is also charged with coordinating with the State Historic Preservation Office (SHPO) regarding potential impacts to significant cultural resources pursuant to Section 106 of the National Historic Preservation Act (NHPA).

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

[2] [PUBLIC COMMENT--COVER LETTER - AFFIDAVIT - SERVICE LISTS], [PUBLIC COMMENTS 27-49],

pursuant to Section 7 of the Endangered Species Act (ESA) regarding a project's potential to affect federally protected species.

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

Table 2-1 Potential Federal Permits and Approvals Required for the project

Unit of Government	Type of Application	Purpose
U.S. Army Corps of Engineers – St. Paul District	Section 404 Clean Water Act – Discharge of Dredged and Fill Material	Protects water quality through authorized discharges of dredged and fill material into water of the United States
U.S. Army Corps of Engineers – St. Paul District	Section 10 – Rivers and Harbors Act	Protects water quality through authorized crossings of navigable waters[1]
U.S. Fish and Wildlife Service	Migratory Bird Treaty Act Consultation	Review to prevent take of protected migratory bird species
U.S. Fish and Wildlife Service	Threatened and Endangered Species Consultation	Consultation to reach a determination of the effect to federally listed species, including measures for avoidance, minimization, and mitigation as appropriate
U.S. Fish and Wildlife Service	Special Use Permit	For work in Waterfowl Production Areas
Federal Aviation Administration	Part 7460 Review	Review to prevent airspace hazards from structures taller than 200 feet (or meeting height and distance requirements as stated in § 77.9 of FAA Form 7460-1) of a commercial airport

[1] The Mississippi River is the only Section 10 water crossed and the crossing location is already permitted.

2.7.3 State of Minnesota Approvals

Table 2-2 lists permits and approvals that could be required for the project, depending on the final design. The Minnesota Department of Natural Resources (DNR) regulates potential impacts to Minnesota's public lands and waters. The DNR requires a license to cross public lands and waters; licenses may require mitigation measures. Similar to the USFWS, the DNR also encourages consultation with project proposers to ascertain a project's potential to impact state-listed threatened and endangered species and possible mitigation measures.

A general national pollutant discharge elimination system/sanitary disposal system (NPDES/SDS) construction stormwater permit from the Minnesota Pollution Control Agency (MPCA) is required for stormwater discharges from construction sites. A permit is required if a project disturbs one acre or more of land. The general NPDES/SDS permit requires (1) using best management practices, (2) a stormwater pollution prevention plan, and (3) adequate stormwater treatment capacity once the project is constructed. The NPDES/SDS permit serves as the mechanism to maintain state water quality standards.

SHPO is charged with preserving and protecting the state's cultural resources. SHPO consults with project proposers and state agencies to identify cultural resources (for example, through surveys) and to avoid and minimize impacts to these resources.

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

The Minnesota Department of Transportation (MnDOT) requires a two-step process for constructing transmission lines within a Minnesota truck highway ROW. The first step would be to complete an Early Notification Memo (ENM), which details the project so the agency is aware of environmental and other interests related to the project. The second step for receiving a permit from MnDOT includes developing a constructability report. The constructability report is required by Minnesota Statute § 161.45.6 and includes terms and conditions of building the collocated project. The report is required to be approved prior to issuing a permit to use the trunk highway to construct the transmission line. Following the approval of the constructability report, the commissioner would provide advance notice for the project to move forward, preferably a four-year advance notice. The application would be required to comply with all permit conditions outlined in the route permit and comply with MnDOT permit conditions.

Additional permits that may be required by MnDOT include an access driveway and oversized/overweight permits. To access the construction corridor, temporary driveway access locations from state highways may be required. Form 1721 outlines the necessary information to include in the application. In some cases, access from the MnDOT roads may not be permissible where there is controlled access. During construction, oversize/overweight permits would be required. Oversized/overweight permits may be needed to transport mobile cranes, utility poles, construction equipment, and construction materials to the project location. Additional permits may be required for transporting overweight equipment and materials during seasonal road restrictions observed in the spring. Oversized/overweight permits are typically requested by vendors working on the project.

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

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

Unit of Government	Type of Application	Purpose
DNR	License to Cross Public Waters and Public Waters Work Permit	License and permit to prevent impacts associated with crossing public waters
DNR	Water Use (Appropriation) Permit	Authorizes dewatering over 10,000 gallons per day
DNR	State Natural Heritage Information System (NHIS) Review	Consultation to avoid, minimize, and mitigate impacts to state-listed species
MPCA	National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit	Minimizes temporary and permanent impacts to stormwater
MPCA	Section 401 Clean Water Act – Water Quality Certification	Protects water quality by applying state water quality standards to projects
SHPO	Minnesota Statute § 138 (Minnesota Field Archaeology Act and Minnesota Historic Sites Act)	Oversees adequate consideration of impacts on significant cultural resources
MDA	Agricultural Impact Mitigation Plan	Establishes measures for protecting agricultural resources
MnDOT	Utility Permit	Authorizes accommodation of utilities within or crossing highway rights-of-way
MnDOT	Driveway Access	Authorizes access to driveways along highways
MnDOT	Oversize/Overweight Permit	Authorizes the use of roads for oversized or overweight vehicles
BWSR	Wetland Conservation Act, Conservation Reserve Enhancement Program (CREP)/ Reinvest in Minnesota (RIM) Conservation Easement authorizations	Coordination with BWSR and local governments for conservation of wetlands and CREP/RIM Conservation Easement authorizations

DNR-Minnesota Department of Natural Resources; MPCA-Minnesota Pollution Control Agency ;
SHPO-Minnesota State Historic Preservation Office; MDA-Minnesota Department of Agriculture;
MnDOT-Minnesota Department of Transportation; BWSR-Minnesota Board of Water and Soil Resources

2.7.4 Local Approvals

Table 2-3 lists permits and approvals that could be required for the project, depending on the final design. The Commission's route permit supersedes local planning and zoning regulations and ordinances. However, the applicants must obtain all local approvals necessary for the project that are not preempted by the Commission's route permit, such as approvals for the safe use of local roads.

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

Table 2-3 Potential Local and Other Permits and Approvals Required for the Mankato to Mississippi River Project

Unit of Government	Type of Application	Purpose
Local/County Governments	Road Crossing, Driveway, and Oversize or Overweight permits	Permits from local governments to coordinate proper use of local roads and lands
Other utilities (pipelines, railroads, etc.)	Crossing Permits/Agreements/Approvals	Notifications to railroads and utilities

2.7.5 Conservation Programs

There are lands throughout the project area that are part of various conservation programs, including but not limited to the RIM and Conservation Reserve Enhancement Program (CREP). Conservation easements, such as CREP and RIM, were avoided as a routing constraint, as noted in the joint certificate of need application and route permit application. If crossed, the application would be required to work with landowners, local governmental entities administering such programs, and sponsoring federal agencies on a site-specific basis to coordinate the approvals necessary for placing the project on these lands.

2.7.6 Electric Safety and Reliability Codes

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

The NESC is designed to protect human health and the environment. The standards confirm that transmission lines and associated facilities are built from materials that will withstand the operational stresses placed upon them over the expected lifespan of the equipment, provided that routine maintenance is performed.

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

3 Project Overview and Alternatives

The applicant proposed to construct approximately 130 miles of new 345 kV transmission line between the Wilmarth Substation in Mankato, Minnesota and the Mississippi River near Kellogg, Minnesota, and a new, approximately 20-mile 161 kV transmission line between the North Rochester Substation near Pine Island, Minnesota and an existing transmission line northeast of Rochester, Minnesota. Substations subject to potential upgrades or modifications are described in Section 3.2.2.

The new transmission line to be constructed has been divided into four segments: Segment 1 (Section 3.1.1), Segment 2 (Section 3.1.2), Segment 3 (Section 3.1.4), and Segment 4 (Section 3.1.5). The applicant proposed two alternatives for each segment, with the exception of Segment 3 (Map 1). The applicant-proposed segments are referred to as Segment 1 North, Segment 1 South, Segment 2 North, Segment 2 South, Segment 3, Segment 4 East, and Segment 4 West. During scoping, additional alternatives were recommended (Map 2). Alternatives are described in relation to their associated segment with one exception. Route Segment 17 (Hwy 14 Option), if selected, would replace Segments 1 and 2 (Section 3.1.3) and is therefore associated with two segments instead of one.

The Commission could select any combination of these segments. This chapter describes the applicant-proposed segments and their alternatives, which are also summarized in Appendix D. This chapter also describes how the project will be designed, constructed, operated, and maintained. Unless otherwise noted, the source of information for this chapter is the joint certificate of need application and route permit application, and supplemental information provided by the applicant (Appendix E).

3.1 Segments and Alternatives

3.1.1 Segment 1, Mankato (Wilmarth Substation) to Faribault (West Faribault Substation)

Segment 1 would be a new 345 kV transmission line that would run from the Wilmarth Substation in the city of Mankato to a point near the West Faribault Substation near the city of Faribault. The applicant proposed two potential options for Segment 1: Segment 1 North (48.1 miles) and Segment 1 South (53.6 miles) (Map 1). Alternatives to Segment 1 are summarized in Table 3-1 and shown in Figure 3-1. Alternatives to Segment 1 North are further described in Sections 3.1.1.1 through 3.1.1.1.4. Alternatives to Segment 1 South are further described in Sections 3.1.1.2.1 through 3.1.1.2.6.

Table 3-1 Segment 1 Alternatives

Segment	Subsegments[1]	Connectors[2]	Alternatives	
			Route Segments[3]	Alignment Alternatives[4]
Segment 1 North	1A, 1L, 1O, 1D, 1E, 1F	None	Route Segment 9, Route Segment 18	Alignment Alternative 2, Alignment Alternative 8
Segment 1 South	1B, 1I, 1J, 1E, 1K, 1M, 1N	None	Route Segment 1, Route Segment 5, Route Segment 6, Route Segment 7, Route Segment 10, Route Segment 11	None

[1] Subsegments listed in this column indicate the smaller pieces of the segments as named by the applicant in the joint certificate of need application and route permit application.
[2] Connectors, where present, connect the north and south options.
[3] The term "route segment" is used to describe an alternative that is outside of the route width of Segment 1 North and Segment 2 South.
[4] The term "alignment alternative" is used to describe an alignment alternative that deviates from the proposed centerline but falls within the defined route width.

Figure 3-1 Segment 1, Mankato (Wilmarth Substation) to Faribault (West Faribault Substation)

3.1.1.1 Segment 1 North

Segment 1 North follows existing Xcel Energy transmission lines from the Wilmarth Substation until it ends near the West Faribault Substation (Figure 3-1). Nearly all of Segment 1 North (96%) could be double-circuited with an existing 115 kV line (Map 3).

Segment 1 North heads northeast out of the Wilmarth Substation through a commercial/industrial area, including a crossing of the Summit Avenue Landfill, before continuing east through primarily agricultural land. Because the existing 115 kV transmission line runs along the south edge of the Mankato Regional Airport, and the new 345 kV line cannot be constructed near the airport, the route diverges from the existing transmission line ROW and runs south, paralleling the railroad and another existing 115 kV transmission line where it meets and shares a common segment with Segment 1 South. This common route segment follows the Sakatah Singing Hills State Trail (a paved multi-use recreational trail) east, where it crosses Eagle Lake at its narrowest point. The 345 kV could be double-circuited with an existing 69 kV transmission line in this ROW. After crossing Eagle Lake, Segment 1 North diverges from Segment 1 South, running back north to the first existing 115 kV transmission line ROW. From that point, it would again be double-circuited with the existing 115 kV line for approximately 30.6 miles to Faribault.

The potential alternatives (route segments and alignment alternatives) to Segment 1 North are described in Sections 3.1.1.1.1 through 3.1.1.1.4.

3.1.1.1.1 Route Segment 9

Route Segment 9 is southwest of the city of Faribault and east of Cannon Lake (Map 2). It is 0.9 miles long and would shift the route approximately 600 feet to the east, where it would then reconnect with Segment 1 North. Route Segment 9 was proposed during scoping to minimize tree clearing. The applicant indicated that if Route Segment 9 is chosen, the corresponding portion of the existing 115 kV line would be shifted to the proposed route segment route and be double-circuited with Route Segment 9 (Appendix E).

3.1.1.1.2 Route Segment 18

Route Segment 18 would be a continuation of Route Segment 9, extending further southwest (Map 2). It is approximately 1.6 miles long. It would continue straight to connect with 230th Street West to the south, where it would then turn west to reconnect with Segment 1 North. Route Segment 18 would be further away from Cannon Lake compared to Route Segment 9. The applicant indicated that if Route Segment 18 is chosen, the corresponding portion of the existing 115 kV line would be shifted to the proposed route segment route and be double-circuited with Route Segment 18 (Appendix E).

3.1.1.1.3 Alignment Alternative 2

Alignment Alternative 2 shifts the alignment of Segment 1 North to the east side of 589th Avenue (Map 2). This alignment alternative would avoid a new development that has broken ground in the same location as the proposed alignment for Segment 1 North. It was proposed by the applicant during scoping.

3.1.1.1.4 Alignment Alternative 8

Alignment Alternative 8 starts east of Echo Avenue and would traverse 0.2 miles northeast, where it would reconnect with Segment 1 North (Map 2). The alignment alternative would avoid tree removal near a steep hill along Segment 1 North.

3.1.1.2 Segment 1 South

Segment 1 South generally follows existing 115 kV and 69 kV transmission lines from the Wilmarth Substation to near the West Faribault Substation (Figure 3-1). More than half of Segment 1 South (69%) could be double-circuited with existing 69 kV and/or 115 kV line (Map 3).

Segment 1 South heads south out of the Wilmarth Substation and would use an existing 115 kV/69 kV double-circuit line ROW which runs south to Highway 14, then follows the south side of the highway and travels east for approximately 4 miles. This would involve rebuilding the existing line and replacing the 69 kV circuit with the new 345 kV line on double-circuit structures with the 115 kV. This option would also require installing equipment at the nearby Eastwood Substation to re-terminate the 69 kV line there instead of at the Wilmarth Substation (Section 3.2.2.2).

Segment 1 South then crosses to the north side of Highway 14 and runs north then east, where it meets and shares a common segment with Segment 1 North. This common route segment follows the Sakatah Singing Hills State Trail east, where it crosses Eagle Lake at its narrowest point. The 345 kV line could be double-circuited with an existing 69 kV transmission line in this ROW. To the east of Eagle Lake, Segment 1 North turns back to the north and Segment 1 South continues east, double-circuited with the existing 69 kV line. In locations where the existing 69 kV lines could be double-circuited with the new 345 kV line east of Eagle Lake, the alignment is typically shifted slightly from the existing alignment due to the wider ROW requirement for 345 kV transmission lines.

Due to routing constraints from existing residential and commercial development, Segment 1 South also diverges from the existing transmission line ROW at the city of Madison Lake, where it traverses around the city, eventually rejoining the 69 kV ROW east of town and continuing east along Highway 60.

At the Blue Earth and Le Sueur County boundary, Segment 1 South turns to the north and then follows another common ROW with Segment 1 North for approximately 6 miles. This common segment is proposed because the 69 kV line runs through the town of Elysian which is located at a narrow point between two lakes. There is not adequate space for a 345 kV ROW through the town. Segment 1 South turns back to the south at 193rd Avenue, following an existing 69 kV line back to Highway 60.

Once at Highway 60, Segment 1 South turns east and is parallel to Highway 60 for approximately 2.6 miles. For the majority of this part, the anticipated alignment is on the north side of the road, but at one point, it crosses to the south side of the road and then back to the north side of the road to avoid a residence. For its entirety, it could be double-circuited with the existing 69 kV line, and where necessary, the 69 kV line would be relocated to the south side of the road as confirmed by the applicant on January 24, 2025 (Appendix E). Segment 1 South diverges from near where Highway 60 turns north and is offset from Highway 60 for approximately 0.65 miles to avoid two residences. It then eventually rejoins Highway 60, where it runs parallel to it on the north and south sides of the road.

At Waterville's southern edge, Segment 1 South diverges from the existing 69 kV transmission line and Highway 60 ROW, moving south slightly before turning back to the east, following existing property lines and roads and crossing agricultural, open, and forested lands.

Approximately 2 miles east of Morristown, Segment 1 South rejoins the existing 69 kV transmission line ROW, traveling east and then north for about 8 miles to the endpoint for Segment 1 on the west side of Interstate 35 near Faribault. To minimize impacts on existing farmsteads along this route option, the anticipated alignment includes multiple crossings of roads.

3.1.1.2.1 Route Segment 1

Route Segment 1 starts south of the Eastwood Substation in Blue Earth (Map 2). It is approximately 2.8 miles long. It traverses east along Madison Avenue until 594th Avenue, where it turns north, crossing County Highway 14, until it joins Segment 1 South. This route segment was recommended during scoping to avoid impacts to a property the owner indicated was intended for commercial use.

3.1.1.2.2 Route Segment 5

Route Segment 5 is near Walnut Avenue and East Street in the city of Madison Lake (Map 2). Route Segment 5 is approximately 1.3 miles long. This proposed route segment extends east from Segment 1 South at the northeast side of the city. It would extend along the south side of an existing railroad to the west side of 626th Avenue, then continue south to rejoin Segment 1 South.

The applicant proposed Route Segment 5 during scoping in response to MnDOT's comment letter noting the construction of a new commercial store planned along Walnut Avenue that will require the extension of East Street and the installation of turn lanes and sidewalks. The planned development is further described in Section 5.5.5.

3.1.1.2.3 Route Segment 6

Route Segment 6 would follow the Sakatah Singing Hills State Trail (Map 2). It is approximately 3.6 miles long. Route Segment 6 would start at the intersection of 516th street and the Sakatah Singing Hills State Trail and continue east where it would rejoin Segment 1 South near State Highway 60. This route segment is intended to utilize the existing Sakatah Singing Hills State Trail corridor to reduce additional land use conversion, and to move the line away from multiple residences along Highway 60.

3.1.1.2.4 Route Segment 7

Route Segment 7 would be located south of the city of Morristown. It extends north from 260th Street West for approximately a half mile before turning east for approximately 1.5 miles, where it rejoins Segment 1 South at Garfield Avenue (Map 2). The applicant proposed Route Segment 7 during scoping in response to an individual who noted during a scoping meeting that they had begun construction of a new home along 260th Street.

3.1.1.2.5 Route Segment 10

Route Segment 10 would start around 0.5 miles north of 250th Street West and traverse east to Interstate 35, where it would run north and connect with Segment 2 North (Map 2). It is 2.9 miles long. The route segment would avoid potential impacts to existing residences and structures.

3.1.1.2.6 Route Segment 11

Route Segment 11 would start at 245th Street West and continue east to Interstate 35 (Map 2), where it would follow Interstate 35 to the north and connect with Segment 2 North. It is approximately 3.6 miles long. The route segment would avoid potential impacts to existing residences and structures.

3.1.2 Segment 2, Faribault (West Faribault Substation) to Pine Island (North Rochester Substation)

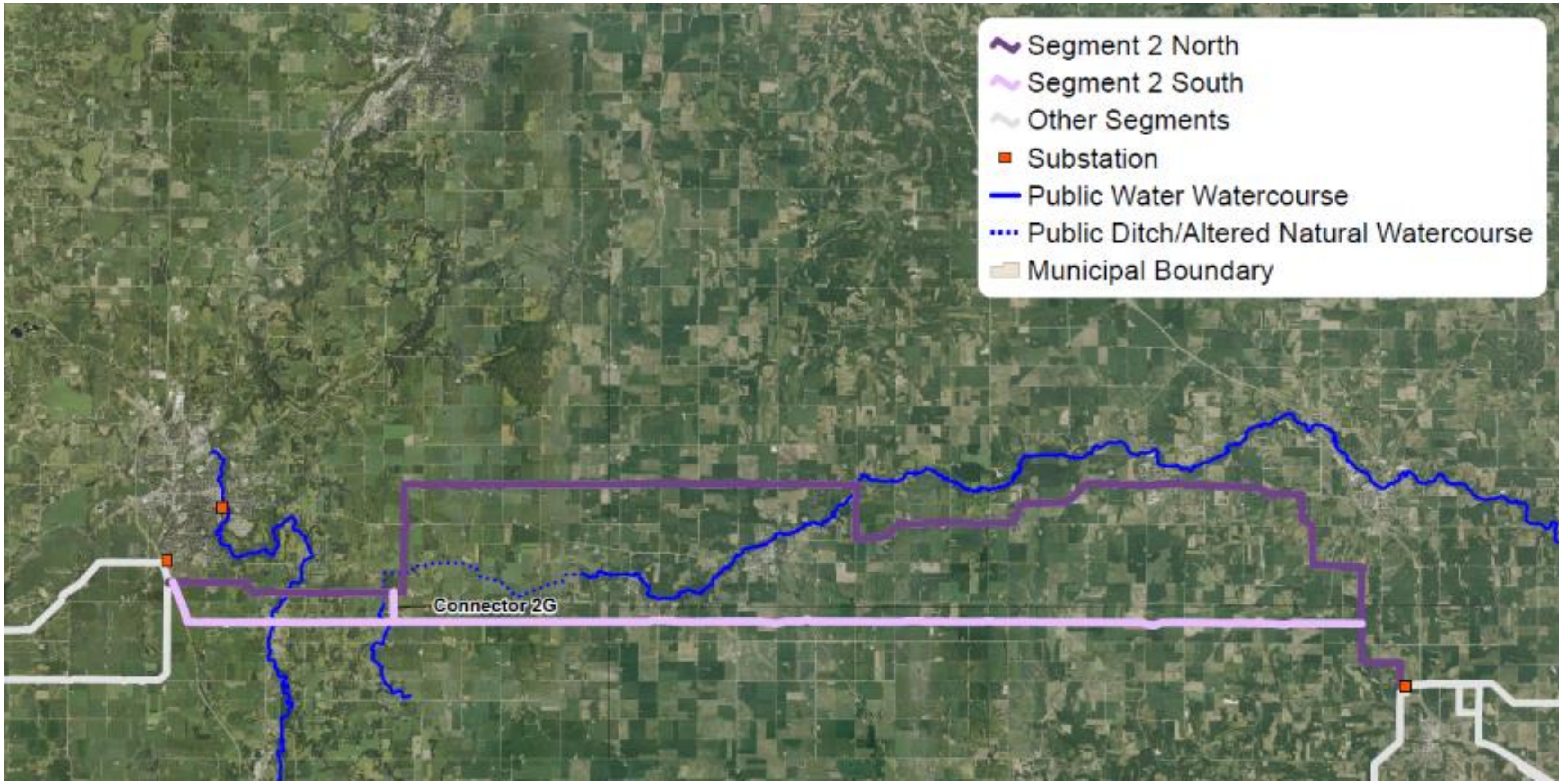
Segment 2 would be a new 345 kV transmission line that would run from a point near the West Faribault Substation, southwest of the city of Faribault, to the North Rochester Substation, just north of the city of Pine Island. The applicant proposed two potential options for Segment 2: Segment 2 North (41.2 miles) and Segment 2 South (33.6 miles) (Map 1). No route segments or alignment alternatives were proposed during scoping for Segment 2. The applicant included Connector 2G in the joint certificate of need application and route permit application. This is the only alternative studied for Segment 2, as summarized in Table 3-2 and shown in Figure 3-2. The potential options for using Connector 2G are discussed in Section 3.1.2.3.

Table 3-2 Segment 2 Routes and Alternatives

Segment	Subsegments[1]	Connectors[2]	Alternatives	
			Route Segments	Alignment Alternatives
Segment 2 North	2A, 2B, 2C, 2D	2G	None	None
Segment 2 South	2A, 2E, 2F, 2D	2G	None	None

[1] Subsegments listed in this column indicate the smaller pieces of the segments as named by the applicant in the joint certificate of need application and route permit application.
[2] Connectors, where present, connect north and south options.

Figure 3-2 **Segment 2, Faribault (West Faribault Substation) to Pine Island (North Rochester Substation)**



3.1.2.1 Segment 2 North

Segment 2 North could be double-circuited with existing 69 kV and 345 kV transmission lines for 69% of its length. The 345 kV double-circuiting occurs on its far eastern end, south of Zumbrota (Map 4).

Starting at the west side of Interstate 35, Segment 2 North heads generally east, crossing Interstate 35 and the Canadian Pacific Rail Systems railroad. The route then continues in a general easterly and northerly direction, crossing primarily agricultural land. Directly east of the railroad, there is a 9.3-mile stretch of Segment 2 North that is interspersed with areas that are not double-circuited nor that parallel existing transportation infrastructure. After crossing Gates Avenue, Segment 2 North joins Xcel Energy's existing 69 kV ROW, where it continues east through agricultural land. This portion of Segment 2 North could be double-circuited with the existing 69 kV line.

Continuing east, the route leaves the existing 69 kV ROW and crosses Highway 56. Segment 2 North continues generally east and then south through primarily agricultural and open land along roadways and crosses the North Branch Zumbro River. This portion of the route would not be double-circuited with an existing transmission line and would parallel existing roads.

After crossing 50th Avenue, Segment 2 North rejoins the 69 kV ROW and continues in a general easterly direction, paralleling Highway 60 and crossing primarily agricultural, residential, and open land. This portion of the route would be built as a double-circuit 345 kV/69 kV. Approximately 1.4 miles west of Zumbrota it leaves the 69 kV ROW and would then be double-circuited with the existing Hampton – La Crosse 345 kV line. For this portion of the route, the new 345 kV line would be placed on the existing double-circuit capable poles. This segment continues in a general southerly direction and crosses primarily agricultural land interspersed with open and forested land and ends at the North Rochester Substation.

3.1.2.2 Segment 2 South

Segment 2 South would be primarily constructed in a new ROW that parallels some (27%) existing infrastructure (transmission lines, roads, or railroads) but mostly (77% in total) parallels property lines (Map 4). A small portion at the east end of Segment 2 South could be double-circuited with an existing 345 kV line on its far eastern end and south of Zumbrota.

Starting on the west side of Interstate 35 near Westwood Park, Segment 2 South follows the same alignment as Segment 2 North for the first 0.1 mile, crossing Interstate 35 and the Canadian Pacific Rail Systems railroad. Segment 2 South then joins an existing 161 kV ROW and travels generally south and east through agricultural land. This portion of the route could be double-circuited with an existing 161 kV line.

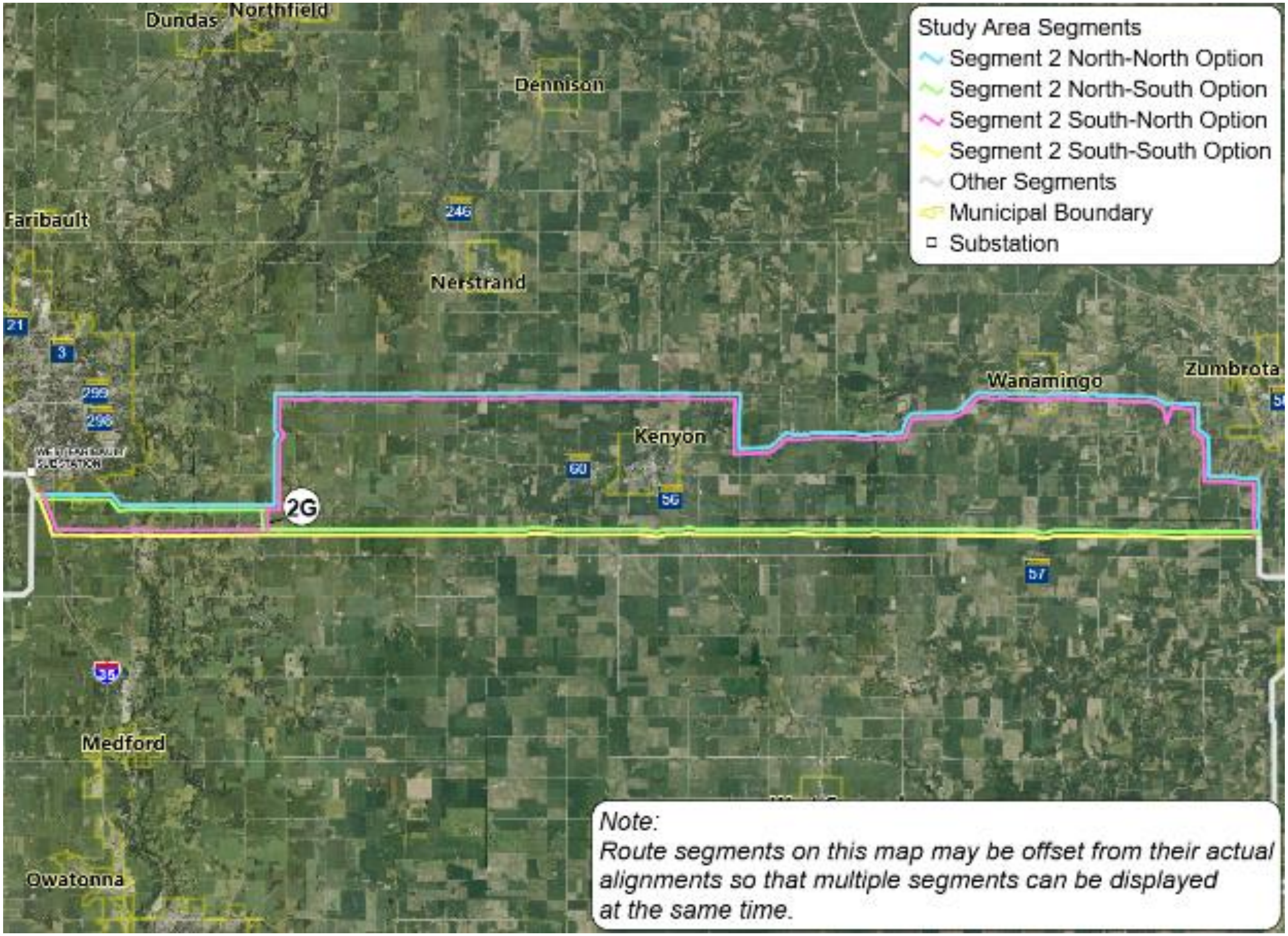
Continuing east, Segment 2 South leaves the existing 161 kV ROW and crosses the Straight River, the Straight River Golf Course, the North Fork Zumbro River, and Highway 56. This portion of the route crosses primarily agricultural land interspersed with forested land. It would not be double-circuited with an existing transmission line and it would require a greenfield ROW. Segment 2 South then joins the existing 345 kV ROW south of Zumbrota and follows the same alignment as Segment 1 North for the remainder of the route. This portion of the route could be double-circuited with the existing 345 kV line and end at the North Rochester Substation.

3.1.2.3 Segment 2 East of Faribault to west of North Rochester Study Area (Connector 2G)

Connectors, where present, connect the north and south options. Connector 2G connects Segment 2 North and Segment 2 South in Rice County (Map 4). It travels north to south across agricultural land. The connector would require a greenfield ROW.

The connector allows for two additional options to be studied beyond the north-north option (this is a subpart of Segment 2 North) and the south-south option (this is a subpart of Segment 2 South). The two new options are shown in Figure 3-3 and would each include a subpart of Segment 1 North and a subpart of Segment 2 South. These four options are collectively referred to as the Segment 2 Faribault (West Faribault Substation) to North Rochester study area.

**Figure 3-3	Segment 2, East of Faribault to west of North Rochester Study Area**



3.1.3 Route Segment 17 (Hwy 14 Option)

Route Segment 17 (Hwy 14 Option) would be a new 345 kV transmission line that would run from the Wilmarth Substation in the city of Mankato, to the Byron Substation, and ultimately to the North Rochester Substation, just north of the city of Pine Island (Figure 3-4). It is an alternative option to Segments 1 and 2 combined. It is referred to as the "Hwy 14 Option" because it would primarily parallel U.S. Highway 14 (Map 5). It is approximately 86.1 miles long and requires a wider ROW and route width (Section 3.3). Route Segment 17 was proposed during scoping to follow U.S. Highway 14 and to avoid agricultural land and natural resources.

At the beginning of Route Segment 14 (Hwy 14 Option), the line could be double-circuited with an existing 161 kV transmission line. Where Route Segment 17 (Hwy 14 Option) runs north/south between the Byron Substation and the North Rochester Substation, double-circuiting with an existing 345 kV transmission line would be possible.

If Route Segment 17 (Hwy 14 Option) were selected by the Commission, the applicant noted two future scenarios that would be potentially applicable to its selection. First, Route Segment 17 (Hwy 14 Option) may need to be connected to the West Faribault Substation in the future. Second, the easternmost part of Route Segment 17 (Hwy 14 Option) that runs north/south could be subject to a congested corridor if additional MISO Tranche 2.1 Portfolio projects are constructed.

Proposed Route Segments 1 and 2 are not connected to the West Faribault Substation; however, as noted in Section 3.2.2, the application noted that the project is designed with options to accommodate future expansion by routing these segments near this substation so that, in the future, the 345 kV line could be connected to the West Faribault Substation. While the future connections to the West Faribault Substation are not included in the scope of this EIS, the applicant noted in their August 28, 2024 response to the scoping comments letter that if the Commission permitted Route Segment 17 (Hwy 14 Option), a possible connection from it to the West Faribault Substation could be required. This new line would be approximately 15 miles in length between Owatonna and Faribault and would be the subject of a separate permit application and environmental review process. The timing for this potential need could be within 10 to 15 years and would be based on a need to connect the 345 kV system to the West Faribault Substation (Appendix E).

The applicant also noted that the MSO Tranche 2.1 portfolio includes a new 345 kV transmission line between the Pleasant Valley Substation and the North Rochester Substation. This new line could be double-circuited with an existing 345 kV line. However, if Route Segment 17 (Hwy 14 Option) is selected for this project, it could be double-circuited with the same 345 kV line that could be used for the Tranche 2.1 project. As such, it would no longer be possible to double-circuit the Tranche 2.1 project, which would negate its potential consideration as a proposed route (Appendix E).

Figure 3-4 Route Segment 17 (Hwy 14 Option)

The applicant initiated MnDOT coordination and submitted an ENM on November 22, 2024. The ENM process is described in Section 2.7.3. The ENM provides an overview of the project and discusses environmental topics; this document is provided in Appendix F. Comments were provided to the applicant by MnDOT on March 10, 2025 (Appendix F). Many of the environmental concerns discussed in the comment letter are being addressed in the EIS. Other concerns raised by MnDOT include coordinating with MnDOT district staff on traffic planning, where land will be exchanged with other local government units, and determining impacts to ROW hydraulics. If Route Segment 17 (Hwy 14 Option) is selected, the next step in the MnDOT process would be for the applicant to develop a constructability report. The report would need to be approved prior to issuing a MnDOT permit to construct the transmission line, and the applicant would be required to comply with MnDOT's conditions.

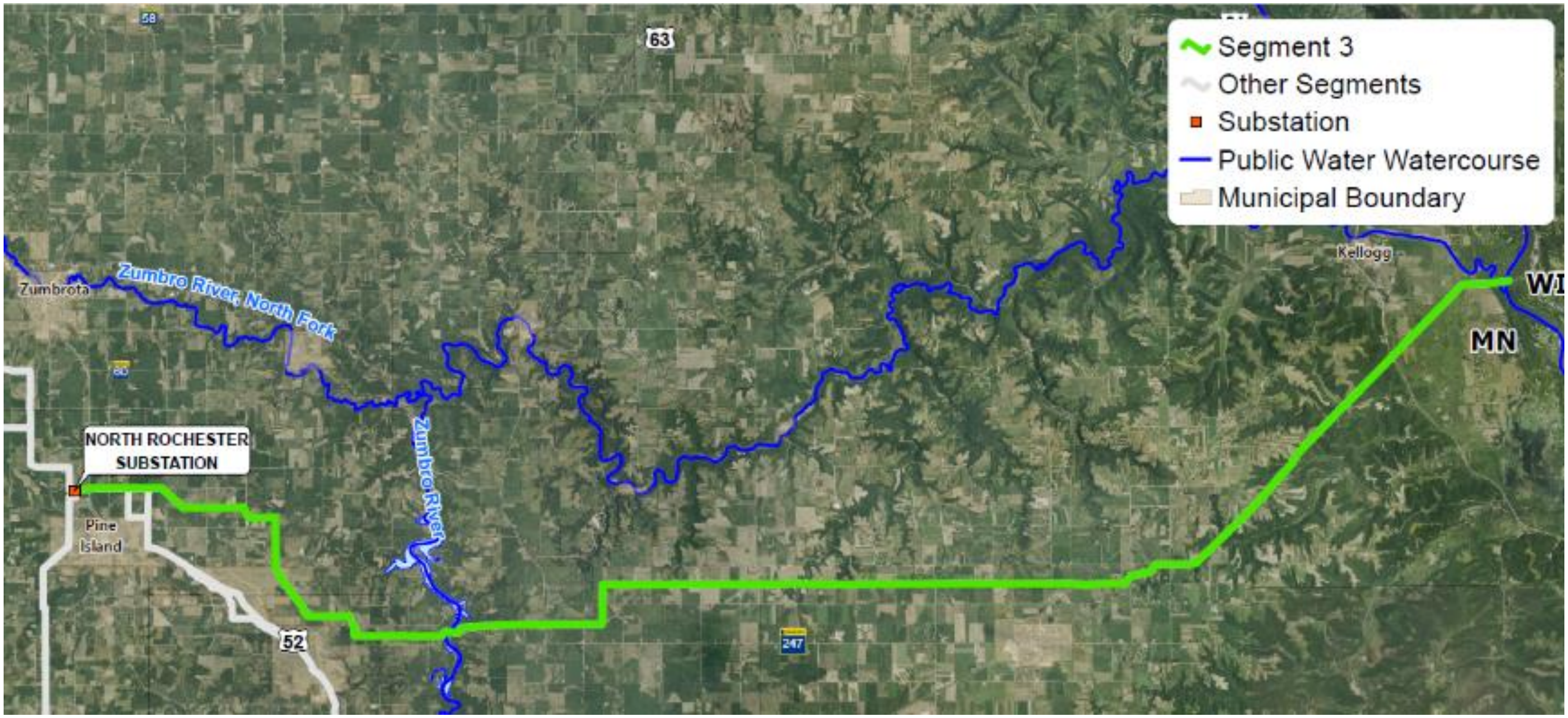
3.1.4 Segment 3, Pine Island (North Rochester Substation) to Mississippi River

Segment 3 would be a new 345 kV transmission line that would run from the North Rochester Substation near Pine Island to the Mississippi River (and Minnesota/Wisconsin border), where it would cross the river at a point near the city of Kellogg (Map 1). Segment 3 is 43.4 miles and could be double-circuited in its entirety (Map 6). The existing double-circuit structures were previously permitted as a 345-kV double-circuit capable line by the Commission as part of the CapX2020 Hampton – La Crosse Project in 2012 (reference (2)). The applicant did not propose an alternative route for Segment 3 because route alternatives to this segment were evaluated during the Hampton – La Crosse Project route permit proceeding. No route segments or alignment alternatives were proposed during scoping for Segment 3.

The westernmost 27 miles of Segment 3 would convert an existing 161 kV transmission line to 345 kV. These 27 miles of 161 kV transmission line would need to be relocated; the relocated part is referred to in the EIS as Segment 4 (161 kV Relocation) and is discussed in Section 3.1.5. The easternmost 16 miles of Segment 3 would involve installing new 345 kV transmission lines on existing transmission structures.

Segment 3 is shown in Figure 3-5. It starts at the North Rochester Substation, then travels in an easterly direction through primarily agricultural land and crosses the Zumbro River. It then turns north and then east through primarily agricultural land. Segment 3 then travels northeast through primarily forested and agricultural land to the Mississippi River.

Figure 3-5 Segment 3, Pine Island (North Rochester Substation) to Mississippi River



3.1.5 Segment 4 (161 kV Relocation)

Segment 4 (161 kV Relocation) would be a new 161 kV transmission line that would replace the portion of the existing North Rochester to Chester 161 kV transmission line that would be displaced by Segment 3, as described in Section 3.1.4. The existing North Rochester to Chester 161 kV transmission line and the portion that would require relocation is shown in Figure 3-6.

The applicant indicated that if Segment 4 West, Segment 4 West Modification, or Segment 4 East were selected, the existing 161 kV line between their starting points and Segment 3 could be removed, but they would require further investigation to confirm future intent first (Appendix E).

Alternatives to Segment 4 are summarized in Table 3-3. Alternatives to Segment 4 West are further described in Sections 3.1.5.1.1 and 3.1.5.3.3. Alternatives to Segment 4 East are further described in Sections 3.1.5.3.1 through 3.1.5.3.2. One alternative for the Segment 4 CapX Co-Locate Option is further described in Section 3.1.5.6.1.

Table 3-3 Segment 4 Routes and Alternatives

Segment	Subsegments[1]	Connectors[2]	Alternatives	
			Route Segments[3]	Alignment Alternatives[4]
Segment 4 West	4K, 4L, 4N, 4H, 4O, 4P	4Q	Route Segment 4M, Route Segment 4R[5]	None
Segment 4 West Modification	Part of 4K, Route Segment 13, part of 4N, 4H, 4O, 4P	4Q	Route Segment 13[6]	None
Segment 4 East	4A, 4B, 4D, 4F, 4G, 4H, 4I, 4J	4Q	Route Segment 4C, Route Segment 4E[5]	Alignment Alternative 16
Segment 4 CapX Co-Locate Option	NA	None	Route Segment 12[7]	Alignment Alternative 15

[1] Subsegments listed in this column indicate the smaller pieces of the segments as named by the applicant in the joint certificate of need application and route permit application.
[2] Connectors, where present, connect north and south options.
[3] The term "route segment" is used to describe an alternative that is outside of the route width of Segment 4 West and Segment 3 East.
[4] The term "alignment alternative" is used to describe an alignment alternative that deviates from the proposed centerline but falls within the defined route width.
[5] Route Segments 4M, R4, 4C, and 4E were included in the application and meet the definition of route segment in that they are alternative outside of the route width of Segment 4 West and Segment 3 East. In the EIS, they are treated the same as route segments recommended by the public during scoping.[6] Route Segment 13 was proposed during scoping by the applicant. It was incorporated into Segment 4 West Modification to allow for analysis in the EIS as one of four main options for relocating the existing North Rochester to Chester 161 kV transmission line that would be displaced by Segment 3.
[7] Route Segment 12 meets the definition of a route segment in that it is located outside of the route width of Segment 4 West and Segment 3 East. However, because in its entirety it represents an alternative option for relocating the existing North Rochester to Chester 161 kV transmission line that would be displaced by Segment 3, it is compared against Segment 4 East, Segment 4 West, and Segment 4 West Modification in the EIS.

Figure 3-6 Existing North Rochester to Chester 161 kV Transmission Line

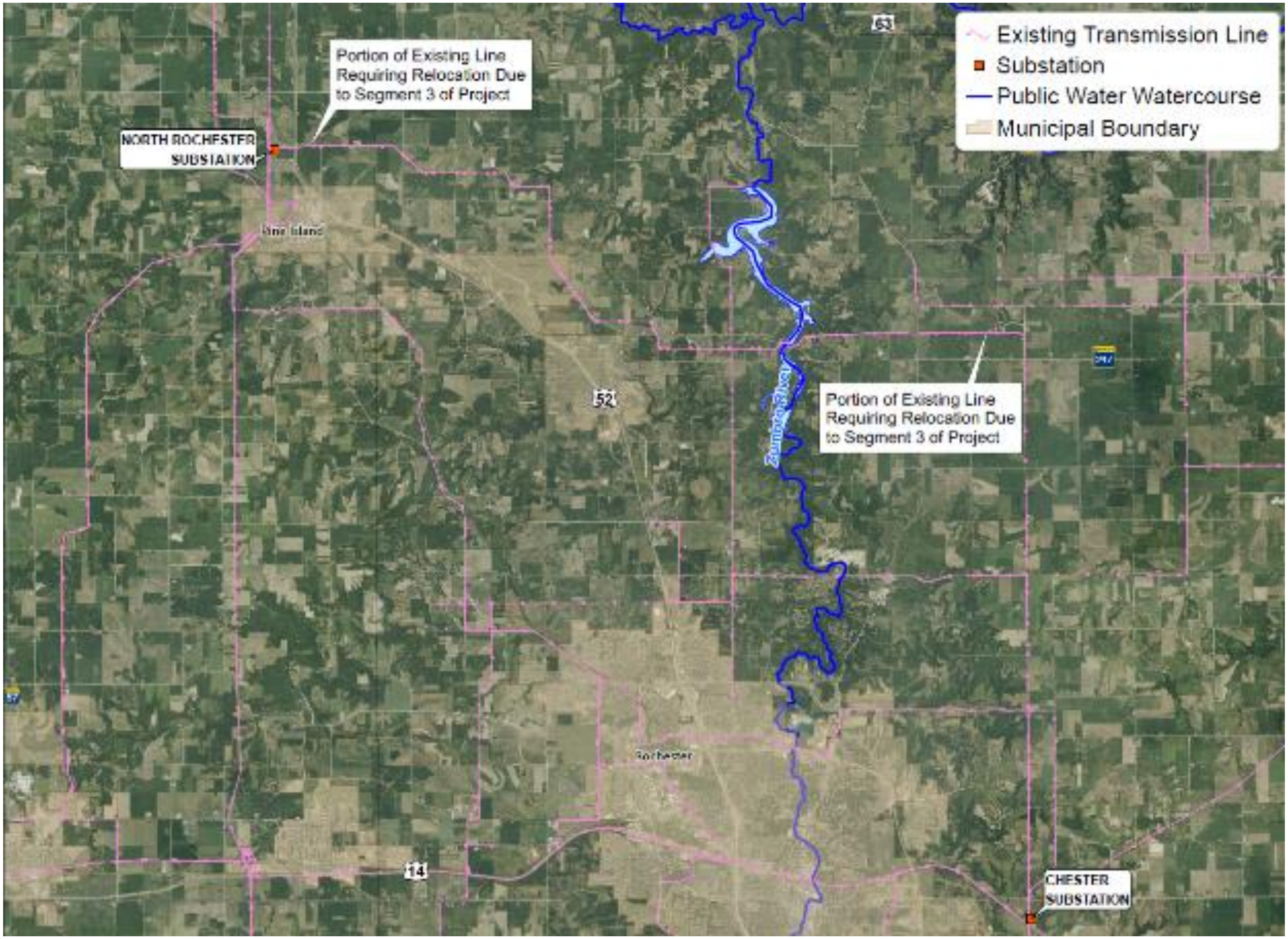
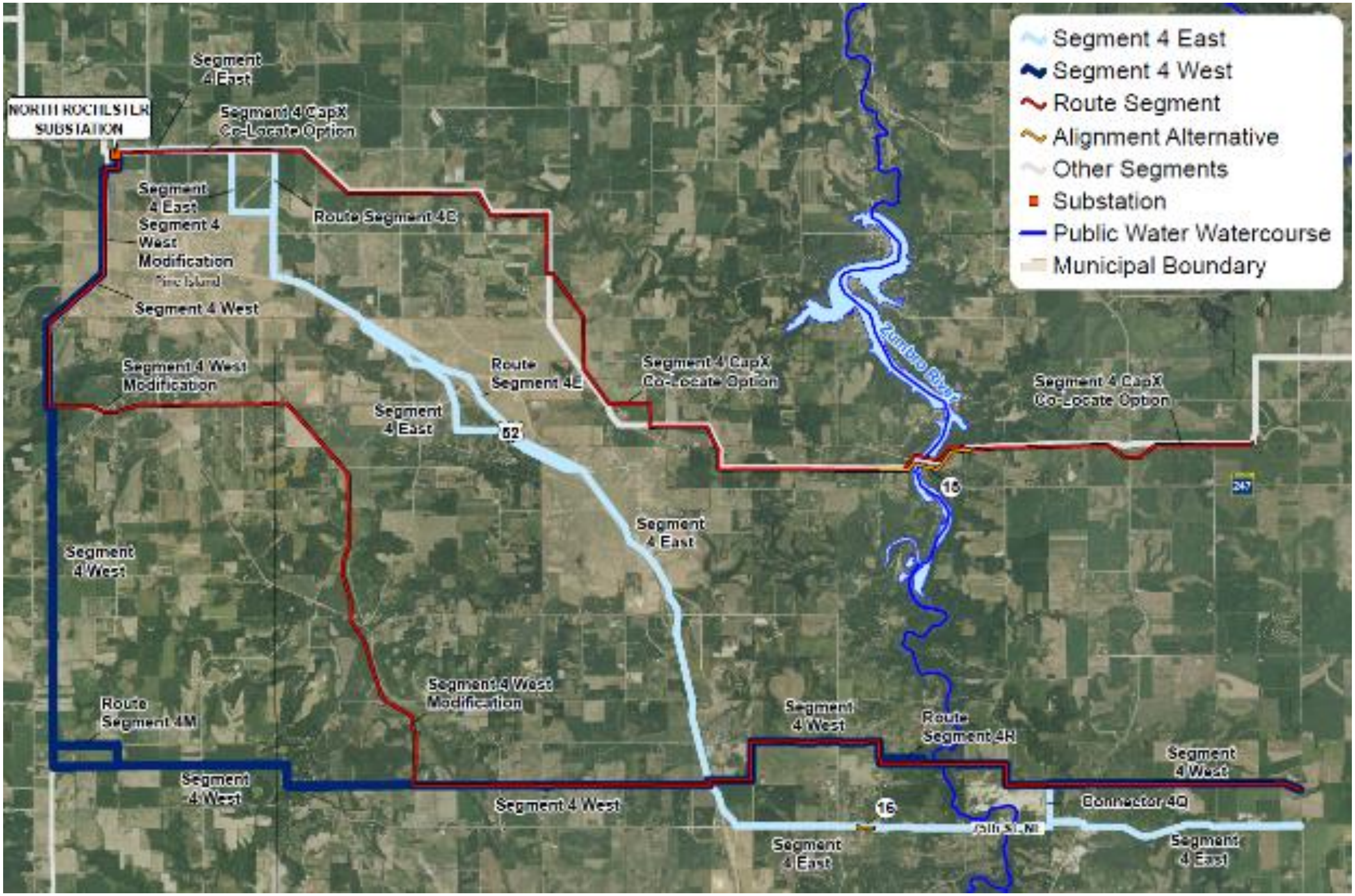


Figure 3-7 Segment 4 Options



3.1.5.1 Segment 4 West

Segment 4 West parallels a combination of roads, property lines, and existing transmission lines for nearly all of its length; it could be double-circuited in part with an existing 161 kV line at its northernmost portion. It has a total length of 23.7 miles. It initiates at 50th Avenue Northeast and continues west, crossing Highway 62, Zumbro River, Highway 52, and South Branch Middle Fork Zumbro River. This east/west portion primarily follows division lines (field, parcel, and section lines). It then generally runs north until its ending point at the North Rochester Substation. This north/south portion parallels existing 161 kV and 345 kV transmission lines (Map 7).

3.1.5.1.1 Route Segment 4M

Route Segment 4M is approximately 1.0-mile long (Map 2). The route segment parallels roads and crosses primarily agricultural and open land along the roadways. The route segment would require a greenfield ROW.

3.1.5.1.2 Route Segment 4R

Route Segment 4R is approximately 0.6-miles long (Map 2). The route segment turns east and then south through primarily open and forested land. The route segment would require a greenfield ROW.

3.1.5.2 Segment 4 West Modification

In the July 3rd, 2024 letter sent during scoping (reference (3)), the applicant proposed Route Segment 13. The applicant provided the following reasoning for requesting the addition of Route Segment 13:

> *"At the time of filing of the Application, Xcel Energy was in the process of working with our utility partners to conduct a reliability analysis to determine whether greater portions of the proposed 161 kV transmission line in Segment 4 of the Project could be double-circuited with existing transmission lines in the area. After the Application was filed, Xcel Energy continued to work with Dairyland Power Cooperative (Dairyland) and Rochester Public Utilities (RPU) to complete a reliability analysis to determine that the proposed 161 kV could be double-circuited with the existing North Rochester – Northern Hills 161 kV line. This analysis concluded that there were no reliability concerns with double-circuiting the proposed 161 kV line with the North Rochester – Northern Hills 161 kV line. As a result, Xcel Energy proposes that this double-circuit route option… be included in the EIS for further study...*
>
> *It would follow the existing alignment of the North Rochester – Northern Hills 161 kV line for 11 miles, from the point where it intersects proposed Route Option 4 West at 75th Ave NW to the North Rochester Substation, and would use the existing 80-foot-wide right-of-way. [It] requires removing the existing North Rochester –Northern Hills 161 kV structures, which are approximately 85 to 135 feet tall, and constructing new double-circuit 161/161 kV structures, which would be of similar height...Because it could be double-circuited with the existing line, [it] does not require acquisition of new right-of-way, as opposed to the equivalent portion of Option 4 West, which would be constructed parallel to existing lines."*

Route Segment 13 was incorporated into what the EIS is referring to as Segment 4 West Modification which is 22.7 miles in length. Segment 4 West Modification begins at the same point as Segment 4 West (at 50th Avenue Northeast) and is the same as Segment 4 West until it heads north at 75th Avenue Northwest, where it begins to be double-circuited with the existing North Rochester – Northern Hills 161 kV line. This portion could be double-circuited all the way through to the North Rochester Substation (Map 7).

3.1.5.3 Segment 4 East

Segment 4 East parallels U.S. Highway 52 for most of its length and includes some double-circuiting where it runs east/west; it has a total length of 19.6 miles. It initiates at 75th Street Northeast and is mostly double-circuited with an existing 69 kV line going west and mostly parallel to 75th Street Northeast. Close to where it intersects U.S. Highway 52, it is no longer double-circuited and instead mostly parallels existing roadway. As Segment 4 East diverges from U.S. Highway 52, it follows division lines (field, parcel, and section lines) and parallels existing transmission lines until it reaches its ending point at the North Rochester Substation (Map 7).

3.1.5.3.1 Route Segment 4C

Route Segment 4C is approximately 1.2-miles long (Map 2). This alternative continues east along 500th Street, paralleling an existing transmission line ROW through agricultural land, then turns south, continuing through agricultural land. The route segment would require a greenfield ROW.

3.1.5.3.2 Route Segment 4E

Route Segment 4E is approximately 3.1-miles long (Map 2). This alternative generally parallels Highway 52 and crosses behind businesses and through open land adjacent to the Highway 52 ROW. The route segment would require a greenfield ROW.

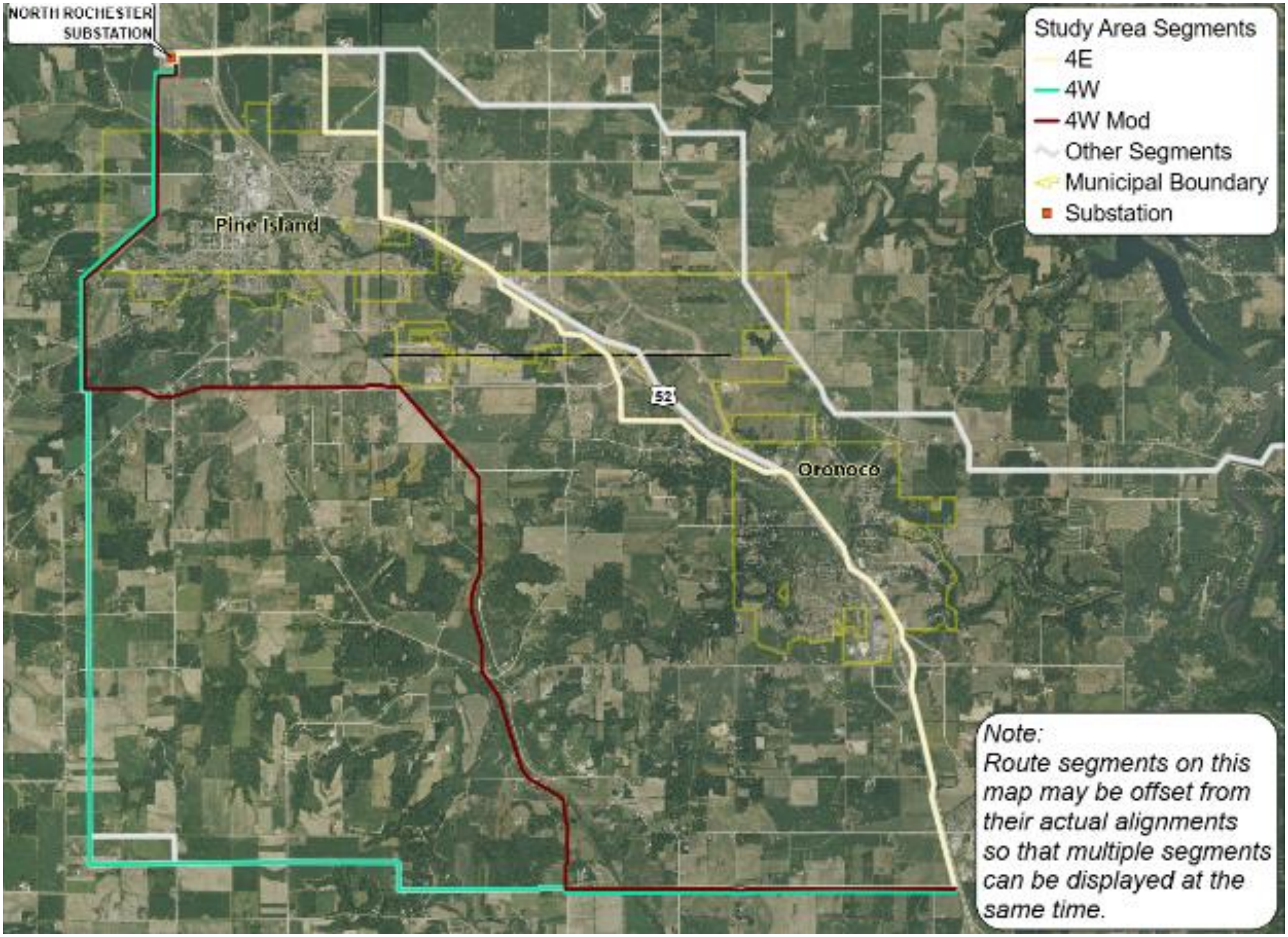
3.1.5.3.3 Alignment Alternative 16

Alignment Alternative 16 shifts the anticipated alignment of Segment 4 East to the south side of 75th Street Northwest. Alignment Alternative 16 would avoid clearing trees along the north side of 75th Street, which provide a visual and noise barrier from vehicle traffic for some of the residences along the north side of 75th street.

3.1.5.4 North Rochester Substation to Highway 52 Study Area

The North Rochester Substation to Highway 52 Study Area isolates data for the Segment 4 West, Segment 4 Modification, and Segment 4 East options so that they begin at Highway 52 and terminate at the North Rochester Substation (Figure 3-8). The purpose of this study area is to isolate the data not included in the second study area (Section 3.1.5.5). This allows for easier analysis of complete Segment 4 route options. In other words, it presents data that can be used to combine with the data presented for east of Highway 52 without any built-in assumptions on which option is used in the Highway 52 to existing 161 kV Line Study Area (Connector 4Q) study area.

Figure 3-8 Segment 4 North Rochester to Highway 52 Line Study Area



3.1.5.5 Highway 52 to existing 161 kV Line Study Area (Connector 4Q)

Connectors, where present, connect north and south options. Connector 4Q connects Segment 4 West and Segment 4 East in Olmsted County, east of Highway 52. It travels north to south across agricultural land and parallels 20th Avenue Northeast. The connector would require a greenfield ROW.

Segment 4 includes an approximately 0.4-mile-long Connector 4Q (Figure 3-9). The connector travels south, paralleling 20th Ave NE, crossing agricultural land for the entire length of the route. The connector would not be double-circuited with an existing transmission line and would therefore require a greenfield ROW. The connector could start on Segment 4 West of the study area, and then use Connector 2G to connect to Segment 4 East. The connector could also start on Segment 4 East in the study area and then use Connector 2G to connect to Segment 4 West.

The connector allows for two additional options to be studied beyond the north-north option (this is a subpart of Segment 4 West) and the south-south option (this is a subpart of Segment 4 East). The two new options are shown in Figure 3-9, and each would include a subpart of Segment 4 West and a subpart of Segment 4 East. These four options are collectively referred to as the Highway 52 to the existing 161 kV line study area.

3.1.5.6 Segment 4 CapX Co-Locate Option

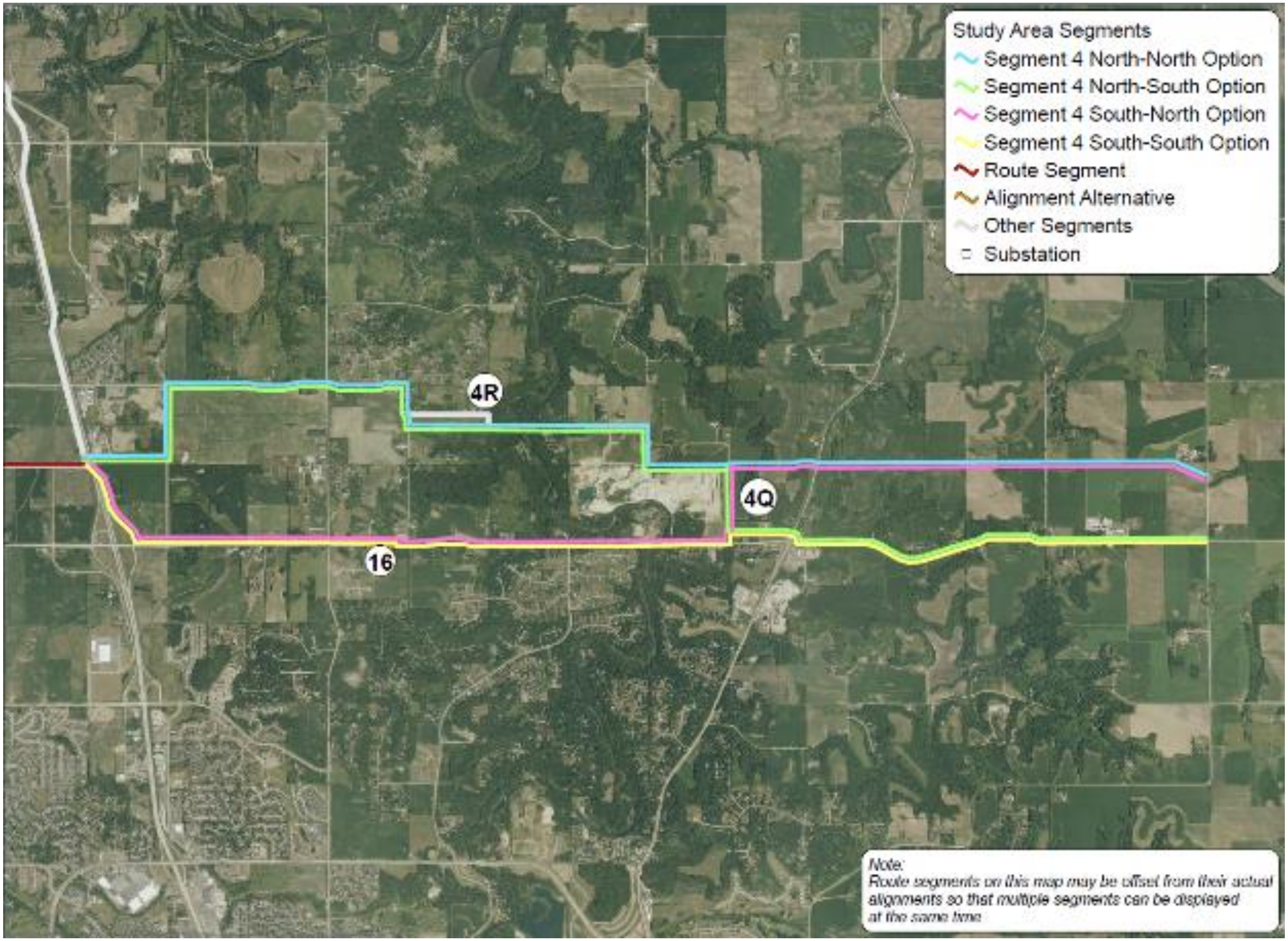
Route Segment 12 was proposed during scoping, and within this EIS, it's referred to as Segment 4 Cap-X Co-Locate Option. The commenter suggesting this alternative requested that the EIS study an option to construct the 161 kV line parallel to the existing CapX line along Route Option 3. This route segment starts at the North Rochester Substation and would parallel Segment 3 to 40th Avenue NE. As noted in Table 3-3, it meets the definition of a route segment but in its entirety, it represents an alternative option for Segment 4 of the project and is analyzed in the EIS in comparison to Segment 4 East, Segment 4 West, and Segment 4 West Modification. Route Segment 12 is referred to in the EIS as Segment 4 CapX Co-Locate Option.

Segment 4 CapX Co-Locate Option parallels the existing 345-kV double-circuit capable line previously permitted by the Commission as part of the CapX2020 Hampton – La Crosse Project in 2012 (that is, Segment 3) in its entirety (Map 7). It is approximately 16.2 miles long.

3.1.5.6.1 Alignment Alternative 15

Alignment Alternative 15 is approximately 1.2 miles long and is an alternative Zumbro River crossing location for Segment 4 CapX Co-Locate. Segment 4 CapX Co-Locate crosses the Zumbro River adjacent to the CapX line, and Alignment Alternative 15 would cross the river further south, on the south side of County Road 12.

Figure 3-9 Highway 52 to Existing 161 kV Line Study Area

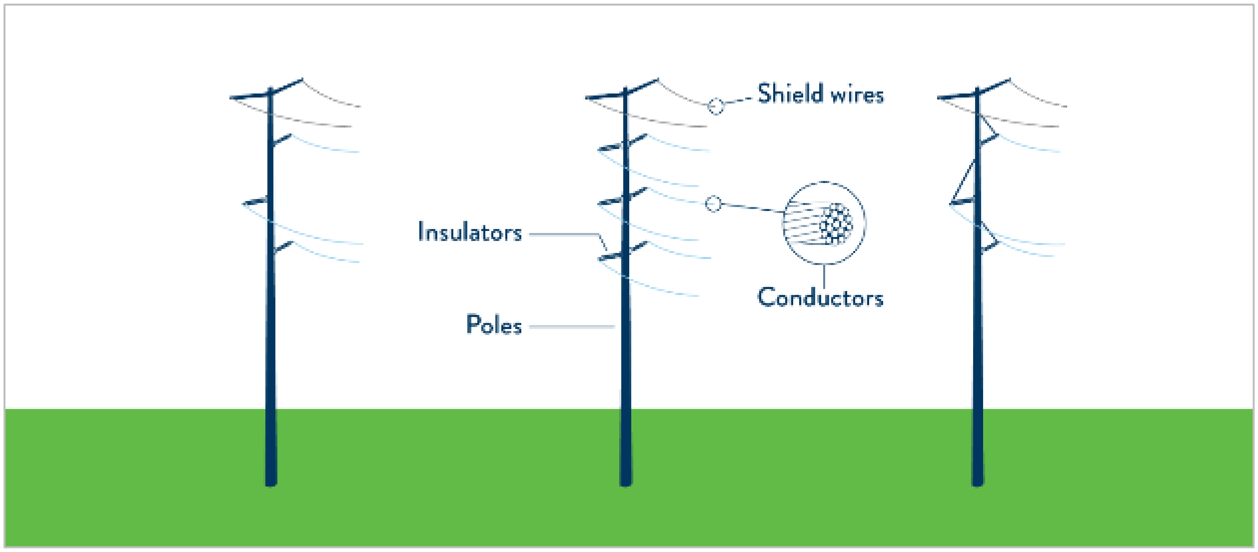


3.2 Engineering and Design

3.2.1 Transmission Line Design and Structures

A high-voltage transmission line consists of three phases (conductors), each at the end of a separate insulator string, and all physically supported by poles called structures. Conductors are metal cables consisting of multiple strands of steel and aluminum wire wound together. A single-circuit line contains three conductors, while a double-circuit line contains two sets of three, or six total conductors. At the top of each structure there are also shield wires strung above the electrical phases to prevent damage from lightning strikes. These cables are typically less than one inch in diameter. The shield wire can include fiber optic cable, which provides a communication path between substations for transmission line protection equipment. Figure 3-10 illustrates a typical double-circuit transmission line. The project would include both single-circuit transmission lines and double-circuit transmission lines.

Figure 3-10 Typical Double-Circuit Transmission Line



Source: Barr Engineering Co.

3.2.1.1 345 kV Transmission Line

For the new 345 kV transmission line, the applicant proposed to primarily use single-pole steel structures in both single-circuit and double-circuit areas. Structures would be spaced approximately 1,000 feet apart. Typical structure design elements for the 345 kV line are summarized in Table 3-4; however, the application noted that the structure sizes may change based on site conditions. Both the single-circuit and double-circuit structures would typically be 85 to 175 feet tall. Figure 3-11 illustrates how the height of a transmission line could compare to a grain elevator.

Table 3-4 345 kV Line Typical Structure Design Summary for Segments 1, 2, and 3

Line Type	Structure Type	Structure Material	Typical ROW Width (feet)	Typical Structure Height (feet)	Foundation Diameter (feet)	Average Span Between Structures (feet)
345 kV Single-Circuit	Monopole w/ Davit Arms	Galvanized or Self-Weathering Steel	150	85-175	7-12	1,000
345 kV with 69 kV Underbuild Double-Circuit	Monopole w/ Davit Arms	Galvanized or Self-Weathering Steel	150	85-175	7-12	1,000
345/345 kV or 345/115 kV Double-Circuit	Monopole w/ Davit Arms	Galvanized or Self-Weathering Steel	150	85-175	7-12	1,000

Figure 3-11 Transmission Line Height Comparison to a Grain Elevator

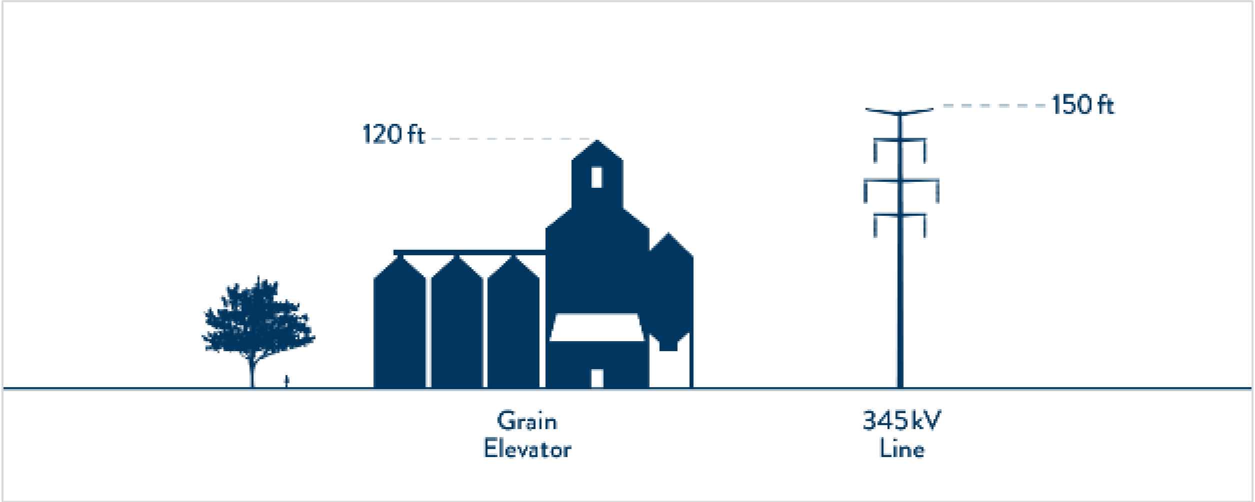
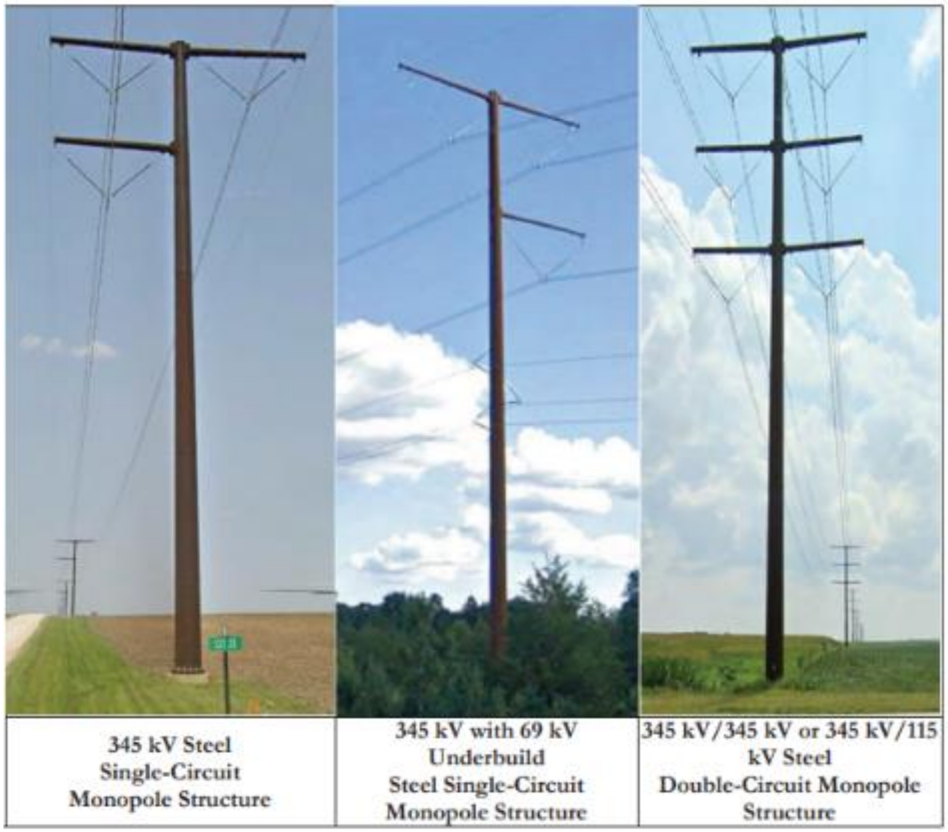


Table 3-4 notes three different line type options: (1) single-circuit, (2) double-circuit with an underbuild with 69 kV, and (3) 345/345 kV or kV 345/115 kV double-circuit. The first picture in Figure 3-12 illustrates a typical single-circuit monopole structure. These structures would be used wherever the transmission line was not double-circuited. The second picture in Figure 3-12 illustrates how a structure would look where the proposed 345 kV line could be double-circuited with an existing 69 kV line. In this scenario, the applicant would underbuild the existing 69 kV transmission line on the same structure as the new 345 kV line. The third picture in Figure 3-12 illustrates how a structure would look where the proposed 345 kV line could be double-circuited with an existing 115 or 345 kV line. In this scenario, the applicant would use structures with additional davit arms to accommodate the existing and proposed lines.

Figure 3-12 Typical 345 kV Structures



Source: joint certificate of need application and route permit application

3.2.1.2 161 kV Transmission Line

For the new 161 kV transmission line (that is, the Segment 4 [161 kV Relocation]), the applicant proposed to use single-pole, self-weathering steel structures where it is single-circuit and double-circuit. Structures would be spaced approximately 350 to 700 feet apart. Typical structure design elements for the 161 kV line are summarized in Table 3-5; however, the application noted that the structure sizes may change based on site conditions. Both the single-circuit and double-circuit structures would be 75 to 140 feet tall.

Table 3-5 161 kV Line Typical Structure Design Summary for Segment 4 (161 kV Relocation)

Line Type	Structure Type	Structure Material	Typical ROW Width (feet)	Typical Structure Height (feet)	Foundation Diameter (feet)	Average Span Between Structures (feet)
161 kV Single-Circuit	Monopole W/ Davit Arms	Galvanized or Self-Weathering Steel	100	75-140	6-8	350-700
161/69 kV or 161/161 kV Double-Circuit	Monopole W/ Davit Arms	Galvanized or Self-Weathering Steel	100	75-140	6-8	350-700

The first picture in Figure 3-13 illustrates a typical single-circuit monopole structure for the 161 kV line. The second picture in Figure 3-13 illustrates a typical double-circuit monopole structure for the 161 kV line where the 161 kV line could be double-circuited with either an existing 69 kV line or an existing 161 kV line.

Figure 3-13 Typical 161 kV Structures

Figure 2-2
Typical 161 kV Structures

161 kV Steel Single-Circuit Monopole Structure	161/69 kV Steel Double-Circuit Monopole Structure

3.2.2 Associated Facilities

Facilities associated with the project and subject to potential upgrades or modifications include the Wilmarth Substation, Eastwood Substation, and North Rochester Substation. Upgrades would be required to the Wilmarth Substation and North Rochester Substation and may be required for the Eastwood Substation.

The West Faribault Substation is located between Segment 1 and Segment 2. As noted in the joint certificate of need application and route permit application, these segments are near the existing substation but are not interconnected to it. The application also notes that the project is designed with options to accommodate future expansion by routing these segments near this substation so that in the future, the 345 kV line could be connected to the West Faribault Substation. This could occur if better connections to the backbone 345 kV line are required to accommodate the needs on lower voltage transmission systems in the area.

Route Segment 17 (Hwy 14 Option) would require a new approximately 13-mile-long 345 kV connection from the Byron Substation to the North Rochester Substation. The applicant confirmed no modifications would be required at the Byron Substation as part of the project (Appendix E).

3.2.2.1 Wilmarth Substation

The existing Wilmarth Substation is owned by the applicant and is at the beginning of the project on its western end, on the northern edge of the city of Mankato (Map 2). It is adjacent to Xcel Energy's refuse-derived fuel plant, just east of the Minnesota River.

New equipment at the Wilmarth Substation would be necessary to support the proposed 345 kV transmission line between the existing Wilmarth Substation to the existing North Rochester Substation. An approximately 0.8-acre expansion of the current yard, fenced area, and retaining wall on the northeast corner of the substation would be required to accommodate this new substation equipment. Construction activities could take up to one to one and a half years, which would include grading and equipment installation. The grading for the pad expansion would take approximately 10 weeks, but the full construction timeline is dependent upon various factors (e.g., supply chain, material availability, workforce/labor, weather, and outage windows). Modifications would include:

- Two new 345 kV circuit breakers
- Four new 345 kV group-operated switches
- Three new one-phase bus stands
- Rigid bus to extend the existing rigid bus to the switches
- A flexible bus to connect the switches to the breakers

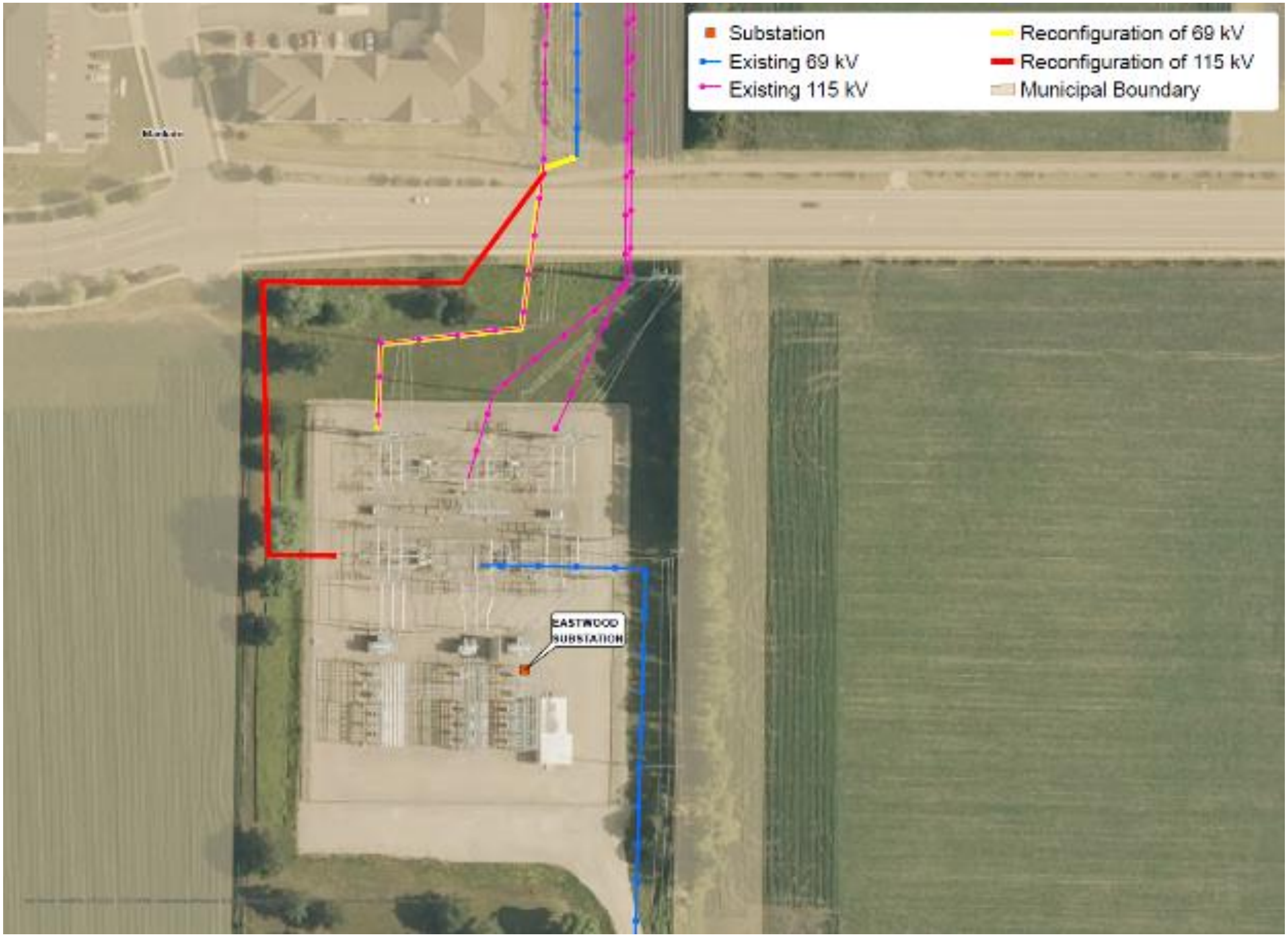
3.2.2.2 Eastwood Substation

The existing Eastwood Substation is owned by the applicant and is located near the eastern boundary of the city of Mankato (Map 2). Modifications to the Eastwood Substation would only be applicable if Segment 1 South were to be selected by the Commission. Construction activities could take up to around 10 months and would include grading and equipment installation. Modifications, if needed, are shown in Figure 3-14 and would include:

- Installation of approximately 500 feet of new 69 kV transmission line to connect an existing 69 kV line at the substation
- Installation of new substation equipment to accommodate the interconnection of this new line, which would include a new 69/115 kV transformer on the north side of the site

The modifications would be necessary to re-terminate the existing 69 kV line at the Eastwood Substation. In this scenario, the existing 69 kV transmission line would be removed between the Eastwood Substation and the Wilmarth Substation and replaced with the project's 345 kV transmission line.

Figure 3-14 Eastwood Substation Reconfiguration



3.2.2.3 North Rochester Substation

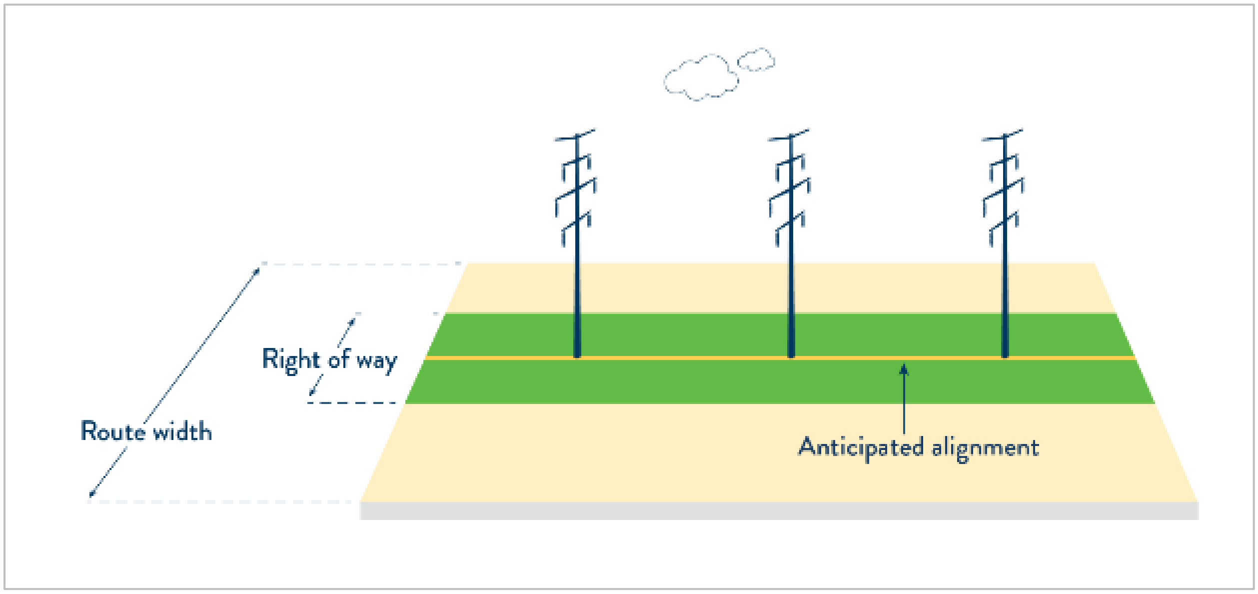
The existing North Rochester Substation is located near Pine Island, Minnesota (Map 2). Segment 3 begins at the substation, and Segment 4 ends at the substation. New substation equipment necessary to accommodate the proposed 345 kV transmission lines would be installed at the North Rochester Substation. The equipment needed would include new 345 kV circuit breakers, new 345 kV switches, new rigid and flexible bus, bus stand and an expansion of the Electrical Equipment Exposure (EEE). No expansion of the current fenced area would be required to accommodate this new substation equipment. The construction activities could take up to a year to complete and would be dependent upon various factors (e.g., supply chain, material availability, workforce/labor, weather, and outage windows).

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

If the Commission issues a route permit, the permit would designate a "route." The width of the route can vary and be up to 1.25 miles wide. The HVTL must be constructed within the route designated by the Commission unless, after permit issuance, permission to proceed outside of the route is sought by the applicant and approved by the Commission. The "anticipated alignment" is the anticipated location of the structures and line within the ROW and route width.

An illustration summarizing the concepts of route width, ROW, and anticipated alignment is provided in Figure 3-15. The route width, in combination with the anticipated alignment, is intended to balance flexibility and predictability.

Figure 3-15 Route Width, Right-of-Way, Anticipated Alignment Illustration



3.3.1 Route Width

The route width is typically larger than the actual ROW needed for the transmission line. This additional width provides flexibility in constructing the line yet is not to such an extent that the placement of the line is undetermined. The route width allows the applicant to work with landowners to address their concerns and to provide flexibility to address engineering issues that could arise after a permit is issued.

For this project, the applicant proposes a typical route width of 1,000 feet along most proposed alignments (500 feet to either side of proposed centerlines). The applicant requested some areas to have a route width wider than 1,000 feet. These areas are typically near substations or locations with routing constraints. Areas where the route width varies from the typical 1,000-foot width are summarized in Table 3-6. Route widths can also appear wider where various 500' buffers of the anticipated alignments overlap. For example, Route Segments 4M, R4, 4C, and 4E route widths would overlap their associated segments. Additionally, the 1,000-foot route width for the Segment 4 CapX Co-Locate Option would overlap and be slightly offset from Segment 3's route width.

Table 3-6 Summary of Route Width Variations

Associated Segment	Location(s) of Variable Route Width
Segment 1 North and South	Around the Wilmarth Substation
Segment 1 North	None
Segment 1 South	Southeast of Ballentine Lake and northwest of Madison Lake Around the Eastwood Substation
Segment 2 North and Segment 2 South	Around the North Rochester Substation
Route Segment 17 (Hwy 14 Option)	At various locations [1]
Segment 3	None
Segment 4 West	At the southwest corner of the segment
Segment 4 West Modification	None
Segment 4 East	Intersection of Hwy 52 and 100th St NW on the west side Intersection of Hwy 52 and 75th St NW on the west side and northeast side of the highway
Segment 4 CapX Co-Locate Option [2]	Near the intersection of 520th Street and 230th Avenue Just west of the intersection of County Road 18 Northwest and 44th Avenue Northwest East of the Zumbro River where the alternative crosses Highway 63 North

[1] Route Segment 17 (Hwy 14 Option) requires ongoing coordination efforts with MnDOT. The variations in the route width for this alternative were included to allow for flexibility in final design should this alternative be selected by the Commission.
[2] The applicant provided input on where additional flexibility may be required to make the Segment 4 CapX Co-Locate Option more easily constructible. Additional information for the reasoning of the wider route widths for this alternative are provided in Appendix E.

3.3.2 Right-of-Way

The ROW is the specific area required for the safe construction and operation of the transmission line, where such safety is defined by the NESC and the NERC reliability standards. The ROW must be within the designated route and is the area for which the applicant obtains rights from private landowners to construct and operate the line.

If a route permit is issued by the Commission, the applicant would conduct detailed survey and engineering work including, for example, soil borings. Additionally, the applicant would contact landowners to gather information about their property and their concerns and discuss how the transmission line ROW might best proceed across the property. Use of a ROW for a transmission line across private property is typically obtained by an easement agreement between the applicants and landowners, as further described in Section 3.3.2.2.

Table 3-7 summarizes the requested ROW widths by segment. Where the proposed transmission lines are double-circuited, ROW could be shared but, in most cases, would require expansion. Where the proposed transmission lines parallel existing roadways or other infrastructure (for example, other transmission lines), the new amount of required ROW may be reduced. The applicant's typical practice when paralleling existing road ROW is to place the poles on adjacent private property near the ROW. With this pole placement, the transmission line shares the existing infrastructure ROW, thereby reducing the size of the easement required from the private landowner(s). For example, if the required ROW is 150 feet, and the transmission pole is placed 5 feet off an existing road ROW, only an 80-foot ROW easement would be required from the landowner. The additional 70 feet of required ROW would be shared with the road ROW. Similarly, if the proposed line parallels an existing transmission line that it would not be double-circuited with, the new ROW required could also be reduced.

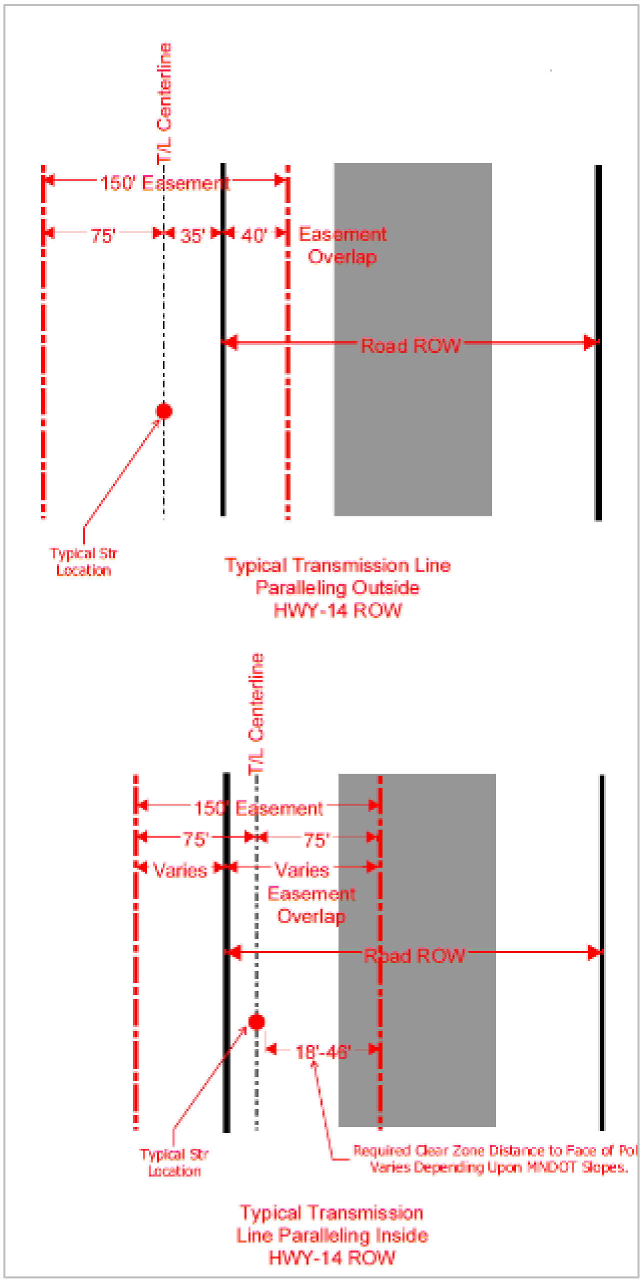
Table 3-7 ROW Width Summary

Associated Segment	Requested ROW Width	Notes regarding existing ROW
Segment 1 North	150 feet	Nearly all of Segment 1 North (96%) could be double-circuited with an existing 115 kV line. For nearly the entire line, some existing ROW would be present and shared with the project but would require widening.
Segment 1 South	150 feet	Most of Segment 1 South (69%) could be double-circuited with existing 69 kV or 115 kV line. For most of the line, some existing ROW would be present and shared with the project but would require widening.
Segment 2 North	150 feet	Segment 2 North could be double-circuited with existing 69 kV, or 345 kV transmission lines for 69% of its length. Where it is double-circuited, some existing ROW would be present and shared with the project but would require widening where it is double-circuited with smaller (69 kV) line.
Segment 2 South	150 feet	Segment 2 South would be primarily constructed in a new ROW that parallels some (27%) existing infrastructure (transmission lines, roads, or railroads) where some opportunity for ROW paralleling/sharing could be present.
Route Segment 17 (Hwy 14 Option)	150 feet	Segment 17 would parallel US Highway 14 from Mankato to Byron. The ROW could overlap with existing MnDOT ROW. Additional information is provided in Section 3.3.2.1.
Segment 3	150 feet	As noted in Section 3.1.4, all of Segment 3 could be double-circuited within the previously permitted route for the CapX2020 Hampton – La Crosse Project. No new ROW would be required for Segment 3.
Segment 4 West	100 feet	Segment 4 West would be primarily constructed in a new ROW that parallels some (46%) existing infrastructure (transmission lines, roads, or railroads) where some opportunity for ROW paralleling/sharing could be present.
Segment 4 West Modification	100 feet	Segment 4 West Modification could be double-circuited with an existing 161 kV line for nearly half of its length (48%). Some existing ROW would be present but would require widening.
Segment 4 East	100 feet	Approximately a quarter (26% of Segment 4 East could be double-circuited with an existing 69 kV line. Some existing ROW would be present but would require widening.
Segment 4 CapX Co-Locate Option	100 feet	The Segment 4 CapX Co-Locate Option would primarily parallel the existing 345 kV line and opportunities for ROW sharing would be present throughout nearly all of its length.

3.3.2.1 Route Segment 17 (Hwy 14 Option) Opportunity for MnDOT ROW Sharing

Route Segment 17 would parallel US Highway 14 for approximately 80 miles from Mankato to Bryon. The requested permanent ROW would be 150 feet and would parallel or overlap with the existing MnDOT highway ROW. The US Highway 14 MnDOT ROW varies in width to accommodate controlled access to the highway. The anticipated alignment would be placed within and outside of the existing MnDOT ROW. If the anticipated alignment is within the MnDOT ROW, the utility pole would be placed outside of the clear zone. The clear zone is an unobstructed travel area beyond the through-traveled way that allows errant vehicles to recover. MnDOT provides guidance in their Facility Design Guide on recommended clear zone distances. Clear zone distances range from 18 feet to 46 feet along US Highway 14 and are dependent on the speed of travel, embankment slope, and radius of turn. Typical ROW configurations are provided in Figure 3-16 for transmission centerlines outside of the MnDOT ROW and within the MnDOT ROW.

Figure 3-16 Typical MnDOT ROW Configurations



3.3.2.2 Right-of-Way Acquisition

If a route permit is issued, the applicant would acquire an easement from each of the landowners along the permitted transmission line route. For transmission lines, utilities typically acquire easement rights across land parcels to accommodate the transmission line. The rights would consist primarily of permanent electric transmission easements, providing a 150-foot-wide easement area for Segments 1, 2, and 3 and a 100-foot-wide easement area for Segment 4. The evaluation and acquisition process includes title examination, initial owner contacts, survey work, document preparation, and acquisition of easement rights.

In areas of the project that would use existing ROW, and the terms of the existing easement are sufficient, the applicant's ROW agents would work with the landowner to address any short-term construction needs, impacts, or restoration. For portions of the project where a new or expanded ROW would be necessary, the applicant's ROW agents would identify all persons and entities that may have a legal interest in the identified real estate. The applicant's ROW agents would contact each property owner to describe the need for the transmission facilities and how the project may affect each parcel. The applicant's ROW agents would also seek information from the property owner about any specific concerns that they may have with the project.

To aid in the design and routing of the project, the applicant might request permission to enter a property to conduct a preliminary survey and geotechnical work. During this process, the location of the proposed transmission line may be staked with the permission of the property owner.

The agent would discuss the construction schedule and construction requirements with the property owner. Special consideration might be needed for fences, crops, or livestock. Fences and livestock may need to be moved; temporary or permanent gates may need to be installed; and crops may need to be harvested early. In each case, the ROW agent and construction personnel would coordinate these processes with the property owner.

Land value data would be collected to assist in determining the fair market value of the easement needed for the land parcels to be crossed by the project, as well as the impact the easement may have on the market value of those parcels. A fair market value offer would be developed that recognizes the impact of the easement on each parcel. Sometimes, a negotiated easement agreement cannot be reached. In those cases, the applicant may exercise eminent domain pursuant to Minnesota law. The process of exercising the right of eminent domain is called condemnation.

Before commencing a condemnation proceeding, typically, the applicant must obtain at least one appraisal and provide a copy to the property owner. The property owner may also obtain another property appraisal, and the applicant must reimburse the property owner for the cost of the appraisal according to the requirements and limits set forth in Minnesota Statutes § 117.036. To start the formal condemnation process, the applicant would file a petition in the district court where the property is located and serve that petition on all owners with an interest in each of the land parcels identified in the petition.

If the court grants the petition, the court then appoints a three-person condemnation commission knowledgeable in real estate issues that would determine, in the first instance, the amount of just compensation the applicant is required to pay for its acquisition of rights in the action. There is a well-developed body of law in Minnesota for determining valuation of the acquisition of easement rights. For each acquisition in a condemnation proceeding, the commissioners conduct a statutorily required viewing and then a hearing at which the owners and the applicant, and their respective witnesses, can present their case as to the appropriate amount the commissioners should award as just compensation. After that hearing and any further deliberation by the commissioners, the panel issues an award reciting the amount to be paid to the owners for the acquisition. The award is filed with the district court. The parties have rights to appeal from those awards to the district court for a jury trial de novo. If an appeal is taken, the district court determines a schedule for the action, and ultimately, the case may be tried by a jury that would issue its verdict on just compensation. At any point in this process, the case can be dismissed if the parties reach a settlement.

There may be instances where a landowner elects to require the applicant to purchase their entire property rather than acquiring only an easement for the transmission facilities. The landowner is granted this right under Minnesota Statute § 216E.12, subdivision 4. This statute, sometimes referred to as the "Buy-the-Farm" statute, applies only to transmission lines with a voltage of 200 kV or greater and to properties that meet certain other criteria. The measure of compensation for acquisition of an owner's fee interest is different than for acquisition of easements, but the process of reaching those valuation determinations—by the Commission and then by a jury or judge in the event of an appeal—are substantively the same as the easement acquisition process described above.

Once a ROW is acquired, and prior to construction, the ROW agent would contact each landowner to discuss the construction schedule and requirements. To allow for safe construction, special considerations might be needed for fences, crops, or livestock. Fences or livestock, for example, might need to be moved or temporary or permanent gates might need to be installed. In each case, the ROW agent would coordinate with the landowner, who would be compensated for any project-related construction damages.

3.3.3 Anticipated Alignment

The anticipated alignment is the anticipated placement of the transmission line within the route and ROW, that is, where the transmission line is anticipated to be built.

After coordinating with landowners and completing detailed engineering plans, the applicants would establish the final alignment for the project and designate pole placements. These final plans, known as "plans and profiles," must be provided to the Commission so that the Commission can confirm that the applicant's plans are consistent with the route permit and all permit conditions prior to construction of the project. This confirmation ensures that the built alignment for the project is consistent with the anticipated alignment in the Commission's permit.

3.4 Construction and Maintenance Procedures

Construction would begin after necessary federal, state, and local approvals are obtained and property rights are acquired for each respective segment. Construction in areas where new easements are not needed or have already been obtained may proceed while ROW acquisition for other areas is still in process. The precise timing of construction would consider various requirements of permit conditions, environmental restrictions, availability of outages for existing transmission lines (if required), available workforce, and materials.

Construction would follow the applicant's best practices for construction and mitigation to minimize temporary and permanent impacts to land and the environment. Construction typically progresses as follows:

- Establish construction staging areas/laydown yards
- Survey marking of the ROW
- ROW clearing and access preparation
- Grading or filling if necessary
- Installation of concrete foundations
- Installation of poles, insulators, and hardware
- Conductor stringing
- Installation of any aerial markers required by state or federal permits
- Site restoration

Once the project is operational, the applicant would follow standard maintenance procedures.

3.4.1 Construction Staging Areas

Construction staging areas/laydown yards are usually established for transmission projects. Staging involves delivering the equipment and materials necessary to construct the new transmission line facilities. Construction of each segment would likely include two or more staging areas. Structures, conductors, matting, and other materials are delivered to staging areas and stored until they are needed for the project.

3.4.2 Survey Marking of the Right-of-Way

Prior to the arrival of construction crews, surveyors would stake the limits of disturbance for the construction ROW. The limits of disturbance would encompass the ROW and structure locations along the approved alignment of the transmission line. The construction contractor would also request utility locates prior to the start of ROW clearing.

The Gopher State One-Call system would be used to locate and mark existing underground utilities prior to the start of ROW clearing to avoid impacts on existing utilities. If crossing an underground utility is required, the applicant would protect existing infrastructure while using heavy equipment during construction, such as construction matting, and would coordinate with the utility owner.

3.4.3 Right-of-Way Clearing and Access Preparation

The applicant would design the transmission line structures for installations at the existing grades. Where a site slope is required (typically on slopes exceeding 10 percent), working areas may be graded or leveled with fill. If acceptable to the property owner, the applicant would propose to leave the graded/leveled areas after construction to allow access for future maintenance activities. If not acceptable to the property owner, the applicant would, to the best of its ability, return the grade of the site back to its original condition.

The applicant would evaluate construction access opportunities by identifying existing transmission line easements, roads, or trails that are near the permitted route. When feasible, the applicant would confine construction activities to the easement area. In certain circumstances, additional off-easement access may be required on a temporary basis. Permission would be obtained from property owners prior to using off-easement access.

Improvements to existing access or construction of new access may be required to accommodate construction equipment. Field approaches and roads may be constructed or improved. Where applicable, the applicant would obtain permits for new access from local road authorities. The applicant would also work with appropriate road authorities to ensure proper maintenance of roadways traversed by construction equipment.

3.4.4 Construction Activities

Construction would require the use of many different types of construction equipment, including tree removal equipment, mowers, cranes, backhoes, digger-derrick line trucks, drill rigs, dump trucks, front-end loaders, bucket trucks, bulldozers, flatbed tractor-trailers, flatbed trucks, pickup trucks, concrete trucks, helicopters, and various trailers or other hauling equipment. Excavation equipment is often on wheeled or track-driven vehicles. When opportunities are available, construction crews would attempt to use equipment that minimizes impacts to land.

3.4.4.1 Foundation and Pole Installation

After ROW clearing and access preparation has been completed, pole and foundation installation would begin. Structures for the project would require drilled pier concrete foundations.

Drilled pier foundations are typically between eight to ten feet in diameter and are typically 20 to 60 feet deep, depending on soil conditions. An angle or dead-end structure may require a foundation up to 12 feet in diameter. The actual diameter and depth of the hole (and foundation) depend on structure design and soil conditions that are determined during the initial survey and soil testing phases. Concrete is brought to the site by concrete trucks from a local concrete batch plant and filled around a steel rebar support cage and anchor bolts. Once the foundation is cured, the structure is bolted to the foundation.

Structures would be moved from staging areas and delivered to the site of each foundation, where they are assembled. Using a crane, the structure is lifted and placed into position. Insulators and other hardware are attached to the structure prior to placing it on the foundation.

Some soil conditions and environmentally sensitive areas would require special construction techniques. The most effective way to minimize impacts to these areas would be to avoid placing poles in the sensitive areas by spanning over sensitive features such as wetlands, streams, and rivers. When it is not feasible to avoid traversing sensitive areas, one or more of the following options would be used to minimize impacts, in consultation with the appropriate agencies:

- When possible, construction would be scheduled during frozen ground conditions.
- When construction during winter is not possible and conditions require, construction mats would be used where wetlands and other sensitive areas would be impacted.
- Equipment fueling and other maintenance would occur away from environmentally sensitive and wet areas. These construction practices help ensure that fuel and lubricants do not enter waterways or impact environmentally sensitive areas.
- Various best management practices (BMPs) would be identified in the project's Stormwater Pollution Prevention Plan (SWPPP), including the use of silt fences, bio logs, erosion control blankets with embedded seeds, and other sound water and soil conservation practices to protect topsoil and adjacent water resources and to minimize soil erosion.

These techniques are also used to reduce impacts to private property, including driveways, yards, and drain tile.

3.4.4.2 Conductor Stringing

Conductor stringing is the last major step of transmission line construction. Stringing setup areas are typically located at two-mile intervals. These sites are located within the ROW, when possible, or within temporary construction easements. Conductor stringing often uses helicopters to start the process by pulling a "sock-line" or high-strength rope through pulleys attached to the insulators on each structure that is attached to the conductor, which is pulled into place and sagged to meet design requirements that are compliant with good utility practice and minimum code clearances. This process requires brief access to each structure to secure the conductor wire to the insulator hardware and to fasten the shield wire on each structure.

Where the transmission line crosses streets, roads, highways, or other energized conductors or obstructions, temporary guard or clearance poles may be installed before conductor stringing. The temporary guard or clearance poles ensure that conductors would not obstruct traffic or contact existing energized conductors or other cables during stringing operations and protects the conductors from damage if they were to fall during stringing.

3.4.4.3 Aerial Marker Installation

After conductor installation is complete, conductor marking devices would be installed if required. These marking devices may include bird flight diverters or air navigational markers. The applicant would work with the appropriate agencies to identify locations where marking devices need to be installed.

3.4.5 Restoration and Cleanup Procedures

Crews would attempt to minimize ground disturbance whenever feasible, but areas would be disturbed during the normal course of work. Once construction is completed in an area, disturbed areas would be restored to their original condition to the maximum extent feasible. Temporary restoration before the completion of construction in some areas along the ROW may be required per NPDES and MPCA construction permit requirements.

After construction activities have been completed, a utility representative would contact the property owner to discuss any damage that has occurred as a result of the project. This contact may not occur until after the applicant has started restoration activities. If fences, drain tile, or other property have been damaged, the applicant would repair damages or reimburse the landowner to repair the damages.

Farmers would be compensated for crop losses caused by project construction. The compensation would be based upon the area(s) affected, the typical yield for the crops lost, and the market rates for those crops. A utility representative would measure the area(s) in which planted crops were damaged or destroyed, or not planted at the applicant's request. The lost yields would be determined in coordination with the property owner. The market rate would also be determined in coordination with the property owner and local elevator and/or other evidence to determine the appropriate rate of payment. The applicant would also make a payment for future year crop loss due to soil compaction. In addition, property owners would be compensated for their expense to deep rip compacted areas. If an individual does not have access to deep ripping equipment, applicant would provide this service or access to such equipment.

Ground-level vegetation disturbed or removed from the ROW during construction of the project would reestablished through implementation of the VMP. Additionally, vegetation that is consistent with substation site operation outside the fenced area would be allowed to reestablish naturally at substation sites. Areas where significant soil compaction or other disturbance from construction activities occur would require additional assistance in re-establishing the vegetation stratum and controlling soil erosion. In these areas, the applicant would use seed that is noxious weed-free to reestablish vegetation.

Another aspect of restoration relates to the roads used to access staging areas or construction sites. After construction activities are complete, the applicant would ensure that township, city, and county roads used for purposes of access during construction would be restored to their prior condition. The applicant would meet with township road supervisors, city road personnel, or county highway departments to address any issues that arise during construction with roadways to ensure the roads are adequately restored, if necessary, after construction is complete.

3.4.6 Maintenance Procedures

Transmission lines and substations are designed to operate for decades and require only moderate maintenance, particularly in the first few years of operation. The applicant would perform aerial inspections of the 345 kV and 161 kV transmission lines and inspect the line from the ground every four years. Typically, one to two workers are required to perform aerial inspections, and three workers are required to perform the ground inspections. Any defects identified during these inspections would be assessed and corrected. The applicant would also perform necessary vegetation management. Vegetation maintenance generally occurs every four years.

Line inspections are the principal operating and maintenance cost for transmission facilities. Aerial inspections cost approximately $75 to $100 per mile, and ground inspections cost approximately $200 to $400 per mile. Actual line-specific maintenance costs depend on the setting, the amount of vegetation management necessary, storm damage occurrences, structure types, materials used, and the age of the line.

The estimated service life of the proposed transmission lines for accounting purposes varies among utilities. The applicant uses an approximately 60-year service life for their transmission assets. However, practically speaking, high-voltage transmission lines are seldom completely retired.

Substations require a certain amount of maintenance to keep them functioning in accordance with accepted operating parameters and the NESC requirements. Transformers, circuit breakers, batteries, protective relays, and other equipment need to be serviced periodically in accordance with the manufacturer’s recommendations. The substation site must be kept free of vegetation and adequate drainage must be maintained.

3.5 Project Costs

The applicant developed route-specific costs based on the estimates developed for the joint certificate of need application and route permit application for a 150-mile-long route, which includes both the Mankato – Mississippi River 345 kV and the North Rochester to Chester 161 kV relocated transmission lines.

There are several main components of the cost estimates, including (1) transmission line structures and materials; (2) transmission line construction and restoration; (3) transmission line and substation permitting and design; (4) transmission line ROW acquisition; and (5) substation materials, substation land acquisition, and construction. Each of these components also may include a risk reserve.

To prepare a cost estimate for the transmission line portions of the project, the applicant relied in part upon the actual costs incurred for constructing prior similar transmission projects. The applicant updated this data based on current market conditions and included a risk reserve. The cost estimates are based on potential transmission line alignments. The introduction of additional corner structures or special structures for river or wetland crossings would increase the project costs. ROW cost estimates for the transmission line and substations were based on a 150-foot ROW for the transmission line. The applicant considered actual costs from prior project acquisitions and approximated the length of the line to estimate the overall land acquisition costs.

To estimate substation construction costs, the applicant identified the necessary components for each substation. The applicant then estimated land, material, construction, design, and permitting costs based on cost estimates for these items from prior substation improvement projects.

To calculate an appropriate risk contingency, the applicant identified potential risks that could result in additional costs. These risks include unexpected weather conditions, poor soil conditions as no geotechnical borings have been obtained, transmission line outage constraints, potential shallow rock, river crossings, labor shortages, and market fluctuations in material pricing and labor costs. The applicant then developed an appropriate cost contingency for each of these risks and applied them to each of the cost categories above.

In the joint certificate of need and route permit application, the applicant estimated the construction of the project, along with substation modifications, at $577.2 million (high capital expenditures estimate). This estimated cost is escalated to nominal dollars to reflect the expected final cost at completion for each component of the project. These cost estimates could increase over time for any number of reasons, such as, but not limited to escalation, inflation, and commodity pricing, especially for these types of large-scale 345 kV transmission projects that have multi-year schedules.

Based on the joint certificate of need application and route permit application, the transmission line is expected to cost approximately $3.7 million per mile. Applying this per-line cost, the project costs as presented in the joint certificate of need application and route permit application are as shown in Table 3-8.

Since the filing of the joint certificate of need application and route permit application, the applicant has updated this range of project costs to reflect the specific costs for each route alternative included in the EIS[3]. These updated costs are also provided in Table 3-8. The low end of the 345 kV transmission line costs in Table 3-8 are based on a combination of the lowest-cost route alternatives for each of the different segments of the 345 kV transmission line. The high end of the 345 kV transmission line costs in Table 3-8 are based on a combination of the highest-cost route alternatives for each of the different segments of the 345 kV transmission line. In their testimony, the applicant also provided total estimated costs for their preferred route (Table 3-8).

[3] Northern States Power Company, dba Xcel Energy: TESTIMONY-- T. Wendland Direct Testimony and Schedules, Docket No. 20253-216973-01

Table 3-8 Overall Project Cost Estimates

Route Options	Low Capital Expenditures (joint certificate of need application and route permit application)	Low Capital Expenditures (applicant-filed testimony)	High Capital Expenditures (joint certificate of need application and route permit application)	High Capital Expenditures (applicant-filed testimony)	Applicant's Preferred Route (applicant-filed testimony)
Mankato – Mississippi River 345 kV Transmission Line	$446.7 million	$376.6 million	$484.8 million	$484.8 million	$376.6 million
Wilmarth Substation Modifications	$8.6 million	$8.6 million	$9.1 million	$9.1 million	$8.6 million
North Rochester Substation Modifications	$10.5 million	$10.5 million	$11.5 million	$11.5 million	$10.5 million
North Rochester to Chester 161 kV Transmission Line	$58.9 million	$41.1 million	$63.2 million	$69.7 million	$69.7 million
Eastwood Substation Modifications	$0 million	$0 million	$8.7 million	$8.7 million	$0 million
Total[1]	**$524.7 million**	**$436.8 million**	**$577.2 million**	**$583.8 million**	**$465.4 million**

[1] There may be differences between the sum of the individual component amounts and the total project costs due to rounding.

3.6 Project Schedule

Table 3-9 provides the permitting and construction schedule currently anticipated for the project. It is anticipated that the Commission would make decisions on the applicant's certificate of need and route permit applications in the fourth quarter of 2025. The applicant plans to complete permitting by the end of the third or fourth quarter of 2025, including all federal, state, and local agency permits. ROW clearing would begin in the third quarter of 2026, with construction expected to begin as early as the fourth quarter of 2026. The full project, including the support substation, is anticipated to be operational in the first quarter of 2030.

This schedule is based on information known as of the date of filing and reflected in the applicant's testimony[4] and may be subject to change as further information develops or if there are delays in obtaining the necessary federal, state, or local approvals that are required prior to construction. The

[4] Northern States Power Company, dba Xcel Energy: TESTIMONY-- T. Wendland Direct Testimony and Schedules, Docket No. 20253-216973-01

applicant is currently evaluating whether portions of the project can be placed in service before 2030 and would provide any schedule updates during the proceeding.

Table 3-9 Anticipated Project Schedule

Activity	Estimated Dates
Minnesota Certificate of Need and Route Permit for Eastern Segment Issued	Fourth Quarter 2025
Land Acquisition Begins	Fourth Quarter 2025
Survey and Transmission Line Design Begins	Third Quarter 2024
Other Federal, State, and Local Permits Issued	Third/Fourth Quarter 2025
Start Right-of-Way Clearing	Third Quarter 2026
Start Project Construction	Fourth Quarter 2026 or First Quarter 2027
Project In-Service	First Quarter 2030

4 Alternatives to the Project

As described in Chapter 2, the Commission must determine whether the proposed HVTL project is needed or if another project or no project would be more appropriate. Section 4.1 provides information from the applicant's joint certificate of need application and route permit application regarding the need for the project as it relates to the overall high voltage transmission system.

Other projects that could meet the purpose of this project are known as system alternatives. System alternatives are discussed in Section 4.2.

4.1 Need for the Project

The purpose of the project, as described in Section 1.1, is to construct an HVTL to provide additional transmission capacity to reduce congestion and to improve electric system reliability throughout the region as more renewable energy resources are added to the high voltage transmission system. The project is needed as part of a broader regional solution to reduce thermal loading, enable future generation, and improve transfer voltage stability. The broader regional solution is required given the evolving energy landscape (driven in part by state and federal energy policy) and ongoing changes to Minnesota's generation portfolio, which will require increasing the capacity of the existing high voltage transmission system in the region. These changes would support existing generation and new generation projects being delivered to load centers efficiently and economically.

4.1.1 Midcontinent Independent System Operator (MISO)

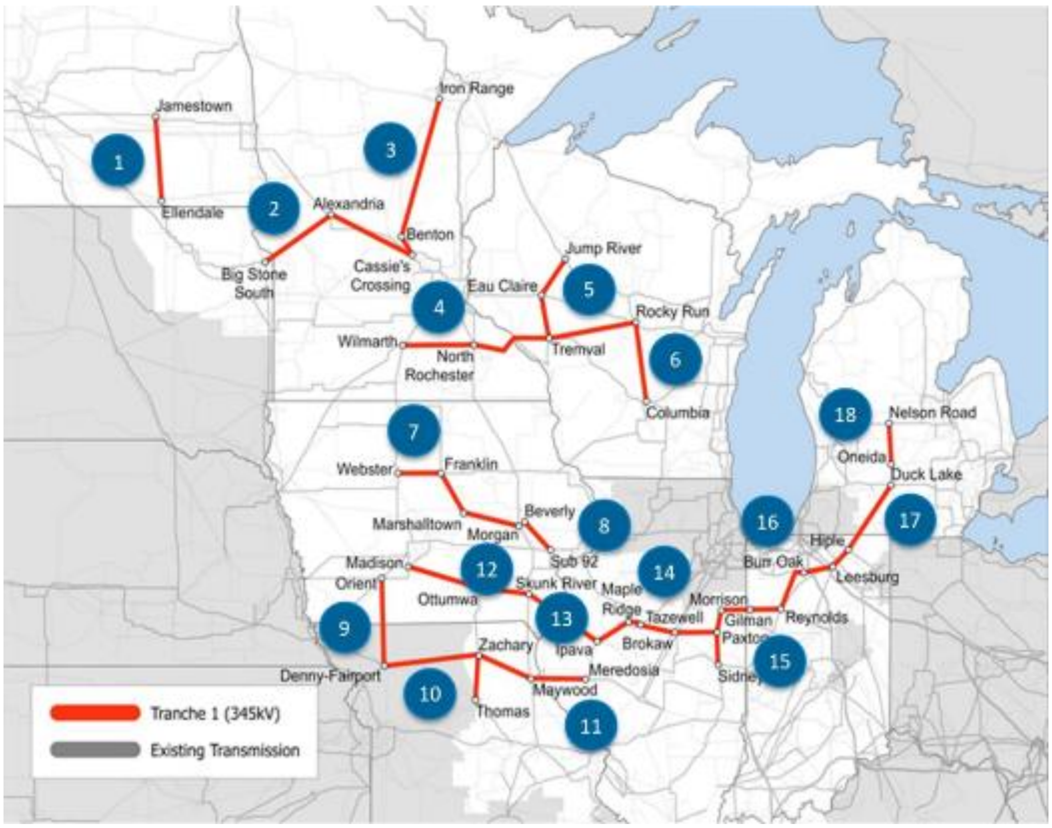
MISO is an independent, not-for-profit, member-based organization responsible for keeping the power flowing across the midcontinent reliably and cost effectively (reference (4)). MISO oversees planning of the transmission systems for its 55 transmission owner members, of which the applicant is one (reference (4)). MISO focuses on three critical tasks:

- Managing the flow of high-voltage electricity across 15 states and the Canadian province of Manitoba.
- Facilitating one of the world's largest energy markets with more than $40 billion in annual transactions.
- Planning the grid of the future (reference (4)).

The Reliability Imperative is a term MISO uses to describe the shared responsibility that MISO, its members, and states have to address the urgent and complex challenges to electric system reliability in the MISO region (reference (5)). Long Range Transmission Planning (LRTP) is a key initiative of the Reliability Imperative. The focus of LRTP is to improve the ability to move electricity across the MISO region from where it is generated to where it is needed - reliably and at the lowest possible cost (reference (6)).

In July 2022, MISO's Board of Directors approved $10.3 billion in new transmission projects referred to as the LRTP Tranche 1 Portfolio (Figure 4-1). It is the first of four tranches of transmission solutions developed to provide reliable and economic energy delivery to address future reliability needs (reference (6)). The project is the Minnesota portion of LRTP Tranche 1 Portfolio's project number 4 (LRTP4) as shown in Figure 4-1. As a whole, LRTP4 involves the construction of a 345 kV transmission line from the existing Wilmarth Substation in Mankato, Minnesota to the existing Tremval Substation in west central Wisconsin near the town of Blair. The Wisconsin portion of LRTP4 will be permitted in a separate proceeding before the Public Service Commission of Wisconsin.

Figure 4-1 MISO LRTP Tranche 1 Portfolio



Source: reference (7)

The Minnesota Public Utilities Commission's determination of whether the project is needed is independent of MISO. However, the need for the project is better understood in the context of the need for its regional project (LRTP4) and the complete Tranche 1 Portfolio.

4.1.2 LRTP Tranche 1 Portfolio Needs

The project, along with the other LRTP Tranche 1 projects, is needed to provide reliable, resilient, and cost-effective delivery of energy as the generation resource mix continues to evolve over the coming years. As noted in Section 1.1, the project would provide additional capacity and relieve transmission constraints in the Twin Cities metro area due to an increasing need to transfer renewable energy toward and past the Twin Cities. The project would also strengthen existing generation outlet towards load centers in Wisconsin and areas to the south. Generally, as more renewable generation is put on the system, there is a need for additional transmission capacity to deliver this renewable energy to load centers.

The joint certificate of need application and route permit application explains MISO's needs for the LRTP Tranche 1 Portfolio's projects from the perspective of portfolio needs, economic benefit, enabled generation, and transfer capability and is summarized as:

- As part of its analysis for portfolio needs, MISO concluded that LRTP Tranche 1 projects 4, 5, and 6 collectively relieve 39 transmission elements with heavy thermal loading when one transmission element is out of service (N-1 contingency) and 96 transmission elements with excessive loading when one or more transmission elements are out of service (N-1-1 contingency) (reference (8)).
- For economic benefit, MISO notes that the LRTP Tranche 1 Portfolio helps deliver economic benefits by providing more transmission infrastructure to distribute loading on other facilities and by enabling the connection of more low-cost resources (reference (8)).
- According to the joint certificate of need application and route permit application, MISO's analysis shows the entire LRTP Tranche 1 Portfolio enables the reliable interconnection of approximately 43,431 MW of new generation, primarily in the form of renewable generation. Of the capacity enabled by the LRTP Tranche 1 Portfolio, 8,339 MW is in the resource zone that includes most of the state of Minnesota.
- The LRTP Tranche 1 Portfolio would expand transfer capability, which would in certain situations increase the ability for a utility to use a new or existing generation resource from another part of the MISO region, rather than construct one locally, to meet its resource adequacy obligation. The stronger regional ties offer more flexibility to handle the variability of renewable output caused by differences in weather patterns across different areas of the MISO footprint (reference (8)).

4.1.3 Reliability Needs

The applicant summarized applicable studies in the joint certificate of need application and route permit application to define and support the project's need. These studies were completed by the applicant to further examine system reliability improvements related to the project. The studies were completed in addition to MISO's need analysis.

The analyses looked at transmission system performance under the stressed conditions for the impacted 345 kV transmission system. These are referred to as the "Summer Shoulder – High Wind" models. Congestion, or stressed conditions, would occur on certain elements of the existing transmission system when there is high wind generation available without peak demand to consume that energy, resulting in overloading. The conclusions of the analyses support how the HVTL could reduce congestion and thereby improve reliability.

The applicant modeled two different scenarios which looked at different timeframes into the future: Scenario One (Section 4.1.3.1) and Scenario Two (Section 4.1.3.2). The MISO local resource zone was used for both scenarios and is the most reflective of the project area; the local resource zone includes nearly all of Minnesota and all of Wisconsin. Use of the local resource zone allowed the applicant to localize the results in a refined area more specific to the project. The applicant modeled four different assumptions under each scenario. These different assumptions were used to analyze the project's potential reliability improvement by allowing isolation of the impact the project would have on reliability. The four different assumptions incorporated into the analysis included:

- The first assumed no additional transmission projects are constructed. This is referred to as the Base Model.
- The second assumed that only LRTP4 is constructed.
- The third assumed all of the LRTP Tranche 1 Portfolio is constructed except for LRTP4.
- The fourth assumed all of the LRTP Tranche 1 Portfolio is constructed.

The information presented here summarizes the analysis in the joint certificate of need application and route permit application. Additional information is available in Chapter 4 of the joint certificate of need application and route permit application.

4.1.3.1 Scenario One Analysis Results

The first analysis was based on the most current MISO transmission system model (MTEP22) assuming no additional generation is added to the system. The MISO MTEP22 model reflects the current transmission system, which includes limited additional transmission facilities in-service.

Under this scenario, thermal issues were shown to be largely resolved by LRTP4 (Table 4-1). Issues were considered resolved if they showed up in the Base Model but not when LRTP4 was assumed to be constructed. In other words, nearly all thermal issues in the base model for this scenario would be resolved within the study area even if only LRTP4 were to be constructed.

Table 4-1 Scenario One: Overload Counts Addressed by LRTP4

Overloaded Facilities	Area	Contingency Type	Base Model (overload counts)	Only LRTP4 (overload counts)	Fixed by LRTP4 (overload counts)
Wilmarth - Sheas 345 kV Ckt [1] 1	MN South	N-1, N-1-1	3205	0	3205
Blue Lake - Scott Co 345 kV Ckt 1	MN South	N-1, N-1-1	6412	42	6370
Helena - Scott Co 345 kV Ckt 1	MN South	N-1, N-1-1	3656	44	3612
Helena - Sheas Lake 345 kV Ckt 1	MN South	N-1, N-1-1	232	0	232
Helena - Chub Lake 345 kV Ckt 1	MN South	N-1, N-1-1	3131	0	3131
N Rochester - Byron 345 kV Ckt 1	MN South	N-1, N-1-1	419	0	419

[1] Ckt is an abbreviation for circuit.

The applicant also provided data comparing the third assumed conditions (which assumed all of the LRTP Tranche 1 Portfolio is constructed except for LRTP4) to the fourth assumed condition (which assumed all of the LRTP Tranche 1 Portfolio is constructed). These results illustrated that LRTP Tranche 1 Portfolio projects (without LRTP4) would address some but not all of the thermal issues.

4.1.3.2 Scenario Two Analysis Results

The second analysis was based on the MTEP21 Future 1 (at year 20) model used for the LRTP Tranche 1 Portfolio analysis. This analysis reflects a future scenario when additional generation is online. It looks further into the future compared to scenario one.

Under this scenario, thermal issues were shown to be largely resolved by LRTP4 (Table 4-2). Issues were considered resolved if they showed up in the Base Model but not when LRTP4 was assumed. This is supported by comparing the Base Model to the second assumed condition that of the complete LRTP Tranche 1 Portfolio, only LRTP is constructed.

Table 4-2 Scenario Two: Overload Counts Addressed by LRTP4

Overloaded Facilities	Area	Contingency Type	Base Model	Only LRTP4	Fixed by LRTP4
Wilmarth - Sheas 345 kV Ckt[1] 1	MN South	N-1, N-1-1	4643	0	4643
Blue Lake - Scott Co 345 kV Ckt 1	MN South	N-1, N-1-1	2646	0	2646
N Rochester - Byron 345 kV Ckt 1	MN South	N-1, N-1-1	923	839	84
Helena - Sheas Lake 345 kV Ckt 1	MN South	N-1, N-1-1	4590	0	4590
Wabaco - Alma 161 kV Ckt 1	MN South/WI	N-1	74	2	72

[1] Ckt is an abbreviation for circuit.

The applicant also provided data comparing the third assumed conditions (which assumed all of the LRTP Tranche 1 Portfolio is constructed except for LRTP4) to the fourth assumed condition (which assumed all of the LRTP Tranche 1 Portfolio is constructed). These results illustrated that LRTP Tranche 1 Portfolio projects (without LRTP4) would address some but not all of the thermal issues. It also illustrated that for some overloaded facilities, such as the North Rochester - Byron 345 kV Ckt, some overloading would still occur even with all of Tranche 1 assumed.

4.2 System Alternatives

The scoping decision includes the system alternatives to be studied in this EIS (Appendix B). The scoping decision states that the EIS will analyze “whether the system alternatives are feasible insomuch that they meet the purpose of the project either individually or in combination with other feasible alternatives.” An alternative is feasible if it can be engineered, designed, and constructed and is also available (the alternative is readily obtainable and at the appropriate scale).

The following system alternatives are discussed further here:

- No-build;
- Demand side management;
- Purchased power;
- Transmission line of a different size or using a different energy source than the source proposed by the applicant, including a 230 kV alternative;
- Upgrading existing facilities;
- Generation rather than transmission;
- Use of renewable energy sources; and
- The Chester Junction system alternative.

4.2.1 No-Build Alternative

The joint certificate of need application and route permit application considered the no-build alternative, i.e., no new transmission facilities would be constructed to meet the identified need. The no-build alternative is feasible and available; however, it does not address the need for the project. The no-build alternative would not address the reliability issues discussed in Section 4.1 and would not allow for connection of new energy sources to the MISO grid. The no-build alternative would also negate the economic benefits of the project which would provide up to $2.1 billion in economic savings across the MISO footprint over the first 20 years that it is in service and up to $3.8 billion in economic savings across the MISO footprint over the first 40 years that it is in service. Relieving the congestion on the transmission system is also important to enabling the state's ability to achieve its goal of 100 percent carbon-free generation by 2040. This new generation would require the additional transmission capacity provided by the project to deliver this power to customers.

The no-build alternative would avoid the potential impacts of the project as described in this EIS (Chapters 5 through 10). If the project is not constructed, Minnesota customers would be denied the reliability and economic benefits of this project.

4.2.2 Demand Side Management

Demand-side management incentivizes individuals and businesses to reduce or shift their electrical usage. Examples include smart thermostats or water heaters; roof top solar; lighting efficiency; and home weatherization. The applicant noted in the joint certificate of need application and route permit application that they analyzed conservation and demand-side management tools that reduce overall demand as well as tools that reduce peak demand as part of the systems alternatives analysis. They also noted that MISO considered conservation and energy efficiency in their analysis. Demand-side management would require broad engagement as the project addresses regional needs including providing additional capacity to relieve transmission constraints in the Twin Cities metro and strengthening existing generation outlet towards load centers in Wisconsin and areas to the south. Demand-side management would not adequately address the broader regional issues associated with thermal loading and would not enable future generation. Demand-side management is not feasible or available and would not meet the purpose of the project.

4.2.3 Purchased Power

Purchased power means that instead of constructing the project, the applicant would purchase power to meet the purpose of the project. This alternative would not address the reliability needs of the broader transmission line system. Purchasing power is feasible; however, this alternative would not meet the purpose of the project.

4.2.4 Transmission Line of a Different Size or Type

System alternatives can generally be described as alternatives with a different size, type, or timing. Regarding size, the transmission line constructed could be larger or smaller, that is, constructed at voltage higher or lower than 345 kV. Regarding type, an underground transmission line could be constructed rather than an overhead line. Regarding timing, the transmission line could be built later rather than on the schedule proposed by the applicant.

Size and type are discussed in more detail below. A project with different timing is not analyzed as it is neither feasible nor available given the timelines considered in the analyses justifying the reliability needs (Section 4.1.3). EERA staff did not analyze a different energy source as this rule requirement relates to a generation facility, for example, a wind facility or solar facility instead of a natural gas facility.

4.2.4.1 HVTL of a Different Size

4.2.4.1.1 Higher Voltage Alternative

The project could be replaced by higher voltage 765 kV or 500 kV transmission lines as alternatives to the proposed 345 kV transmission line. Constructing a new 765 kV or 500 kV transmission line would require additional substation transformers to accommodate the higher voltage transmission lines. Higher voltage lines above 345 kV also require wider ROW and additional structure foundations, resulting in greater environmental impacts along the route. This option would cost more but would be feasible and available. In addition to the impacts discussed in the EIS, a larger transmission line and wider ROW could have the following additional impacts.

Human Settlement Impacts

The following factors of the human environment have the potential to be affected by considering a transmission line of a larger size:

- Aesthetics: Aesthetic impacts are subjective and difficult to measure. However, the taller structures and wider ROW associated with constructing a transmission line of a larger size would presumably be more visible on the landscape.
- Displacement: The wider ROW associated with constructing a transmission line of a larger size would introduce greater potential for displacement of residential and/or non-residential structures within the potential alignment.

- Human health and safety: Increasing the voltage of the line would increase EMF and the associated area that would be subject to the Commission's imposed maximum electric field limit of 8 kV/m would be wider.
- Land-based economies, agriculture: The wider ROW associated with constructing a transmission line of a larger size could potentially affect more acreage of agricultural lands and be more disruptive agricultural practices.
- Land use and zoning: The wider ROW would result in more disruption to existing land uses and result in a higher potential to disrupt potential future development.
- Noise: Short-term noise impacts would occur during construction. Impacts are anticipated to be minimal and last only for the duration of construction. The applicant would be required to comply with state noise standards during construction, and operation of a larger line is expected to meet state noise standards.
- Property values: A bigger transmission line would result in greater aesthetic impacts which could more negatively impact real or perceived impacts to property values.
- Recreation: Increased height of structures would result in greater aesthetic impacts to recreational resources.
- Socioeconomics: The socioeconomic factors related to constructing a transmission line of a larger size are anticipated to be short-term, with increased expenditures from workers leveraging local businesses during construction.

Archaeological and Historic Resources

The wider ROW associated with constructing a transmission line of a larger size could potentially affect more archaeological and historic resources due to a larger area of potential effect.

Environmental Impacts

The following factors of the natural environment have the potential to be affected by considering a transmission line of a different size:

- Public and Designated Lands: The wider ROW associated with constructing a transmission line of a larger size could potentially affect more public and designated lands by creating greater potential for such lands to be within the ROW.
- Rare and Unique Natural Resources: The wider ROW associated with constructing a transmission line of a larger size could potentially affect more rare and unique natural resources by creating greater potential for resources to be within the ROW.
- Surface Waters: The wider ROW associated with constructing a transmission line of a larger size could potentially affect more surface waters by creating greater potential for watercourses and/or waterbodies to be within the ROW.

- Vegetation: The wider ROW associated with constructing a transmission line of a larger size could potentially affect more vegetation, especially forested areas if present, by requiring clearing within a wider area.
- Wetlands: The wider ROW associated with constructing a transmission line of a larger size could potentially affect more wetlands by creating greater potential for such lands to be within the ROW.
- Wildlife and Wildlife Habitat: The wider ROW associated with constructing a transmission line of a larger size could potentially affect more wildlife habitat by creating greater potential for such lands to be disturbed within the ROW. Taller structures could create greater potential for bird strikes.

The proposed new single-circuit 161 kV line from North Rochester to Rochester could be replaced by a higher voltage 345 kV transmission line. However, the higher voltage alternative would not provide additional load serving benefits to the Rochester area because the area is currently served by several 161 kV transmission lines. The existing 161 kV lines would not be able to accommodate the higher voltage, and the incompatibility with higher voltage could potentially create a new transmission constraint in the Rochester area. Thus, a 345 kV alternative from North Rochester to Rochester is not feasible.

4.2.4.1.2 Lower Voltage Alternative

The project could be replaced by lower voltage 161 kV, 115 kV, 69 kV, and 34.5 kV transmission lines as alternatives to the proposed 345 kV transmission line. Lower voltage alternatives would not have sufficient capacity to address congestion and overload issues on the existing system and would not offer the capacity needed to support future renewable generation without construction of more transmission facilities. Constructing a lower voltage line would require additional costs to complete substation upgrades to accommodate the introduction of new voltage to the existing 345 kV system, and larger conductors (and associated structures, foundations and hardware) to achieve a comparable line rating. This option would cost more but would be feasible; however, this alternative would not meet the purpose of the project.

The proposed new single-circuit 161 kV line from North Rochester to Rochester could be replaced by lower voltage 115 kV or 69 kV transmission lines. However, the lower voltage alternatives would not have sufficient capacity to address the congestion and overload issues on the existing system and would require construction of additional substation upgrades. Thus, a 115 kV or 69 kV alternative from North Rochester to Rochester is feasible, however, this alternative would not meet the need for the project.

4.2.4.1.3 230 kV System Alternative

This system alternative would use 230 kV transmission lines, instead of 345 kV lines, to meet the need for the project. The joint certificate of need application and route permit application assessed potential option for lower voltage transmission lines but did not assess the potential for a 230 kV transmission line to replace the 345 kV transmission line (Section 4.2.4.1.2).

The applicant noted in its August 28, 2024, response to EIS comments[5] that the analysis completed in the joint certificate of need application and route permit application for smaller voltage lines (161 kV, 115 kV, 69 kV, and 34.5 kV transmission lines) would also be applicable to a 230 kV transmission line. This lower voltage alternative would not have sufficient capacity to address congestion and overload issues on the existing system and would not offer the capacity needed to support future renewable generation without construction of more transmission facilities. Introducing a 230 kV transmission line in this area would also require construction of additional substation facilities to accommodate this new voltage in the area. The 230 kV system alternative is feasible, however this alternative would not meet the project's need.

4.2.4.2 HVTL of a Different Type

4.2.4.2.1 Direct Current Lines

This system alternative would use high voltage direct current (HVDC), instead of alternating current (AC), to meet the need of the project. However, a HVDC transmission line is generally used to deliver generation over a considerable distance, more than 300 miles, to a load center, and does not allow for cost-effective interconnections along the line. As noted in the joint certificate of need application and route permit application, converter stations for 500 to 600 kV HVDC lines can range from approximately $400 million to $500 million. Additionally, the extended lead time (6 years or more) and the cost of the required converter stations at each end point of the line to convert power from AC to DC and DC to AC would exceed the benefits of a HVDC system. The human and environmental impacts would be of a similar scope to the proposed project, with a relatively similar footprint. This option would cost more and take more time to build but would be feasible and available.

4.2.4.2.2 Underground Transmission Lines

The project could be replaced with a new underground transmission line. Underground transmission construction is most often used in urban areas where an overhead line cannot be installed with appropriate clearance (for example, near airports), conflicts with the built environment, or when sufficient ROW is not available for an overhead line. Underground lines generally require a continuous trench which needs to be coordinated with existing utilities. Large concrete splice vaults or access structures need to be constructed at frequent intervals, and transition substations requiring grading, access roads, storm water management facilities, fencing and lighting are needed wherever underground cables connect to overhead transmission.

The trenching for underground transmission construction causes greater soil disturbance than overhead lines. Trenching an underground line through farmlands, forests, wetlands, and other natural areas can cause significant land disturbances; issues associated with land disturbance, such as soil compaction, erosion, and soil mixing, are key concerns in agricultural areas.

[5] Docket No. 20248-209829-01 [NORTHERN STATES POWER COMPANY, DBA XCEL ENERGY RESPONSE TO EIS SCOPING COMMENTS, 08/28/2024]

Engineering factors increase the cost of underground transmission facilities. As the voltage increases, engineering constraints and costs increase. Other increased costs include the large number of cables, additional specialized equipment, transition substations, routing and/or boring to avoid other underground utilities, time to construct, and the use of specialized labor. It is estimated that the cost of constructing underground transmission lines ranges from four to fourteen times more expensive than overhead lines of the same voltage and same distance (reference (9)).

Repair costs for underground transmission lines are usually greater than costs for an equivalent overhead line. Damage to underground transmission lines may be difficult to locate, and repairs may take weeks to months to complete.

This alternative is available but more costly. Furthermore, while an underground transmission line might mitigate certain impacts, such as aesthetics, overall, such a line would not have any significant environmental benefit compared to the project.

4.2.4.2.3 Alternative Conductors

The proposed double bundled 2x636 kcmil 26/7 Twisted Pair ACSR "Grosbeak" conductor for the new 345 kV transmission line, and the proposed new double bundled 954 kcmil ACSS/TW 20/7 "Cardinal" conductor as the second circuit on the existing structures between the North Rochester Substation and the Mississippi River to match the wire type of the existing circuit, could be replaced with alternative conductors which would meet the required ampacity for the project. There is a high potential for line galloping in this area, the proposed twisted pair wire, double bundled "Cardinal" and "Grosbeak" conductors are less likely to experience galloping compared to alternative conductor options. Additional concerns of impedance and noise are must effectively minimized by using the larger diameter "Grosbeak" conductor as opposed to an alternative conductor. However, twisted pair wire due to high galloping potential in this area, and larger diameter "Grosbeak" to help with impedance and noise would be more appropriate. As such, alternative conductors would not meet the needs of the project.

4.2.5 Upgrade Existing Facilities

Where feasible, the project would include upgrades to lines in existing ROWs. However, existing transmission lines are insufficient to provide the additional transmission capacity needed to resolve the transmission constraints on the system and alleviate congestion on the system. Relying solely on upgrades to existing facilities thus does not meet the project need.

4.2.6 Generation Rather than Transmission

4.2.6.1 Peaking Generation

The project could be replaced with peaking generation which dispatches natural gas or diesel generators to supplement other generation resources. This alternative would require construction of new facilities and depending upon the final locations of the facilities, could reduce the linear length of new transmission line required. Human settlement impacts such as aesthetic impacts or impacts to agriculture could be minimized. A shorter transmission line could also avoid impacts to many types of sensitive and/or protected environmental resources.

However, the broader regional solution is required given the evolving energy landscape (driven in part by state and federal energy policy) and ongoing changes to Minnesota's generation portfolio, which will require increasing the capacity of the existing high voltage transmission system in the region. Construction of additional peaking generation would not create the needed transmission capacity to enable greater generation deliverability. Development of additional peaking generation would not take into consideration the existing renewable energy generation facilities on the landscape. Existing congestion and curtailment issues at existing wind energy facilities would worsen, and customer costs would increase. As such, relying solely on peaking generation would not meet the purpose of the project.

4.2.6.2 Distributed Generation

The project could be replaced with distributed generation, which is generation located near load centers and is connected to the local distribution system. The transmission system in southern Minnesota is the nexus between significant renewable energy sources in Minnesota and the Dakotas and the regional load centers of the Twin Cities and load centers to the east in Wisconsin. Distributed generation would involve construction of energy generators in the Twin Cities area and Wisconsin. Environmental impacts would be more localized in smaller footprints compared to a linear transmission line, but could involve greater impacts depending upon the type of generation (e.g., more air pollution if fossil-fueled generation). Development of additional distributed generation would not take into consideration the existing renewable energy generation facilities on the landscape. As with peaking generation, existing congestion and curtailment issues at existing wind energy generation facilities would worsen, and customer costs would increase. As such, relying solely on distributed generation would not meet the purpose of the project.

4.2.7 Use of Renewable Energy Sources

The project could be replaced with renewable energy sources. However existing renewable generation resources already in place need additional transmission capacity (i.e., the project) to provide greater generation deliverability. The addition of new renewable generation resources in lieu of adding transmission capacity would worsen existing congestion and require further build-out on the transmission system. As such, this alternative would not meet the purpose of the project.

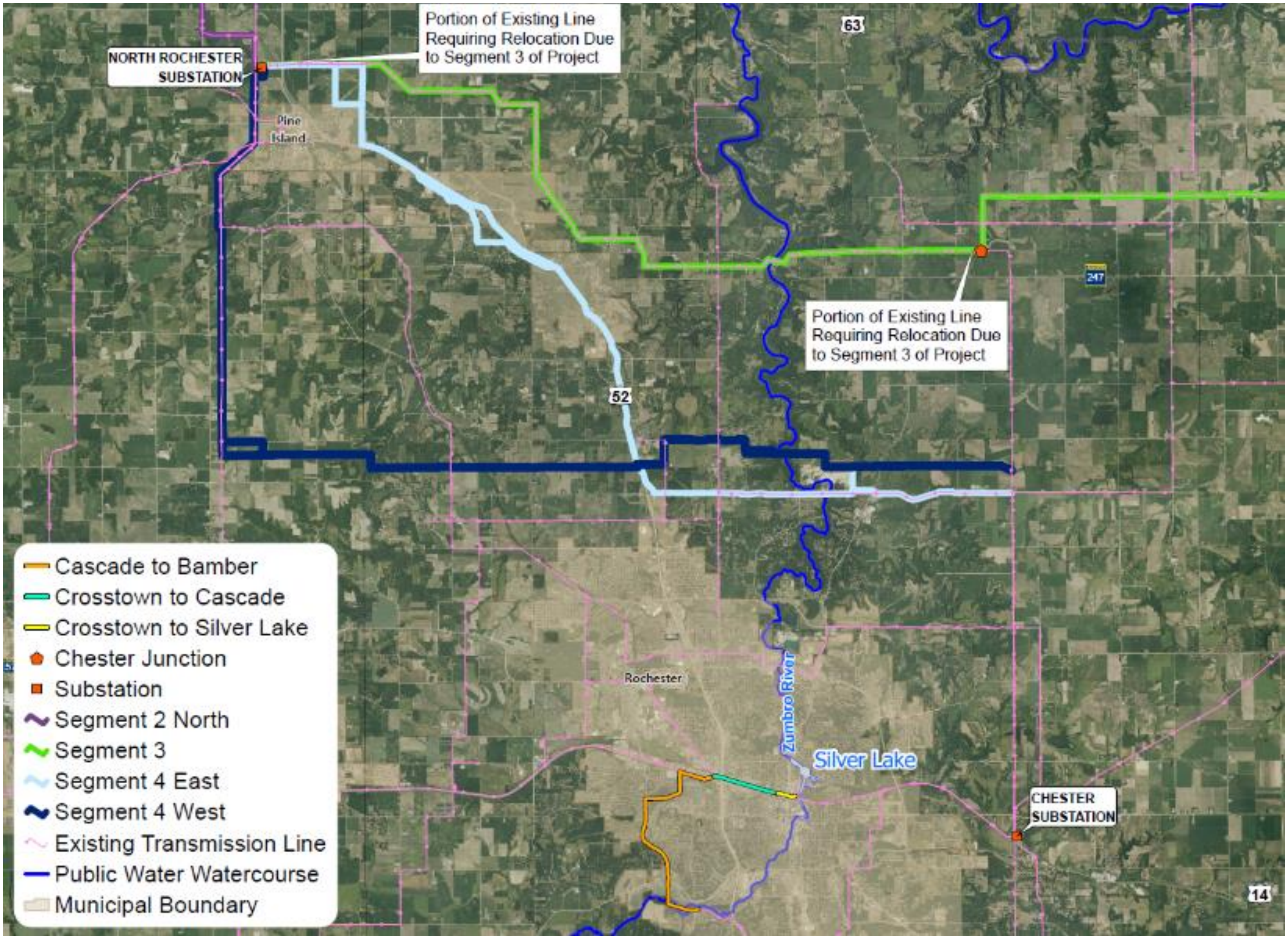
4.2.8 Chester Junction System Alternative

This system alternative would use a new substation, instead of constructing new 161 kV transmission lines. This system alternative would install a new substation at Chester Junction along Segment 3 to eliminate the need to construct the new 161 kV transmission lines in Segment 4. This system alternative would require the following as outlined in the applicant's response provided in Appendix E:

- Acquisition of an approximately 40-acre parcel near the junction location and construction of a new substation.
    - Construction of this new substation would involve construction of a pad and installation of a perimeter fence, a 161/345 kV transformer and 8 circuit breakers, as well as additional standard substation equipment. The applicant noted they have not identified a potential site at this time and procurement challenges with lead times for the necessary equipment would apply. Breakers could be reserved for delivery in 2028/2029, however acquiring a transformer would be more complicated because of very limited availability.
- Construction of an ancillary transmission line to connect to the substation.
- Rebuilding three 161 kV transmission lines to a higher capacity to avoid overloads, including:
    - Crosstown to Cascade 161 kV line to a minimum of 1500 amps, depending on conductor type and input from Rochester Public Utilities (RPU). This existing line is approximately 1.21 miles in length.
    - Crosstown to Silver Lake 161 kV line to a minimum of 1500 amps, depending on conductor type and input from RPU. This existing line is approximately 0.36 miles in length.
    - Cascade to Bamber 161 kV line to between 1000-2000 amps, depending on conductor type and input from RPU. This existing line is approximately 4.33 miles in length.

In total, the alternative would therefore require approximately 5.9 miles of 161 kV line to be rebuilt. The three transmission lines that would require being built are illustrated in Figure 4-2Figure 4-2.

Figure 4-2 161kV Lines that would be required to be rebuilt for the Chester Junction System Alternative



Human and environmental impacts for rebuilding the 5.9 miles of 161 kV line would be similar to the impacts described in this EIS for Segment 4. This would include minimal aesthetic impacts in an area with existing transmission lines already present. The existing land use would be more developed and populated, and there could be fewer or less sensitive natural resources present. The new substation would introduce new aesthetic impacts and depending on its final siting location, could impact natural resources.

The project as proposed would cost between $465.4 million and $583.8 million. The applicant estimates that the Chester Junction system alternative would cost approximately $51 million to construct. This includes:

- $33.6 million to construct the substation ($2.5 million for an ancillary line, $1.1. million to acquire land for the substation and ROW, and $30 million to construct the substation) and
- $17.4 million ($4.8 million to construct the Crosstown to Cascade line, $1.8 million to construct the Crosstown to Silver Lake line, and $10.8 million to construct the Cascade to Bamber line) to rebuild the existing 161 kV lines.

Under current system conditions, renewable generation from southern Minnesota flows north along the 345 kV system through the North Rochester Substation and then continues either north to the Twin Cities load center or east to Wisconsin. If the Chester Junction Alternative is constructed, certain contingencies result in overloads of facilities in the current 20-year MISO model. Specifically, loss of the Byron – North Rochester 345 kV transmission line forces power onto lower-capacity 161 kV equipment. The addition of Chester Junction Substation would create a new, lower-impedance path, that when paired with a second outage, would cause existing 161 kV lines to overload, thus the need for three 161 kV lines rebuilt to a higher capacity as mentioned above (Appendix E).

Operational changes associated with rebuilding the three 161 kV transmission lines would eliminate the economic benefits associated with the project. Adding the Chester Junction Substation along the 345 kV line would cause additional power from the 345 kV line to flow onto the 161 kV system that is at capacity, resulting in additional system congestion. System congestion would increase costs for electricity to consumers because it prevents the delivery of the lowest-cost power generation to where it is needed, forcing the system to rely on higher-cost generation sources, and ultimately resulting in higher energy costs (Appendix E).

The applicant also notes in Appendix E that the alternative could reduce operational cost savings. The applicant conducted economic analyses in the joint certificate of need application and route permit application to support the need for the project. The analyses were based on assumptions due to operational changes in system as opposed to construction-based as this analysis looks at projects after they are in-service.

The applicant conducted economic analyses using PROMOD software, short for PROduction MODeling (PROMOD), which is used to support economic transmission planning. The PROMOD software simulates the electric market on an hourly constrained-dispatch basis using models containing generation unit locations and operating characteristics, transmission grid topology, and market system operations. The PROMOD software can calculate the future cost of producing electricity, market congestion, and energy losses based on these assumptions. One of the economic analyses conducted by the applicant was to calculate the adjusted production cost (APC) savings benefit of the project to the MISO footprint and LRZ1. APC savings are utilized to measure the economic benefits of proposed transmission projects. These savings are calculated as the difference in total production costs of energy for a generation fleet adjusted for import costs and export revenues with and without the proposed transmission project. The applicant determined that the project will provide up to $2.1 billion in economic savings across the MISO footprint over the first 20 years that the project is in service and up to $3.8 billion in economic savings across the MISO footprint over the first 40 years.

The applicant conducted a similar economic analysis for the Chester Junction System Alternative. The Chester Junction Alternative would still provide APC benefits to the MISO footprint in its first 20 years, the APC savings benefits to the partners (Xcel Energy, SMP, and DPC), would be negative. Specifically, the APC benefits to the MISO footprint are expected to be $130.59 million while the APC benefits to the project partners are expected to be -$2.85 million for the first 20 years that the project is in-service. The reduction in economic benefits as compared to the proposed project and the negative benefits to the project partners is due to the fact that adding the Chester Junction Substation along the 345 kV line causes additional power from the 345 kV line to flow onto the 161 kV system that is at capacity resulting in additional system congestion. System congestion increases costs for electricity consumers because it prevents the delivery of the lowest-cost power generation to where it is needed, forcing the system to rely on higher-cost generation sources, ultimately resulting in higher energy costs.

This system alternative would cost more during operation (in that it would result in new 161 system congestion issues) and take more time to build. The alternative does not meet the need of the project in its entirety. The purpose of the project is to construct a 345 kV HVTL to provide additional transmission capacity to reduce congestion and to improve electric system reliability throughout the region as more renewable energy resources are added to the high voltage transmission system. The 345 kV is needed as part of a broader regional solution to reduce thermal loading, enable future generation, and improve transfer voltage stability. This system alternative would provide an alternative means of replacing the 161 kV transmission line that would be displaced by the 345 kV, but would not address the regional capacity issues. However, it could be feasible and available.

5 Segment 1, Mankato (Wilmarth Substation) to West Faribault – Affected Environment, Potential Impacts, and Mitigation

This chapter provides an overview of the human and environmental resources that could be affected by Segment 1 and its alternatives (Section 3.1.1 - Segment 1, Mankato (Wilmarth Substation) to West Faribault). It discusses potential impacts relative to the construction and operation of the project on these resources. It also discusses ways to avoid, minimize, and mitigate these impacts.

Segment 1 would be a new 345 kV transmission line that would run from the Wilmarth Substation in the city of Mankato to a point near the West Faribault Substation near the city of Faribault. The applicant proposed two potential options for Segment 1: Segment 1 North (48.1 miles) and Segment 1 South (53.6 miles) (Map 1). Alternatives to Segment 1 North are discussed in Section 5.10, and alternatives to Segment 1 south are discussed in Section 5.14.

5.1 Terms and Concepts

Understanding proposed and alternative route impacts involves contextualizing their duration, size, intensity, and location. This form of contextual information serves as the basis for assessing the overall project impacts on resources. To provide appropriate context, the following terms and concepts are used to describe and analyze potential impacts:

> **Duration –** Impacts vary in length of time. Short-term impacts are generally associated with construction but might extend into the early operational phase of the project. Long-term impacts are associated with the operation of the project. Permanent impacts extend beyond project decommissioning and reclamation.
>
> **Size –** Impacts vary in size. To the extent possible, potential impacts are described quantitatively, for example, the number of impacted acres or the percentage of affected individuals in a population.
>
> **Uniqueness –** Resources are different. Common resources occur frequently, while uncommon resources are not ordinarily encountered.
>
> **Location –** Impacts are location-dependent. For example, common resources in one location might be uncommon in another.

The context of an impact – in combination with its anticipated on-the-ground effect – is used to determine an impact intensity level, which can range from highly beneficial to highly harmful.

Impact intensity levels are described using qualitative descriptors, which are explained below. These terms are not intended as value judgments, but rather a means to confirm common understanding among readers and to compare potential impacts between route alternatives.

Negligible impacts do not alter an existing resource condition or function and are generally not noticeable to an average observer. These short-term impacts affect common resources.

Minimal impacts do not considerably alter an existing resource condition or function. Minimal impacts might, for some resources and at some locations, be noticeable to an average observer. These impacts generally affect common resources over the short or long-term.

Moderate impacts alter an existing resource condition or function and are generally noticeable to the average observer. Impacts might be spread out over a large area, making them difficult to observe, but can be estimated by modeling. Moderate impacts might be long-term or permanent to common resources, but generally short- to long-term to uncommon resources.

Significant impacts alter an existing resource condition or function to the extent that the resource is impaired or cannot function as intended (highly harmful). Significant impacts are likely noticeable or predictable to the average observer. Impacts might be spread out over a large area, making them difficult to observe, but they can be estimated by modeling. Significant impacts can be of any duration and affect common or uncommon resources.

Also discussed are opportunities to mitigate potential impacts through mitigation. Mitigation means:

- Avoiding impacts altogether by not undertaking a certain project or parts of a project;
- Minimizing impacts by limiting the degree of magnitude of a project;
- Rectifying impacts by repairing, rehabilitating, re-creating, or restoring the affected environment;
- Reducing or eliminating impacts over time by preservation and maintenance operations during the life of the project;
- Compensating for impacts by replacing or providing substitute resources or environments; or
- Reducing or avoiding impacts by implementing pollution prevention measures.

Some impacts can be avoided or minimized; some might be unavoidable but can be minimized; others might be unavoidable and unable to be minimized but can be rectified (corrected). The level at which an impact can be mitigated might change the impact intensity level.

When referring to construction practices or mitigation measures, this EIS uses the convention of describing these as actions by the applicant, even if the action would be carried out by the applicant's contractor.

5.2 Regions of Influence

Potential impacts on human and environmental resources are analyzed within specific geographic areas called regions of influence (ROI). The ROI is the geographic area where the project might exert some influence and is used as the basis for assessing potential impacts. ROIs vary by resource and potential impact (Table 5-1). As necessary, the EIS discusses potential impacts and mitigation measures beyond the identified ROI to provide appropriate context. Direct impacts within the ROI might cause indirect impacts outside the ROI.

This EIS uses the following ROIs:

- **Right-of-Way –** the ROW for the 345 kV transmission line is 150 feet wide (75 feet on each side of the anticipated alignment). In some locations, ROW may already exist but could require expansion as described in Section 3.3.2.
- **Route Width –** the route width varies but is most commonly 1,000 feet wide (500 feet on each side of the anticipated alignment). Locations where the route width varies are described in Section 3.3.1 Route Width.
- **Local vicinity –** within 1,600 feet of the anticipated alignment (in other words - a 3,200-foot-wide buffer area distributed equally on either side of the anticipated alignment)
- **Project area –** within one mile of the anticipated alignment (in other words - a two-mile-wide buffer distributed equally on either side of the anticipated alignment)
- **Four-county area** – term used to collectively describe the four counties in which the project is located (including Blue Earth, Le Sueur, Rice, and Waseca counties).

Table 5-1 Regions of Influence

Resource Type	Resource Element	Region of Influence
Human settlement	Aesthetics	Local vicinity
	Cultural values	Four-county area
	Displacement	ROW
	Environmental justice	Census Tracts within the route width
	Land use and zoning	ROW
	Noise	Local vicinity
	Property values	Local vicinity
	Recreation	Route width
	Socioeconomics	Four-county area
	Transportation and Public Services	Roadways/rail - Local vicinity/Route Width Public utilities - ROW Emergency Services – Four-county Area Airports – 3.78 miles
Human health and safety	Electromagnetic fields	ROW
	Implantable medical devices	ROW
	Public and worker safety	ROW
	Stray voltage	ROW
	Induced voltage	ROW
	Electronic interference	ROW
Land-based economies	Agriculture	Route width
	Forestry	Route width
	Mining	Route width

Resource Type	Resource Element	Region of Influence
	Tourism	Local vicinity
Archaeological and historic resources	Archaeological and historic resources	Route width
Natural environment	Air quality	Project area
	Climate	Project area
	Geology and topography	Route width
	Greenhouse Gases	ROW
	Groundwater	ROW
	Public and designated lands	ROW
	Rare and unique natural resources	Project area for protected species; route width for sensitive ecological resources
	Soils	ROW
	Surface water	Route width
	Vegetation	ROW
	Wetlands	ROW
	Wildlife and Wildlife Habitat	Route width

5.3 Environmental Setting

Segment 1's project area is dominated by rural and agricultural land use, with concentrated areas of development on the west end of Segment 1 near Mankato (Map 8). Both Segment 1 North and Segment 1 South cross the Cannon River (Map 9). Sakatah Lake State Park is located between Segment 1 North and Segment 1 South (Map 10).

The DNR and the USFWS have developed an Ecological Classification System (ECS) for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features (reference (10)). Under this classification system, Segment 1 is in the Eastern Broadleaf Forest Province (Map 11). This section is further divided into subsections, including the Big Woods and Oak Savanna subsections. These subsections are used below to classify the environmental setting of the project.

The Big Woods Subsection is primarily characterized by a loamy mantled end moraine with landscapes consisting of circular, level-topped hills bounded by smooth side slopes. Closed depressions within level areas between hills contain lakes and peat bogs, and drainages are often controlled by lake levels. Underlying bedrock at depths of 100 to 400 feet includes Ordovician and Cambrian sandstone, shale, and dolomite to the south and Cretaceous, sandstone, and clay to the north. Loamy soils are dominant and are classified primarily as Alfisols, with some Mollisols to the west of the subsection (reference (11)).

The Oak Savanna Subsection is primarily characterized by rolling plains of loess-mantled ridges over sandstone and carbonate bedrock and till. The boundaries are characterized by end moraines to the west and land dominated by hardwood forests to the east. Topography is gently rolling throughout the subsection, with steeply sloped Stagnation moraines in the southwest. Glacial drift is generally less than 100 feet thick, with a maximum thickness of about 200 feet. Soils within this subsection are a combination of Alfisols and Mollisols and include Aquolls, Udolls, Udalfs, and Aqualfs. Bur oak savanna was the primary vegetation, but presently, most of the area is farmed (reference (12)).

Segment 1 North and Segment 1 South are in Blue Earth, Le Sueur, and Rice Counties. Major communities nearest to Segment 1 include Mankato to the west and Madison Lake, Waterville, Morristown, and Faribault to the east (Map 2). Existing transmission lines are prevalent throughout (Map 12). Segment 1 North and Segment 1 South are generally bound by U.S. Highway 169 to the west, MN Highway 60 to the south, and Interstate Highway 35 to the east (Map 12). County and township roads are also present within the route widths.

5.4 Use or Paralleling of Existing Rights-of-Way

When the Commission makes a final decision about the route permit and per Minnesota Statute § 216E.03, subpart 7(e), it must make specific findings that it has considered locating a route for a new high-voltage transmission line (HVTL) along an existing HVTL route or parallel to existing highway right-of-way (ROW), and, to the extent these are not used, the Commission must state the reason(s).

When considering a new HVTL along an existing HVTL route, there is a difference in potential impacts between using ROW for double-circuiting and paralleling existing ROW. Both would present opportunities for combining new ROW with existing ROWs, which minimizes fragmentation of the landscape and can minimize human and environmental impacts (e.g., aesthetic and agricultural impacts). Use of existing ROW for double-circuiting would involve either:

- Expanding the existing ROW and replacing existing transmission line structures (for existing lines of a smaller voltage than 345 kV) with new structures capable of double-circuiting the new 345 kV line, or
- Using the existing ROW and placing the new 345 kV line on the existing double-circuit capable poles (for existing 345 kV lines which already have existing double-circuit capable poles present).

Segment 1 does not involve any opportunities for double-circuiting with an existing 345 kV line, and therefore, in all cases, double-circuiting within the alternatives for Segment 1 would involve replacing the existing transmission line structures (Section 3.2.1) and expanding the ROW (Section 3.3.2). Opportunities for use or paralleling existing ROW for double-circuiting are summarized in Table 5-2.

Table 5-2 Segment 1 North and Segment 1 South, Opportunities for Double-Circuiting

	Unit	Segment 1 North	Segment 1 South
Total Segment Length	Miles	42.1	47.7
Double-circuit with existing 115 kV line	Miles (percent)	35.0 (83%)	11.0 (23%)
Double-circuit with existing 69 kV line	Miles (percent)	5.5 (13%)	21.9 (46%)
Total opportunity for double-circuiting	Miles (percent)	40.5 (96%)	32.9 (69%)
Parallels existing transmission line (i.e., not double-circuited but parallel and adjacent to)	Miles (percent)	0	0
Double-circuiting or paralleling existing transmission lines (total)	Miles (percent)	40.5 (96%)	32.9 (69%)

Paralleling existing ROW would involve installing the new 345 kV line parallel and adjacent to existing transmission lines or transportation, pipeline, and electrical transmission systems or rights-of-way. As described in Section 3.3.2, the total width of the new ROW required could be reduced from 150 feet, where some of the ROW would overlap with existing ROW. Opportunities for paralleling existing ROW, including highway rights-of-way, are further discussed in Section 5.5.1.

5.5 Human Settlements

5.5.1 Aesthetics

The ROI for aesthetics is the local vicinity. Transmission lines alter a viewshed. Because aesthetic impacts are subjective, the potential impacts can vary widely and be unique to each person. Impacts are largely assessed by reviewing the number of nearby residences and opportunities for double-circuiting with an existing transmission line and/or ROW paralleling. Where double-circuiting occurs within Segment 1, existing transmission line structures would be replaced with larger structures and the ROW would be extended. Determining the relative scenic value or visual importance in any given area is subjective and depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question.

Aesthetic impacts can be minimized by selecting routes that are located away from homes, schools, businesses, and other places where people congregate (for example, parks or other recreation areas). Aesthetic impacts can also be minimized by following existing transmission line ROW where elements of the built environment already define the viewshed and the addition of an additional transmission line would have an incremental impact. Following other infrastructure, such as roads and railroads, would also be expected to reduce potential impacts but not to the same extent.

5.5.1.1 Existing Conditions

The aesthetic and visual resources of a landscape are defined as the existing natural and built features which affect the visual quality and character of an area. A landscape's character is largely influenced by topography, vegetation, water resources, existing development, and infrastructure. Determining the relative scenic value or visual importance in any given area depends, in large part, on the individual viewer, or community of viewers, whose perceptions are shaped by their values and experiential connection to the viewing area, as well as their physical relationship to the view, including distance to structures, perspective, and duration of the view.

Viewer sensitivity is understood as an individual's interest or concern for the quality of a viewshed and varies depending upon the activity viewers are engaged in, their values and expectations related to the viewshed, and their level of concern for potential changes to the viewshed. High viewer sensitivity is generally associated with individuals engaged in recreational activities; traveling to scenic sites for pleasure and to or from recreational, protected, natural, cultural, or historic areas; or experiencing viewsheds from resorts, roadside pull-outs, or residences. Residents have a higher sensitivity to potential aesthetic impacts than temporary observers. Low viewer sensitivity is generally associated with individuals commuting, working, or passing through an area.

For the purpose of this document, it is assumed that landscapes which are, for the average person, harmonious in form and use are generally perceived as having greater aesthetic value. Infrastructure which is not harmonious with a landscape or affects existing landscape features reflects a change in the aesthetic view that for some, or many, could negatively affect a viewer's perception and expectation of the area. Assessing visual quality reflects the difference between the landscape change and the individual or communal reaction to that change. As noted above, individual or communal perspectives are complex and affected by individual or shared values and experiences with the land. As such, some viewers could perceive the project setting as having high visual quality while others might perceive the area to have less visual quality. Perceived aesthetics can carry more weight when they are tied to a specific feature, like residential properties, scenic byways, or historic/archaeological/natural features. This is a key reason among those that prefer to co-locate new infrastructure among the built environment (utility ROWs, roads, railways, pipelines).

The topography of Segment 1 is generally level to moderately rolling. Segment 1 North is primarily agricultural (70 percent), with small amounts of area that are developed, forested, and herbaceous. Segment 1 South, while mostly agricultural (53 percent) has a larger amount of land that is developed (37 percent), with smaller amounts of land that is forested, herbaceous, and open water.

There are several municipalities near Segment 1 (Map 2). Both Segment 1 North and Segment 1 South start within the city of Mankato before traveling through mostly rural residential and agricultural areas and ultimately ending within the city of Faribault. Municipalities between Mankato and Faribault include Eagle Lake, Madison Lake, Waterville, and Morristown. These areas are characterized by a higher concentration of industrial, municipal, and commercial features, residential buildings, streets, and sidewalks. There are also other recreational features that influence the visual character and enjoyment of these areas, like parks and trails. There are no wind or solar farms in the local vicinity of Segment 1.

The majority of Segment 1's route width contains existing utility infrastructure, including electric transmission and distribution lines (Map 12). The existing transmission structures within Segment 1's ROI generally range in height from 45 to 120 feet, depending on the size of the existing line.

- Where existing transmission lines are 69 kV, the structures are typically 45 to 70 feet tall.
- Where existing transmission lines are 115 kV, the structures are typically 55 to 95 feet tall.

Certain landscape areas have higher aesthetic value due to their scenic qualities. These areas could include scenic byways, recreation areas, and river crossings. Segment 1 North and Segment 1 South both cross the Minnesota River Valley Scenic Byway, which is a public roadway in an area of regionally significant scenic, natural, recreational, cultural, historic, or archaeological resources. The segments cross the scenic byway just east of the Wilmarth Substation (Map 13). Other recreational resources in the ROI include the Minnesota River (Map 10), the Cannon River (Map 10), and the Sakatah Singing Hills State Trail (Map 10).

5.5.1.2 Potential Impacts

The project's HVTL structures and conductors would create aesthetic impacts. The ROI for aesthetic impacts is the local vicinity. The new 345 kV transmission line structures would range in height from 85 to 175 feet, with several taller structures reaching around 195 feet where Segment 1 South would cross Highway 14 and an existing double-circuit 115 kV line north of the Eastwood Substation (Map 12). Aesthetic impacts would also include clearing existing woody vegetation and creating a new fragmented landscape and/or expanding the fragmented landscape with the expansion of the existing ROW. The degree of impacts depends in large part on opportunities to share or parallel existing ROW and the magnitude of viewer sensitivity.

Paralleling and/or sharing other types of existing ROW would have an incremental impact relative to existing horizontal elements, such as existing transmission lines, highways and county roads, and/or railroads (collectively referred to as "existing infrastructure"). In some cases, portions of a route segment could parallel ROW with more than one of these existing features at the same time (e.g., be sharing or paralleling transmission line and be paralleling road ROW). Map 3 illustrates where ROW paralleling occurs and shows existing infrastructure. Where subparts parallel more than one existing type of infrastructure, precedence is given to showing where the alternative could be double-circuited or paralleling an existing transmission line over showing it paralleling existing road ROW.

As shown in Table 5-3, both Segment 1 North and Segment 1 South would primarily follow existing infrastructure (100 and 86 percent of their lengths, respectively). Where Segment 1 South is not following existing infrastructure, it is following existing field, parcel, and section lines (collectively referred to as "division lines") for all but 2.4 miles.

Table 5-3 Segment 1 North and Segment 1 South, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

	Segment 1 North (42.1 mi total)		Segment 1 South (47.7 mi total)	
Double-circuited with existing transmission lines	40.5 mi	96%	32.9 mi	69%
Follows existing roads	7.3 mi	17%	30.3 mi	63%
Follows existing railroads	2.9 mi	7%	<0.0 mi	<0%
Follows existing infrastructure (transmission lines, roads, and railroads)	42.1 mi	100%	40.9 mi	86%
Follows division lines (field, parcel, and section lines)	31.1 mi	74%	41.7 mi	88%
Total ROW paralleling [1]	42.1 mi	100%	45.2 mi	95%
Total length that does not follow existing infrastructure or division lines	0.0 mi	0%	2.4 mi	5%

[1] Total ROW paralleling represents the total length of the segment that either parallels existing infrastructure (transmission lines, roads, and railroads) *or* follows division lines (field, parcel, and section lines). Some parts of a segment fall into both categories but are not double-counted in this total.

For the majority of Segment 1, where the HVTL could be double-circuited (Map 3), aesthetic impacts would be diminished because the existing transmission lines are already part of the aesthetics of the area. Aesthetic impacts would include removal of existing structures and installation of the larger structures (Section 3.2.1). The increased structure height (typically 85 to 175 feet) for the new structures could be 130 feet taller than the existing structures (ranging from 45 to 120 feet, Section 5.5.1.1). Impacts due to taller structures would be more prevalent for Segment 1 South, where 46% of its length could be double-circuited with existing 69 kV line, compared to Segment 1 North, where 83% of its length could be double-circuited with existing 115 kV line (Table 5-2). In some cases, existing structures are wood and would be replaced with steel structures. Impacts for double-circuited areas would also include vegetation clearing to accommodate the expansion of the ROW width (Section 3.3.2 Right of Way). In some cases, the aesthetic impacts could be shifted from one side of a road to another. For example, if the existing transmission line is on the north side of the road and the final alignment for the project is on the south side of the road, aesthetic impacts would be shifted.

In addition to opportunities to share or parallel existing ROW, the degree of aesthetic impacts would also be dependent on the magnitude of viewer sensitivity and exposure. Visual impacts are expected to be minimal for those with low viewer sensitivity, such as people traveling to and from work. For those with high viewer sensitivity, for example, neighboring landowners or recreationalists, visual impacts are anticipated to be moderate to significant. Viewer exposure refers to variables associated with observing a viewshed and can include the number of viewers, frequency and duration of views, and view location. Viewer exposure would typically be highest for views experienced by high numbers of people, frequently, and for long periods. To the extent these impacts can be quantified depends on the presence of several on-the-ground factors linked to the concepts of viewer quality, sensitivity, and exposure. These factors include:

- Proximity to residences, schools, churches, etc., where relatively more observers are present to experience aesthetic impacts;

- Views valued by the public at large, for example, scenic overlooks or scenic byways; or
- Locations where people recreate or otherwise enjoy leisure activities.

Appendix G summarizes human settlement features in the local vicinity of the route segments. The proximity of residential structures (homes, daycares, and nursing homes) and non-residential structures (for example, agricultural buildings and sheds) to route segments at various distances is shown in Figure 5-1 and Table 5-4, respectively. Segment 1 North has the least residences within the local vicinity (154), and Segment 1 South has the most residences within the local vicinity (323). Segment 1 North has no residences within the ROW, while Segment 1 South has 11 residences within the ROW. Segment 1 North would have fewer non-residential structures within its vicinity (186) than Segment 1 South (322).

Figure 5-1 Segment 1 North and Segment 1 South, Proximity of Residential Structures

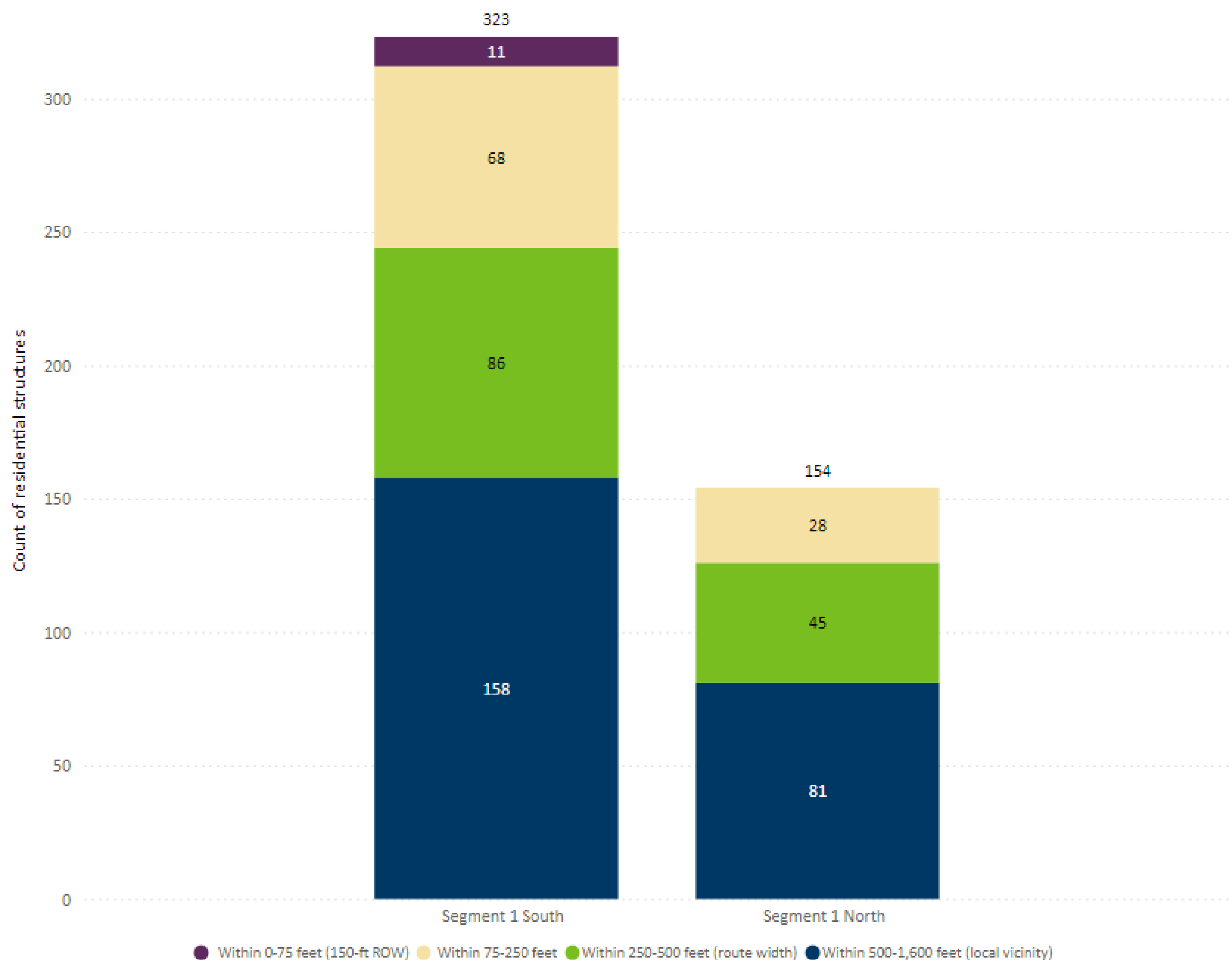


Table 5-4 Segment 1 North and Segment 1 South, Proximity of Non-Residential Structures

	Segment 1 North	Segment 1 South
Within 0-75 feet (150-ft ROW)	4	11
Within 75-250 feet	67	144
Within 250-500 feet (route width)	108	341
Within 500-1,600 feet (local vicinity)	186	322

Recreational resources are also considered in the aesthetic impacts analysis in that they might include certain landscapes with higher aesthetic value due to their scenic qualities and could also have the potential for higher viewer sensitivity, especially if people are expected to congregate in recreational areas. Recreationalists subject to potential impacts in Segment 1's ROI would include travelers on the Minnesota River Valley Scenic Byway and users of the state water trails and Sakatah Singing Hills State Trail (Section 5.5.8). Duck Lake Park (Map 10–2), Shager Park (Map 10–4) and Westwood Park (Map 10–2) are located within Segment 1's ROI, but aesthetic impacts are anticipated to be negligible to minimal given the location of the anticipated alignment in relation to the parks (i.e., on the other side of the adjacent roads) and the existing surrounding environment (i.e., trees between the parks and the anticipated alignments and the presence of existing transmission lines).

Segment 1 North and Segment 1 South both cross the Minnesota River Valley Scenic Byway (Map 10–1). The aesthetic impacts would be minimal for the byway given the existing transmission lines and adjacent existing development.

Aesthetic impacts would occur to two waters that are designated as a state water trail and a wild and scenic river: the Minnesota River (Map 10–1) and the Cannon River (Map 10–3 and Map 10–4). The Minnesota River is on the western edge and within the ROI of Segment 1 North and Segment 1 South. The aesthetic impacts would be minimal for the Minnesota River given the presence of existing transmission lines and Wilmarth Substation. The Cannon River is within the ROI of Segment 1 North which crosses the watercourse in two locations. The aesthetic impacts would also be minimal for the Cannon River given the existing 115 kV transmission line at the crossing locations.

The Sakatah Singing Hills State Trail is crossed by Segment 1 North on its western end (Map 10–1), is adjacent to a common part of Segment 1 North and Segment 1 South shortly after that crossing location, and is later adjacent to and crossed by Segment 1 South (Map 10–2 and Map 10–3). The crossing locations would occur where existing transmission lines are present, with one exception, where Segment 1 South crosses the trail east of Madison Lake (Map 10–2). The anticipated alignment of Segment 1 is generally on the opposite side of the roadways as the trail, where possible. Aesthetic impacts would include visibility of construction traffic and equipment during construction and higher structures that may be more visible from the trail than the existing structures.

5.5.1.3 Mitigation

The primary strategy for minimizing aesthetic impacts is prudent routing—that is, choosing routes where an HVTL is most harmonious with the landscape. This could include:

- Maximizing ROW sharing and/or paralleling with existing linear rights-of-way (for example, transmission lines, roadways, and railroads) to minimize incremental aesthetic impacts.
- Minimizing the magnitude of viewer exposure (for example, locating the transmission line away from residences or areas where people congregate).
- Avoiding routing through areas with high-quality, distinctive viewsheds.
- Crossing rivers and streams using the shortest distance possible (that is, perpendicular to the waterbody).
- Reducing structure heights to minimize impacts within scenic areas.
- Using structures and structure designs that minimize impacts.

In the joint certificate of need application and route permit application, the applicant committed to minimizing aesthetic impacts by avoiding removal of trees where possible, spanning natural areas when feasible, and using existing infrastructure and roadway or transmission facility rights-of-way to the maximum practicable extent. The sample route permit (Section 5.3.7 of Appendix H) contains the following mitigation related to aesthetics:

- "The Permittee shall consider input pertaining to visual impacts from landowners or land management agencies prior to final location of structures, rights-of-way, and other areas with the potential for visual disturbance."
- "The Permittee shall use care to preserve the natural landscape, minimize tree removal, and prevent any unnecessary destruction of the natural surroundings in the vicinity of the Transmission Facility during construction and maintenance."
- "The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads."
- "The Permittee shall place structures at a distance, consistent with sound engineering principles and system reliability criteria, from intersecting roads, highways, or trail crossings."

Other minimization and mitigation measures could include:

- Placing structures to take advantage of existing natural screening to reduce the view of the line from nearby residences and roadways.
- Including specific conditions in individual easement agreements with landowners along the route (for example, requiring new plantings or landscaping).

- Using the protections of Minnesota Statute § 216E.12, subdivision 4 (commonly known as the “Buy the Farm” statute), where available, to move residents away from potential aesthetic impacts.

5.5.2 Cultural Values

The ROI for cultural values is the project area. Impacts associated with rural character and sense of place are expected to be dependent on the individual. These impacts would be localized, short- and long-term, but might diminish over time. Impacts to community unity are not anticipated to occur. Impacts are minimal and unavoidable.

5.5.2.1 Existing Conditions

Cultural values are those community beliefs and attitudes which provide a framework for community unity and animate community actions. Cultural values can be informed by history and heritage, local resources, economy, local and community events, and common experiences. The project traverses land that has been home to a variety of persons and cultures over time.

The project area was populated primarily by Dakota and Ojibwe tribes in the early to mid-1800s. Most lands in the local vicinity of the project were ceded to the U.S. government during the 1851 treaty. Existing conditions are discussed for both the pre-contact period (prior to European settlement of the project area) and the post-contact period.

5.5.2.1.1 Tribal and Indigenous Peoples History within ROI

The Treaty of Traverse des Sioux in 1851, between the Sioux-Sisseton and Wahpeton bands of the Dakota and the U.S. government, ceded much of the southeastern portion of the Minnesota territory. The Sisseton and Wahpeton bands of Dakota were in areas that had been overhunted and depleted of animals. While many of the Sisseton and Wahpeton Dakota leaders had concerns and did not support the treaties, a consensus was eventually reached that they believed would help supplement their struggling hunting and gathering economy (reference (13)). The land cession treaty offered annuity payments and a way to get through the hard times. When signed, the treaty ceded 24 million acres for $1,665,000. A reservation, including an area of land ten miles wide, was retained on each side of the Minnesota River for the tribal members (reference (14)). The U.S. government kept more than 80 percent of the money, leaving the Dakota to receive the interest on the amount, at five percent for 50 years (reference (15)). The Dakota Leaders also signed the “Traders Papers,” which unfairly siphoned substantial funds from the treaty to pay alleged Dakota debts to settler fur traders (reference (13)).

After the Treaty of Traverse de Sioux was signed by the upper bands of the Dakota, the treaty delegation traveled to lower bands of the Dakota. The Treaty of Mendota was also signed in 1851 between the Mdewakanton and Wahpekute bands of Dakota. The Mdewakanton and Wahpekute were not as in need of food and goods to support their tribes at the time as the upper bands were. The Leaders asked that the annuity from the Treaty of 1837 be paid before further discussion and attempted to change the boundaries of the proposed reservation. Under this treaty the bands were to receive annual annuities on $1,410,000 (reference (16)). The bands were given one year to move to the same reservation land along the Minnesota River outlined above in the Treaty with the Sioux-Sisseton and Wahpeton Bands (reference (14)).

5.5.2.1.2 Tribal and Indigenous Peoples within Present-Day ROI

There are currently 11 federally recognized American Indian Tribes with reservations in Minnesota. Minnesota tribes are sovereign nations that operate their own natural resource departments that reflect their commitment to environmental preservation for future generations. Various restoration projects have been aimed at revitalizing bison, lake trout, sturgeon, and plant populations. Traditional ecological knowledge emphasizes that caring for the land means it will care for you in return. This belief is deeply rooted in the spiritual and cultural importance of flora and fauna, as well as sacred burial sites. Plants such as wild rice, cedar, sage, sweetgrass, and tobacco are considered sacred and used for ceremonial purposes and their healing properties (reference (17)).

According to the United States Department of Housing and Urban Development Tribal Directory Assessment Tool (reference (18)), Tribes with historic cultural interest or ancestral ties in Segment 1 include the following:

- Apache Tribe of Oklahoma
- Cheyenne and Arapaho Tribes, Oklahoma
- Flandreau Santee Sioux Tribe of South Dakota
- Lower Sioux Indian Community in the State of Minnesota
- Menominee Indian Tribe of Wisconsin
- Prairie Island Indian Community in the state of Minnesota
- Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
- Grand Portage Band of the Minnesota Chippewa Tribe
- Iowa Tribe of Kansas and Nebraska
- Sisseton-Wahpeton Oyate of the Lake Traverse Reservation, South Dakota
- Spirit Lake Tribe, North Dakota
- Santee Sioux Nation, Nebraska
- Upper Sioux Community, Minnesota

5.5.2.1.3 County Conditions within ROI

Today, Segment 1 goes through Blue Earth, Le Sueur, Waseca, and Rice counties in the southeastern region of Minnesota. It is a national leader in agricultural production and renewable energy (reference (19)). Southeastern Minnesota is known for its vast landscapes and wooded bluffs along the Mississippi Corridor (reference (20)). It is a health care and agricultural powerhouse, where advanced manufacturing is a strong industry (reference (21). Segment 1 is primarily in a rural setting, with some more populated municipal areas scattered throughout.

Within Blue Earth County's 764 square miles are 368 miles of rivers with wooded bluffs and rich agricultural land. It is known for many parks, trails and campgrounds that help to visitors to experience its lakes, rivers, streams. Agriculture has historically been its principal industry, and remains so today, producing high yields of corn and soybeans (reference (22)). The Greater Mankato area has more populated areas within the county and includes the city of Mankato, North Mankato, Eagle Lake, Lake Crystal, St. Peter, and Madison Lake. Greater Mankato holds events like the Mankato Craft Beer Expo, Anthony Ford Pond Hockey Classic, Bend of the River Music Festival (reference (23)). The city of Mankato is the largest city in Blue Earth County and is an economic and cultural hub in the region. Minnesota State University (Mankato), the Minnesota River, Minneopa State Park, Mount Kato and Carnegie Art Center are some of the larger attractions in the city. Events like the annual Mahkato Wacipi Pow-Wow in Land of Memories Park honoring the 38 Dakota and the Dakota Wkiksuye Memorial Ride and Memorial Relay Run serve as a message of remembrance, healing, and understanding of the area's history (reference (24)).

Le Sueur County is also part of the Minnesota River Valley and known for its agricultural roots and natural beauty connected to the Minnesota River, three dozen lakes, Sakatah Lake State Park, and 12 county parks. The county has events like the classic car & motorcycle roll-ins, Cherry Creek Days, and Montgomery's Kolacky Days celebrating Czech heritage (reference (25); (26)). The county is known for its fertile agricultural soil, producing crops like corn, soybeans, and dairy products. The food processing industry also made its mark, with the county being the original home of the Jolly Green Giant (references (27); (28)).

Waseca County is known for its fertile prairie soils, making it a productive agricultural area. The land within the county is predominantly used for farmland (reference (29)). They have a substantial livestock sector, raising cattle, swine, and poultry (reference (30)). Waseca has annual events like the Waseca Sleigh & Cutter Festival, Lakefest Music Festival, and the Waseca County Free Fair (reference (31)). Waseca County is within a mile of Segment 1 South but not Segment 1 North. Segment 1 South is within a mile of Waseca County when the route travels between Elysian and Waterville and dips into Waseca County for around 1,000 feet.

Rice County is around 50 miles south of the Twin Cities metropolitan area and encompasses an area of 516 square miles. The county remains a blend of agriculture and industry. The largest cities in the county are Northfield and Faribault. Northfield's main business is education, with college students making up a large percentage of the population. Northfield is also known for the notorious Jesse James attempted robbery of the First National Bank. One of the largest cities in the county is Faribault, where Segment 1 North and Segment 1 South would end. Faribault is known for the Faribault Woolen Mill and is home to the Rice County Fair which brings the community together to celebrate agriculture, local talent, and family fun (reference (32)).

There are numerous natural amenities, including lakes, rivers, and public lands, that attract local and regional recreational users within and near the project area (discussed further in Sections 5.5.8 and

5.9.6). These areas provide a variety of outdoor recreational opportunities, like fishing, hunting, boating, hiking, and snowmobiling which also contribute to the identity of area residents.

5.5.2.2 Potential Impacts

Construction, operation, and maintenance of Segment 1 is not anticipated to conflict with cultural values in the ROI. The area throughout Segment 1 is generally rural, with pockets of more populated municipal areas. Pooles Lake has historically shown wild rice growth and is around 0.3 miles from Segment 1 in Rice County, around two miles southeast from the city of Waterville (references (33); (34)). BMPs during construction would be used to avoid degradation of water quality. While construction has the potential to occur during wild rice harvesting season, direct impacts to the production and harvest of this culturally important food are not anticipated. The project would not interfere with hunting and fishing in the area.

Transmission line and substation projects have the potential to impact community and regional events during construction, primarily due to the presence of equipment and supplies on local roadways and potential temporary road closures or detours. Impacts would be minor and temporary if they occur.

Segment 1 North and Segment 1 South would have similar potential impacts in regard to cultural values. Impacts associated with rural character and sense of place are expected to depend on the individual. For some residents, constructing the project might change their perception of the area's character, thus potentially eroding their sense of place. This tension between infrastructure projects and rural character creates real tradeoffs. For those residents who place high value on rural character and a sense of place, impacts are anticipated to be moderate. These impacts would be localized, short- and long-term, but might diminish over time depending on the individual.

5.5.2.3 Mitigation

There are no conditions included in the sample route permit that directly mitigate impacts to cultural values, sense of place, or community unity. Impacts could be minimized by sharing or paralleling existing ROW as it would minimize new routes across the landscape.

Impacts are unavoidable, and the applicant would continue to coordinate with potentially affected parties if further mitigation is requested.

5.5.3 Displacement

The ROI for displacement is the anticipated ROW. Displacement occurs when a residence or building is required to be removed for construction of the project. Residential buildings within the ROI could require removal, whereas non-residential buildings could more likely stay within the ROI if the activities taking place in these buildings are compatible with the safe operation of the line.

Potential displacement impacts are assessed by identification of buildings within the ROW which is based on the anticipated alignment. If buildings are located within the ROW, they could be subject to displacement depending upon site-specific considerations and coordination with the applicant. The

applicant noted in the joint certificate of need application and route permit application that "displacement of residential properties is not anticipated" if any of the applicant-proposed segments are selected by the Commission.

5.5.3.1 Existing Conditions

Displacement is the removal of a residence or building to facilitate the operation of a transmission line. For electrical safety code and maintenance reasons, utilities generally do not allow residences or other buildings within the ROW of a transmission line. Any residences or other buildings within a proposed ROW have the potential to be removed or displaced. Displacements are relatively rare and more likely to occur in highly populated areas where avoiding all residences and businesses is not feasible.

The ROI for displacement is the ROW. There are no daycares, hospitals, schools, churches or nursing homes within the ROW of Segment 1. There are 11 residential structures in Segment 1 South's ROW and none within Segment 1 North's ROW. The 11 residences within Segment 1 South's ROI include:

- Six residential apartment complexes that are a part of the Woodside Apartments (Map 13–18).
- Two residences near MN Highway 60, south of 516th Street, and where Segment 1 South makes a 90 degree turn east (Map 13–18).
- Two residences near the city of Waterville (Map 13–28).
- One residence west of the intersection of 3rd St S and MN Highway 60 (Map 13–28).
- One residence approximately 0.3 miles south of the intersection of MN Highway 60 and 13 (Map 13–28).
- One residence on the west side of Appleton Ave (Map 13–33).

There are four non-residential structures (for example, agricultural outbuildings or animal production structures) within Segment 1 North's ROI, and 11 non-residential structures within the Segment 1 South's ROI. All non-residential structures appeared to be agricultural, storage or shed type buildings, with the exception of three businesses (a Taco John's, Dance Express, and what appears based on Google Street view to be a multi-use office building). Each of these businesses is located south of Highway 14 and east of County Road 22/N Riverfront Drive and within the Segment 1 South's ROI (Map 13–17).

5.5.3.2 Potential Impacts

Segment 1 South's ROW includes 11 residences. The applicant indicated in the joint certificate of need application and route permit application, and in Appendix E that displacement of residential structures would not occur. The applicant noted in Appendix E that if a residence is identified within the permitted route and within the required transmission line ROW, Xcel Energy would revise the alignment to avoid such impact and avoid displacement.

There are no residences within Segment 1 North's ROW; as such, there is no potential for residential displacement.

Non-residential structures within the ROW could be displaced by the project. Though the general rule is that buildings are not allowed within the ROW of the transmission line, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line. This is determined on a case-by-case basis.

5.5.3.3 Mitigation

The sample route permit (Section 5.3.7 of Appendix H) does not have specific statements on displacement. In the aesthetic requirements it states: "The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads."

In the safety codes and design requirements it states: "The Permittee shall design the transmission line and associated facilities to meet or exceed all relevant local and state codes, the National Electric Safety Code, and NERC requirements. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, strength of materials, clearances over roadways, ROW widths, and permit requirements."

Displacement of residential and non-residential structures can be avoided by adjusting the placement of transmission line structures, using specialty structures, increasing structure height, or by modifying the ROW location or width. The applicant would work with landowners on a case-by-case basis to address potential displacement. The applicant might need to conduct a site-specific analysis to determine if the building would need to be displaced. Building owners would be compensated by the applicant for any buildings that are displaced.

5.5.4 Environmental Justice

The ROI for environmental justice (EJ) includes the census tracts that intersect the route width. Potential EJ impacts are assessed by first identifying if any census tracts meet a definition of an EJ area per its socioeconomical information. Second, census tracts meeting an EJ definition are reviewed to consider if those residents might be disproportionally affected. The project would not result in disproportionate adverse impacts to the EJ areas of concern within the ROI. Therefore, impacts are anticipated to be minimal.

5.5.4.1 Existing Conditions

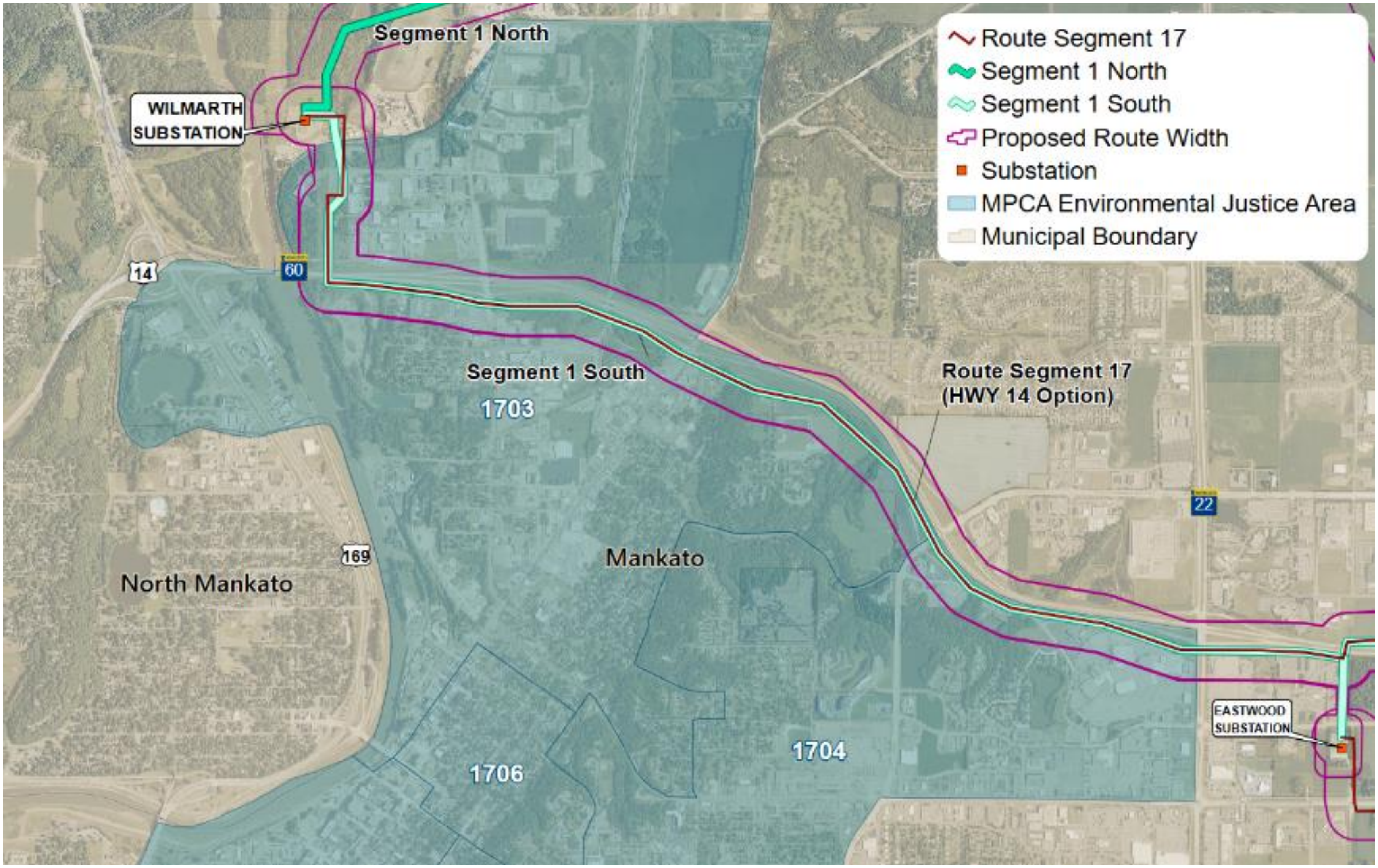
The MPCA's EJ Proximity Analysis tool is an online mapping tool that uses census data to identify areas for meaningful community engagement and additional evaluation for disproportionate effects from pollution (reference (35)). The tool identifies EJ areas of concern using the following four criteria, which align with the definition of an environmental justice area in Minnesota Statutes § 216B.1691, subdivision 1(e):

1. 40 percent or more of the area's total population is nonwhite;

2. 35 percent or more of households in the area have an income that is at or below 200 percent of the federal poverty level;
3. 40 percent or more of the area's residents over the age of five have limited English proficiency; or
4. The area is located within Indian country, as defined in United States Code, title 18, section 1151.

Using the above criteria, Census Tracts 1703 and 1704 (Figure 5-2) in Blue Earth County were identified as an EJ area of concern within the ROI because around 39 percent and 36 percent of the population, respectively, have a reported income that is less than 200 percent of the federal poverty level. These two census tracts are crossed by Segment 1 South but not Segment 1 North. There are no census tracts within the ROI with federally recognized Tribal lands.

Figure 5-2 Census Tract 1703 and 1704 – MPCA EJ Area of Concern



5.5.4.2 Potential Impacts

Disproportionate impacts to census tracts 1703 and 1704 would not be anticipated. The HVTL could be double-circuited with an existing transmission line through these tracts.

5.5.4.3 Mitigation

As described in 2.4.2, several public meetings have been held in the counties the project crosses. There are upcoming meetings scheduled to occur throughout the process. The applicant initiated an outreach campaign in 2023 to Tribal contacts and federal, state, and local agencies through in-person meetings and project notification letters. The applicant met with tribal government contacts and state and local agencies as part of the outreach program for the project.

Meetings that were held near the EJ areas of concern included a scoping meeting held on July 8th, 2024, in Mankato, which is within census tracts 1703 and 1704.

No EJ impacts are anticipated; therefore, no additional mitigation outside of the resource-specific mitigation outlined above is proposed at this time.

5.5.5 Land Use and Zoning

The ROI for land use and zoning is the ROW. If a route permit is issued, it would supersede and preempt zoning restrictions, building, or land use rules. However, to assess human settlement impacts, potential land use and zoning impacts are addressed by evaluating the project against local land use and zoning ordinances. Impacts to planning and zoning are anticipated to be minimal and can be avoided through selection of alternatives.

5.5.5.1 Existing Conditions

Minnesota authorizes counties and cities to create their own zoning ordinances to implement and work in conjunction with their comprehensive plans. Zoning is a method to regulate the way land is used and create patterns in the way they are used. Zoning is a regulatory device used by local governments to geographically restrict or promote certain types of land uses. Minnesota Statutes provide local governments with zoning authority to promote public health and general welfare.

This project is subject to Minnesota's Power Plant Siting Act (Minnesota Statute § 216E.10). Under this Statute, the route permit issued for a transmission line "shall be the sole site or route approval required to be obtained by the utility. Such permit shall supersede and preempt zoning restrictions, building or land use rules, regulations or ordinances promulgated by regional, county, local and special purpose government." Therefore, the applicant is not required to seek permits or variances from local governments to comply with applicable zoning codes. Nonetheless, impacts to local zoning can clearly impact human settlements, and the Commission considers impacts to human settlements as a factor in selecting transmission line routes.

Publicly available zoning information was reviewed for each county and municipality crossed by the route alternatives. Segment 1 has four counties within its ROI, including: Blue Earth, Le Sueur, Waseca, and Rice. Map 14 shows the zoning district data that was gathered for the project.

5.5.5.1.1 Blue Earth County Plan and Ordinances Analyses

The Blue Earth County Land Use Plan was adopted in 2018. The plan states that the county's vision is to "continue to provide a high quality of life for its residents, from agricultural production to urban living. A focus on agricultural preservation, natural resource protection, recreational opportunities, and well-planned growth throughout the county will preserve and secure diverse quality-of-life options for residents" (reference (36)). The Blue Earth County Code of Ordinance was last updated in January of 2024. The zoning districts in Blue Earth County include agriculture, conservation, rural residence, rural townsite, general business, highway business, light industry, heavy industry, shoreland, planned unit development, urban fringe overlay, and orderly annexation areas (reference (37)).

The city of Mankato is the largest city in the county, comprising around 65 percent of the population of the county. The city's goal stated in the Land Use Plan (reference (38)) is to promote orderly growth and preserve natural areas. The Mankato City Code (reference (39)) details the zoning districts in the city, which include the residential, institutional overlay, mobile home overlay, office, business, and industrial districts. Mankato also has a zoning ordinance specific to the Mankato Regional Airport. Airports are discussed in Section 5.5.10.

One known recent development has been identified east of the city of Mankato, where the applicant-proposed anticipated alignment is parallel to 589th Avenue (Map 13–2 and Map 13–3). The applicant noted during scoping[6] that the development had broken ground and is located on the western side of the road.

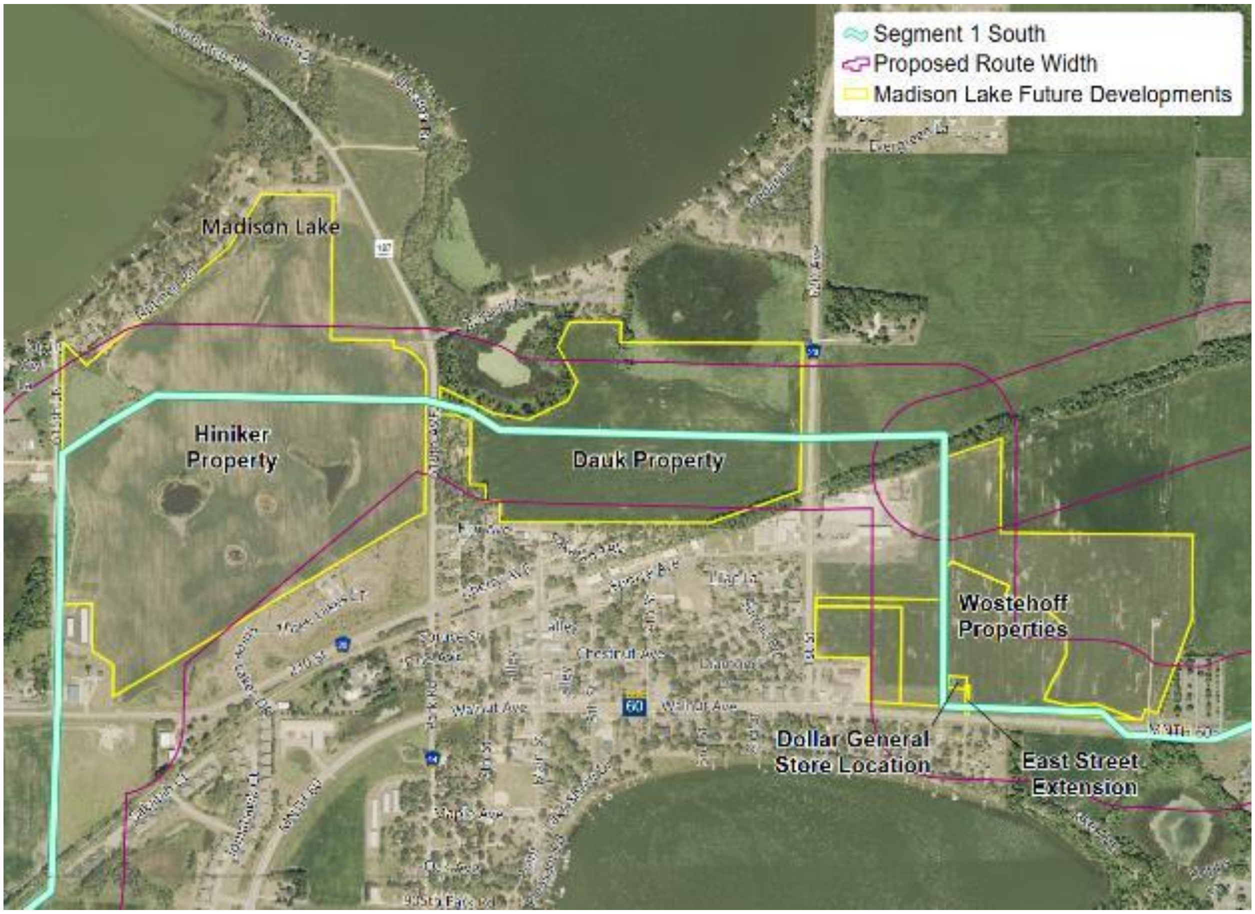
The city of Madison Lake is a small municipality in Blue Earth County, comprising around two percent of the county's population. They have their own comprehensive plan (reference (40)), adopted in 2006, that provides a long-range vision and guide for community development. The plan highlights key community values for planning and states that their community should be beautiful, efficient, accessible, competitive, habitable, equitable, and sustainable. The zoning districts within Madison Lake per the Madison Lake Zoning ordinance (reference (41)) include agricultural, residential, business, industrial, shoreland overlay, and environmental review districts. Segment 1 South and Route Segment 5 would go through primarily agriculturally zoned land per their 2018 zoning map (reference (42)).

The Greater Mankato website represents multiple cities and counties and advertises targeted areas available for industrial and commercial development. Several properties near Highway 60 in Madison Lake are targeted for development (reference (43)). By email communication, the Madison Lake City Administrator verified future proposed and planned developments (shown in Figure 5-3). The city anticipates that the Hiniker Property will have continued residential development over the next several

[6] Docket No. 20248-209829-01 [NORTHERN STATES POWER COMPANY, DBA XCEL ENERGY RESPONSE TO EIS SCOPING COMMENTS, 08/28/2024]

years based on market demand. The Dauk property is part of the cities key priority areas for future Main Street and Downtown District expansion. Madison Lakes goals for their downtown growth and expansion are reflected in their Economic Development Goals and Strategies in their comprehensive plan (reference (40)). In email correspondence with the city they also mentioned the planned Dollar General Store that is planned for the Wostehoff Properties. MnDOT also noted this project during scoping. The Dollar General Store will be constructed near Highway 60 and along Walnut Avenue.[7] The development would require extension of East Street and installation of turn lanes and sidewalks. For this development, MnDOT and the city are requiring the developer provide sidewalks with connectivity to the city's sidewalk network.

Figure 5-3 Madison Lake Future Development



5.5.5.1.2 Le Sueur County Plan and Ordinances Analyses

The Le Sueur County Comprehensive Plan, adopted in 2007, has eight land use goals and correlating policies that help to meet the County residents' needs and protect health, safety, and welfare. These goals revolve around protecting natural resources while also managing increasing growth pressures (reference (44)). The Le Sueur County Land Use Ordinance was adopted in 2012 and includes the

[7] Docket. No. 20248-209198-01 [MnDOT Comments, 08/01/2024]

following zoning districts: agriculture, conservancy, special protection (shoreland), urban/rural residential, recreational residential (shoreland), shoreland special protection, shoreland recreational residential, shoreland recreational commercial, general business, and general industry. They also have several overlay districts, which include mineral resources, flood plain, floodway, flood fringe, and airport zoning (reference (45)).

The city of Waterville is a small municipality in Le Sueur County, comprising around six percent of the population of the county. They do not have a comprehensive plan but have their own zoning ordinance (reference (46). The zoning districts included in the ordinance are agricultural, residential, business, industrial, and shoreland. Segment 1 South and Segment 6 would be within the city of Waterville.

5.5.5.1.3 Waseca County Plan Analysis

The Waseca County Comprehensive Plan: Charting a Course for the Next 20 Years, was adopted in 2005. The plan states four key principles: strategic vision for change, community-based partnerships, sustainable community development, and economic opportunity. They also have ten vision statements that guide the plan. There are vision statements for the following categories: infrastructure, transportation, sustainable agriculture, technology, population growth, integrated services, economic, multicultural, education, positive (reference (47)). The Waseca County Unified Development Code (UDC) was adopted in August of 2009. The zoning districts within the county include agricultural protection, limited residential, urban expansion, village missed use, highway commercial, agricultural interpretive center, and general industrial. There are several overlay districts, which include the Highway 14 overlay, shoreland overlay, floodplain overlay, and airport overlay (reference (48)).

5.5.5.1.4 Rice County Plan and Ordinances Analyses

The Rice County 2040 Comprehensive Plan was adopted in 2021. Their vision statement is a long-range, big-picture portrayal of their desired future: “As Rice County grows and evolves into the future, we will support and encourage orderly growth and a diverse economy that will continue to create jobs and a high quality of life for our citizens. We will aspire to maintain the small town feel of our cities and preserve our agricultural heritage (reference (49)).” The Rice County Zoning Ordinance was last amended in January of 2024. The zoning districts in the county include: agricultural, urban reserve, rural residential, village mixed-use, village planned unit development, highway commercial, limited industrial, rural industrial, shoreland, shoreland planned unit developments, urban reserve-industrial, and wild & scenic river (reference (50)). The city of Faribault’s municipal boundaries are within the eastern edge of Segment 1 but primarily overlap with Segment 2; Faribault’s ordinances are discussed in Section 6.5.5.1.1. Faribault also has a zoning ordinance specific to the Faribault Municipal Airport. Airports are discussed in Section 5.5.10.

The city of Morristown is a small municipality in Rice County, comprising around 1.5 percent of the population. They do not have a comprehensive plan but have a City Code of Ordinances that includes the zoning code (reference (51)). The zoning code details the agricultural, residential, highway commercial, business, industrial, and residential-mobile home districts. Segment 1 South and Route Segment 7 are close or cross the Rice County urban reserve district that surrounds Morristown. Its purpose is to implement urban growth zones where municipal infrastructure is likely to expand (Chapter 510 of reference (51)).

5.5.5.2 Potential Impacts

Transmission line and substation projects have the potential to be incompatible with existing land use patterns, local zoning requirements, and the future land use planning of local governments. Construction and operation of the project is not expected to have significant impact on land use within the counties crossed by the route alternatives.

Existing land uses along the HVTL would experience short-term impacts during the period of construction. When transmission line construction is complete, project workspaces would be restored as described in Section 3.4.5. Land uses which are consistent with the safe and reliable operation of the project would be allowed to continue as before.

The project crosses primarily agricultural areas within the ROI of Blue Earth County (around 58 percent), Waseca County (around 73 percent), Le Sueur County (around 85 percent), and Rice County (around 86 percent). Transmission lines and substations are typically either permitted or conditional use in areas zoned as agricultural, and transmission lines and substations currently exist in some of these areas. In places where the project crosses sensitive environmental features such as larger perennial watercourses, shoreland, and floodplain districts or overlays are crossed as well.

The project passes through scenic river, shoreland, and floodplain management districts throughout the counties. Minnesota Statute § 103F defines protection of water resources, including floodplain management, wild and scenic rivers, and shoreland areas, and describes limitations on uses and locations of structures in those areas. These limitations are established through special land use provisions to maintain and restore the natural beauty and attractiveness of shoreland and to provide environmental protection for the water resources. These overlay districts were established to protect and enhance shoreland and floodplain areas by establishing additional restrictions and requirements for development and use of these resources. Currently, construction details for the project and exact locations of structures and associated facilities are not known. The project would be designed to span waterbodies and floodplains where practicable and to minimize the number of structures in surface water resources where these resources cannot be spanned. Furthermore, no impacts to the overall function of watersheds are expected. Any impacts that might occur from installation of structure foundations would be minimal and localized. The placement of transmission line structures in floodplains is not anticipated to alter the flood storage capacity of the floodplain based on the minimal size of individual transmission line structures.

A few smaller pockets of commercial and industrial zoning areas are crossed by the project, in particular where the project routes near municipalities. Transmission lines and substations are typically either permitted as conditional use in areas zoned as industrial or commercial because these facilities are similar to other infrastructure in industrial and commercial areas.

Based on review of the zoning information for the counties crossed by each route alternative, the likelihood of future residential, commercial, or industrial development within the route alternatives is generally low. Future development would be most likely in or near the incorporated areas traversed by the project.

Two known areas of future development were noted during scoping and would be subject to impacts if the Commission were not to select one of their alternatives in the final route. Segment 1 North would impact a development that has broken ground on the western side of 589th Avenue west of the city of Mankato if the anticipated alignment were to stay on the west side of the road. Segment 1 South could impact planned residential and commercial development in several properties around Madison Lake. Based on email correspondence received from the City Administrator, the city indicated that Segment 1 South would be incompatible with the city's current and future land use plans. They indicated that it would disrupt construction timelines and planning commitments, as well as jeopardize critical components of their economic and community growth strategy.

Segment 1 South and Route Segment 7 would impact urban reserve zoning districts in Rice County, where municipal growth is anticipated for Madison Lake. Elsewhere, the project is not anticipated to be inconsistent with authorized uses within the affected zoning districts crossed by any route alternative or be incompatible with future land use planning goals of local governments.

5.5.5.3 Mitigation

The sample route permit does not include mitigation measures specific to land use and zoning. Section 1.1 of Appendix H states: "Pursuant to Minn. Stat. § 216E.10, this route permit shall be the sole route approval required for construction of the transmission facilities and this route permit shall supersede and preempt all zoning, building, or land use rules, regulations, or ordinances promulgated by regional, county, local and special purpose governments."

Project impacts to zoning and to current and future land uses can be mitigated by selecting routes alternatives that are compatible, to the extent possible, with community zoning and land-use plans. Land-use impacts can be mitigated by minimizing aesthetic impacts of the project, to the extent that zoning and land-use plans address aesthetics (for example, landscaping). Land-use impacts can also be mitigated by using existing ROW to the maximum extent possible. The proposed transmission line is generally compatible with local planning and zoning ordinances. Impacts to planning and zoning are anticipated to be negligible.

5.5.6 Noise

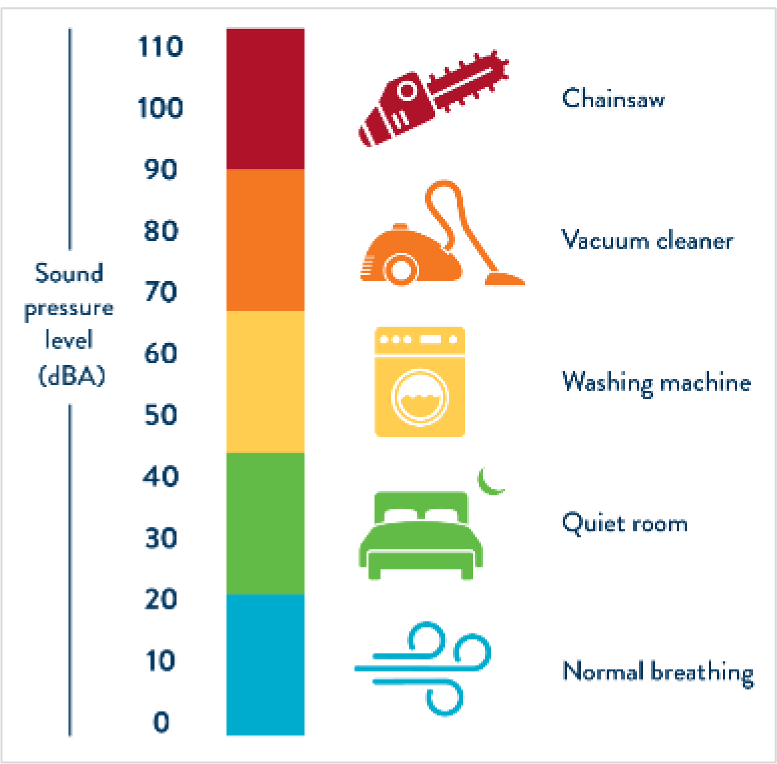
The ROI for noise is the local vicinity. Short-term noise impacts would occur during construction. Impacts would be minimal, and the applicant would be required to comply with state noise standards. Noise impacts during operation would be negligible except for perceptible noise impacts, particularly during periods of foggy, damp, or light rain conditions. Operation of the project would meet state noise standards. Impacts would be minimized by selecting the route with the fewest receptors nearby; receptors are quantified as part of the aesthetics assessment.

Noises from the project are associated with construction and operation. Noise created by construction activities is anticipated to be minimal for all route alternatives. Construction activity would occur during a specified time during the day, and only at a specific portion of the project for a few days to weeks at a time over the course of 24 to 27 months. Impacts are expected to be compliant with state noise standards.

5.5.6.1 Existing Conditions

Noise levels are measured in units of decibel (dB) on a logarithmic scale and can be used to compare a wide range of sound intensities. Human hearing is not equally sensitive to all frequencies of sound, so certain frequencies are given more weight. The A-weighted decibel scale (dBA) scale accounts for the sensitivity of the human ear. It puts more weight on the range of frequencies that the average human ear perceives, and less weight on those we don't, like higher or lower frequencies. An increase of 10 dBA sounds twice as loud, due to the way that the logarithmic scale functions in compressing the measurements associated with sounds (reference (52)). Figure 5-4 illustrates common noise levels at various levels of the dBA scale.

Figure 5-4 Common Activity Noise Levels



The MPCA has the authority to adopt noise standards pursuant to Minnesota Statute § 116.07, subpart 2. The adopted noise standards are set forth in Minnesota Rule 7030, which sets noise limits for different land uses (Table 5-5). These land uses are grouped by Noise Area Classification (NAC) and are separated between the daytime and nighttime noise limits. Residences are classified as NAC -- 1 and have the lowest noise limits of the four NACs. A complete list of all land use designations assigned to the

NAC categories are available at Minnesota Rule 7030.0050. All project noises must comply with the MPCA noise standards (Table 5-5). The noise standards specify the maximum allowable noise volumes that may not be exceeded for more than 10 percent of any hour (L_{10}) and 50 percent of any hour (L_{50}) (reference (52)).

Table 5-5 Minnesota Noise Standards

	Daytime Limit (dBA)	Daytime Limit (dBA)	Nighttime Limit (dBA)	Nighttime Limit (dBA)
	L_{10}	L_{50}	L_{10}	L_{50}
NAC – 1: Residential and Other Sensitive Uses	65	60	55	50
NAC – 2: Non-Residential Uses (typical Commercial)	70	65	70	65
NAC – 3: Non-Residential Uses (typical Industrial, Agricultural)	80	75	80	75
NAC – 4: Undeveloped Uses	NA	NA	NA	NA

Source: reference (1)

The project ranges through a mix of developed and rural areas. Background noise has the potential to be higher in the more populated areas of the project. Rural areas without significant noise might be in the 30 to 40 dBA range, while noise could be in the 40 to 50 dBA range in more developed portions of the project (reference(53)). Portions of the route parallel existing highways which may further elevate near-field noise levels depending on traffic load. The primary noise receptors within the project area are residences and farmsteads, which are classified as NAC – 1.

For most of the project, ambient noise levels are in the range of 30 to 50 dBA, with temporary, higher noise levels associated with wind, vehicular traffic, and the use of gas-powered equipment (for example, tractors or chainsaws). Community noise levels are usually closely related to the intensity of human activity. Noise levels are generally considered low when below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. In rural areas, noise levels can be below 35 dBA. In small towns or wooded and lightly used residential areas, noise levels are more likely to be range from 40 to 50 dBA. Levels around 75 dBA are more common in busy urban areas, and levels up to 85 dBA occur near major freeways and airports.

5.5.6.2 Potential Impacts

5.5.6.2.1 Construction Noise

During project construction, temporary, localized noise from heavy equipment and increased vehicle traffic is expected to occur along the ROW during daytime hours during implementation of the project. HVTL 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. Substation noise would be localized and present at a particular location from start to end. Major noise-producing activities are associated with clearing and grading, material delivery, augering foundation holes, setting structures, and stringing conductors.

Noise associated with heavy equipment can range between 80 and 90 dBA when operating at full power 50 feet from the source (reference (54)). Heavy equipment generally runs at full power up to 50 percent of the time. Point source sounds decrease six dBA at each doubling of distance (reference (52)); therefore, a 90 dBA sound at 50 feet is perceived as a 72 dBA sound at 400 feet and a 60 dBA sound at 1,600 feet.

Construction noise could reach levels above the state thresholds for short intervals at select times and locations. Any periods of sufficient duration to exceed the MPCA daytime noise limits would be temporary in nature and no exceedances of the MPCA nighttime noise limits are expected for the project. Construction noise could temporarily affect residences, schools, businesses, libraries, parks, recreational areas, and related public spaces that are close to the ROW. An exceedance of noise standards need not occur for a negative impact to occur. For example, interference with conversational speech typically begins at about 60 dBA (reference (55)). A 70 dBA sound interferes with telephone conversations, and an 80 dBA sound interferes with normal conversation. Distinct noise impacts during construction are anticipated to be minimal to moderate depending on proximity to receptors, the activity occurring and equipment being used. Construction noise impacts will be temporary, localized, and intermittent.

5.5.6.2.2 Transmission Line Noise

Noise from transmission lines (electrical conductors) is due to small electrical discharges which ionize surrounding air molecules. The level of noise from these discharges depends on conductor conditions, voltage levels, and the weather conditions. Noise emissions are greatest during heavy rain events when the conductors are consistently wet. However, during heavy rains, the background noise level is usually greater than the noise from the transmission line. As a result, audible noise is typically not noticeable during heavy rains. In foggy, damp, or light rain conditions, transmission lines might produce audible noise higher than background levels. During dry weather, noise from transmission lines is a perceptible hum and sporadic crackling sound. The noise modeling for the proposed transmission line indicates that the noise generated by the project will not exceed the most stringent MPCA noise standards of NAC-1 at the edge of the ROW. Therefore, no mitigation is proposed.

5.5.6.2.3 Substation Noise

Transformers and switchgear operation are the common noises associated with a substation. Noise emissions from this equipment have a tonal character that often sound like a hum or a buzz that corresponds to the frequency of the alternating current (AC). Transformers produce a consistent humming sound, resulting from magnetic forces within the transformer core. This sound does not vary with transformer load. Switchgear produces short-term noises during activation of circuit breakers; these activations are infrequent. The applicant indicates that the substations will be designed such that noise levels would be compliant with Minnesota noise standards at the substation boundary. Accordingly, substation noise levels are anticipated to be within Minnesota noise standards (that is, < 50 dBA and NAC-1) at the nearest receptor(s).

5.5.6.3 Mitigation

The sample route permit (Section 5.3.6 of Appendix H) contains the following mitigation related to noise: "The Permittee shall comply with noise standards established under Minnesota Rules 7030.0010 to 7030.0080. The Permittee shall limit construction and maintenance activities to daytime working hours to the extent practicable."

Sound control devices on vehicles and equipment, for example, mufflers; conducting construction activities during daylight hours, and, to the greatest extent possible, during normal business hours; and running vehicles and equipment only when necessary are common ways to mitigate noise impacts. Impacts to state noise standards can be mitigated by timing restrictions if needed. During operation, permittees are required to adhere to noise standards. No additional mitigation is proposed.

5.5.7 Property Values

The ROI for property values is the local vicinity. Property values are impacted by many interconnected factors. If effects do occur due to transmission lines and substations, research has shown these effects to be almost always less than 10 percent. Impacts are anticipated to be minimal. However, it is acknowledged that every landowner has a unique relationship and sense of value associated with their property and impacts. Impacts of the project would be minimized by selecting the route with the fewest residences nearby; residences are quantified as part of the aesthetics assessment.

5.5.7.1 Existing Conditions

The ROI for property values is the local vicinity. Residences located within the local vicinity of Segment 1 are summarized in the aesthetics impact analysis (Section 5.5.1). Map 15 includes residence locations within the route width of the route alternatives; they are also shown in Map 13. For a general sense of the number of residences within the ROI, Segment 1 North has more than 180 residences within the ROI (Figure 5-1) and Segment 1 South has more than 320 residences within the ROI (Figure 5-1).

5.5.7.2 Potential Impacts

Potential impacts of overhead transmission lines on property values are generally connected to three main factors. First, how the transmission line affects the viewshed and aesthetics of a property. Second, the real or perceived risks that buyers have of electric magnetic fields (EMF). Third, the effects to agricultural production on properties that are used for farming operations. The aforementioned factors are only some of the many interconnecting factors that affect property values. Because of this, it is difficult to measure how much and the numerous ways that transmission lines and property values are correlated.

A variety of methodologies have been used to research the relationship between transmission lines and property values. Some general conclusions can be drawn from this body of literature. This discussion highlights relevant outcomes of property value research with additional detail provided in Appendix I.

Research does not support a clear cause-and-effect relationship between property values and proximity to transmission lines, but has revealed trends that are generally applicable to properties near transmission lines:

- When negative impacts on property values occur, the potential reduction in value is in the range of one to 10 percent.
- Property value impacts decrease with distance from the line; thus, impacts are usually greater on smaller properties than on larger ones.
- Negative impacts 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 greater effect on sale price than the presence of a transmission line.
- The value of agricultural property decreases when transmission line structures interfere with farming operations.

Every landowner has a unique relationship and sense of value associated with their property. Thus, a landowner's assessment of potential impacts to their property's value is often a deeply personal comparison of the property "before" and "after" a proposed project is constructed. These judgments, however, do not necessarily influence the market value of a property. Rather, appraisers assess a property's value by looking at the property "after" a project is constructed. Moreover, potential market participants likely see the property independent of the changes brought about by a project; therefore, they do not take the "before" and "after" into account the same way a current landowner might.

5.5.7.3 Mitigation

The sample route permit does not include any specificity around mitigation required for property values.

The applicant would be responsible for any construction-related damages and for returning affected property to its original condition, which would help maintain property value. As discussed in Section 3.3.2, for properties crossed by the ROW, the applicant would develop a fair market value offer and once ROW is acquired, would contact the landowner to discuss any special considerations that might be needed (for example, for fences, crops, or livestock). Impacts could also be mitigated by using the protections offered through Minnesota Statute § 216E.12 (commonly known as the "Buy the Farm" statute), where available, to move away from potential property value impacts.

5.5.8 Recreation

The ROI for recreation is the route width. Impacts to recreation are assessed through identification of recreational resources within the ROI and reviewing their use and proximity to the anticipated alignment in comparison to other features that are a part of the natural or built environment. Recreational resources that are present include local parks, a publicly accessible trail system (Sakatah Singing Hills State Trail), public watercourses (including a designated state water trail and wild and scenic river), and snowmobile trails. The project also crosses a scenic byway. Intermittent and

localized indirect impacts could occur during construction (for example – increased noise levels); long-term impacts during operation could occur in the form of aesthetic impacts (Section 5.5.1). Given that direct long-term effects are predominantly related to aesthetics, the indirect long-term repercussions on recreation are anticipated to be subjective, meaning that responses vary based on individual perspectives and experiences.

5.5.8.1 Existing Conditions

Recreation within Segment 1's ROI consists primarily of outdoor recreational opportunities including picnicking, hiking, cross-country skiing, biking, bird watching, fishing, hunting, canoeing/kayaking, and snowmobiling. Publicly accessible recreational areas within the ROI are summarized in Table 5-6, shown in Map 10, and further discussed below. Additional recreational resources that are near Segment 1 but outside the ROI include: Sakatah Lake State Park and Campground, Lake George Park, and Ray's Lake Park (Map 10–1, Map 10–2, and Map 10–3). Publicly accessible lands that may be used for recreational purposes but also serve to provide wildlife habitat are discussed further in Section 5.9.12. Within Segment 1 North and Segment 1 South's ROI, these include: Aquatic Management Areas (AMAs), Wildlife Management Areas (WMAs), Waterfowl Production Areas, and state game refuges. Scientific and Natural Areas (SNAs) are also publicly accessible and are discussed in Section 5.9.7. SNAs are open to recreational activities but limited to activities that do not disturb natural conditions such as birdwatching, photography, and hiking (reference (56)).

Table 5-6 Recreational Resources within the ROI

Recreational Resource Type	Recreational Resource	Unit	Segment 1 North	Segment 1 South
City or County Parks	Duck Lake Park (Blue Earth County)	acres	0	9.0 [1]
	Shager Park (Rice County)	acres	1.8	0
	Westwood Park (city of Faribault)	acres	0.4	0
State Trails	Sakatah Singing Hills State Trail	miles	4.2	6.3
State Water Trails and Wild and Scenic Rivers	Cannon River	crossing count	2	0
		linear feet	2,750	0
	Minnesota River	crossing count	0	0
		linear feet	280	280
Public Water Access Sites	Lily Lake Public Water Access Site	crossing count	0	1
	Sprague Lake Public Water Access Site	crossing count	0	1
Scenic Byway	Minnesota River Valley Scenic Byway	miles	0.4	0.4
Snowmobile Trails	Faribo-Sno-Go Trails	miles	4.2	6.3
	Lesueur County Snow Trails	miles	1.7	0.3
	Waseca County Trails	miles	0.0	0.8
	Total snowmobile trails	miles	5.9	7.4

[1] Duck Lake Park was identified by the applicant in the joint certificate of need application and route permit application.

One local public park is located within the ROI of Segment 1 South: Blue Earth County's Duck Lake Park (9.0 acres) and two local public parks are located within the ROI of Segment 1 North: Rice County's Shager Park (1.8 acres) and the city of Faribault's Westwood Park (0.4 acres). Duck Lake Park is located along the southern shoreline of Duck Lake north of the city of Madison Lake (Map 10–2). The park is a popular day-use park offering volleyball, picnicking, fishing, swimming, boat launching, and a playground area (reference (57)). Its property boundaries extend into the ROI for Segment 1 South however its parking area and publicly access beach and facilities are located north of 232nd Lane and outside of the ROI. Shager Park is located along the southeastern shoreline of Cannon Lake, approximately 2.5 miles west of the West Faribault Substation (Map 10–2). At its closest point to the project, it is approximately 270 feet northwest of Segment 1 North's anticipated alignment and on the opposite side of Morristown Boulevard. The park is a popular way station along the Sakatah Singing Hills State Trail and includes 2,000 feet of lakeshore as well as opportunities for swimming, picnicking, fishing, hiking, and snowmobiling, and (reference(58)). Westwood Park is located 0.4 miles south of the West Faribault Substation (Map 10–4). At its closest point to the project, it is approximately 450 feet east of Segment 1 North's anticipated alignment and on the opposite side of Interstate 35. It includes an outdoor open space. No local public parks are located within the ROI of Segment 1 South.

The Sakatah Singing Hills State Trail is located within the ROI of Segment 1 North for 4.2 miles and Segment 1 South for 6.3 miles (Map 10–2 and Map 10–3). The trail is a 39-mile paved system that begins near State Highway 14, traverses city streets through Waterville, passes through three miles of Sakatah Lake State Park, and ends east of Interstate 35 in Faribault (reference (59)). The trail is used for bicycling, in-line skating, horseback riding, hiking, snowmobiling, and cross-county skiing (reference (59)). In most areas, but not all, the trail is lined with trees on at least one of its sides. Existing infrastructure, including roads and transmission lines, cross the trail in multiple locations. Where Segment 1 North and Segment 1 South converge and are one in the same traveling east/west east of Mankato and up until Madison Lake, an existing 69 kV transmission line is parallel to and adjacent to the trail.

Watercourses provide opportunities for recreation throughout the project area. Some watercourses hold special designations, such as state water trails and national or state wild and scenic rivers. State water trails are miles of waters publicized for canoeing, kayaking, and camping (reference (60)). National and state wild and scenic river designations preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations (reference (61)). The Minnesota River and the Cannon River are both designated as state water trails and wild and scenic rivers. The Minnesota River is located directly west of the Wilmarth Substation. Approximately 280 linear feet of the Minnesota River is located within the ROI of both Segment 1 North and Segment 1 South but the anticipated alignments do not cross the watercourse (Map 10–1). Segment 1 North crosses the Cannon River in two locations (Map 10–3 and Map 10–4). Approximately 2,750 linear feet of the watercourse is located within the ROI of Segment 1 North. In this area, the watercourse runs west to east and is not crossed by Segment 1 South.

Public Water Access (PWA) Sites, typically owned by the DNR, are designated spots along lakes and rivers that allow the public to launch boats and other watercraft for recreational purposes. Two PWA Sites, Lily Lake Public Water Access Site and Sprague Lake Public Water Access Site, are located within the ROI of Segment 1 South (Map 10–3). No PWA Sites are located within the ROI of Segment 1 North.

Segment 1 North and Segment 1 South both cross one scenic byway, the Minnesota River Valley Scenic Byway (Map 10–1). National and state scenic byways are alternative road ROWs to major highways that have regionally outstanding scenic, natural, recreational, cultural, historic or archaeological significance (reference (62)). The Minnesota River Valley Scenic Byway follows the Minnesota River through central Minnesota between the city of Browns Valley, on the border of South Dakota and Minnesota, and the city of Belle Plaine (reference (63)).

Several snowmobile trails are located within the ROI (Table 5-6; Map 10). The trails are maintained by the Le Sueur County Snowmobile Trails Association, Waseca County Trail Association, and the Faribo Sno-Go Club.

5.5.8.2 Potential Impacts

Effects on recreation due to construction of the project are anticipated to be minimal and temporary in nature, lasting only for the duration of construction and are anticipated to include short-term disturbances, such as increased noise and dust, as well as visual impacts. They could also detract from nearby recreational activities and during construction, could require short-term closures across the Sakatah Singing Hills State Trail which would impact pedestrians and bikers. Construction activities also could, depending on the timing, affect nearby hunting or wildlife viewing opportunities in public spaces by temporarily displacing wildlife. Wildlife, however, is expected to return to the area once construction has been completed.

Once constructed, the project would result in modified viewsheds or new visual impacts caused by new built features introduced to the landscape which could change the aesthetic of a recreational destination in a way that changes the experience or reduces visitor use. Because direct long-term impacts are primarily aesthetic in nature, indirect long-term impacts to recreation are expected to be subjective and unique to the individual. These unavoidable impacts might affect unique resources. Potential impacts can be minimized through prudent routing. Visual impacts are discussed in Section 5.5.1. In many cases, the project would cross recreational resources (e.g., the scenic byway and Cannon River state water trail) where transmission lines are already present. While visual impacts would occur, the project is not anticipated to impede recreational activities, such as snowmobiling, golfing, canoeing, hunting, or fishing.

5.5.8.3 Mitigation

Impacts to recreation can be mitigated by prudent routing and/or selecting route alternatives that avoid resources used for recreational purposes. For example, the anticipated alignments for both Segment 1 North and Segment 1 South are located on the opposite side of the road from the three local parks located within the ROI. The applicant committed to installing appropriate signage along recreational areas to warn trail users of ongoing construction.

Impacts can also be mitigated by reducing impacts to natural landscapes. Specifically, impacts could be reduced by paralleling existing infrastructure and/or sharing existing ROW. The applicant committed to coordinating with local governments, the DNR, and USFWS to ensure construction of the project will not significantly impact nearby natural resources that could influence recreation.

5.5.9 Socioeconomics

The ROI for socioeconomics is the four-county area. Impacts are qualitatively assessed based on the influx of workers during construction activities. Economic factors related to construction and operation of the project are anticipated to be short-term and positive, but minimal. Positive impacts come from increased expenditures at local businesses during construction, the potential for some materials to be purchased locally, and the use of local labor.

5.5.9.1 Existing Conditions

Segment 1 is in southeastern Minnesota. Labor force and unemployment data was used from the 2019-2023 American Community Survey, 5-Year Estimates from the US Census Bureau and the Minnesota Department of Employment and Economic Development. Table 5-7 shows the compiled population and economic data on Minnesota and the counties that Segment 1 North and Segment 1 South intersect, including Blue Earth, Le Sueur, Waseca, and Rice counties.

Table 5-7 Population, Income, and Employment

County	Population	Population Density (population/ sq. miles)	Labor Force Participation (%)	Labor Force	Labor Force Unemployment Rate (%)	Per Capita Income	Median Household Income
Minnesota	5,024,279	71.7	68.7	4,537,247	4.0	$44,947	$84,313
Blue Earth	70,006	91.6	64.3	38,413	2.5	$34,010	$66,249
Le Sueur	28,795	64.2	67.4	16,021	2.5	$41,400	$87,180
Waseca	18,953	43.8	64.2	11,438	1.5	$40,471	$75,063
Rice	67,948	137.0	62.7	35,806	1.3	$35,983	$81,455

County populations within Segment 1 range from around 18,000 to 70,000. The highest populations and population densities within Segment 1 are where the project is closer to the metropolitan areas of Mankato and Faribault, which include Blue Earth and Rice Counties. At the county level, change in population between the 2010 and 2020 census ranged from a decline of 0.9 percent in Waseca County to an increase of 8 percent in Blue Earth County.

The labor force unemployment rate in Segment 1 ranges from 1.3 percent in Rice County to 2.5 in Blue Earth and Le Sueur Counties. All counties in Segment 1 have an unemployment rate below the state of

Minnesota. Per capita incomes for counties crossed by Segment 1 range from around $34,000 to $41,600. The highest per capita income is in Le Sueur County.

The median household income ranges from around $66,000 in Blue Earth County to around $87,000 in Le Sueur County. All of the counties, besides Le Sueur, had a median income lower than the state of Minnesota, which has a median income of $84,000.

According to the 2018-2022 American Community Survey, 5-Year Estimates from the US Census Bureau, each county's largest industry in terms of employment is "educational services, health care, and social assistance." "Manufacturing" is the second largest industry in terms of employment in all counties except Blue Earth County, where the second largest industry in terms of employment is "Retail Trade."

5.5.9.2 Potential Impacts

Potential socioeconomic impacts would be short-term due to the time frame of construction (2-3 years). An influx of construction jobs and personnel, delivery of construction material, temporary housing, and other purchases from local businesses will occur during that time. Slight increases in retail sales in the project area are expected. These would include purchases of lodging, food, fuel, construction materials, and other merchandise. No long-term impacts are expected in transmission line and substation projects.

Construction of the transmission line would employ approximately 50-100 workers over the 2-3 years of the project, per the joint certificate of need application and route permit application. The applicant committed in the joint certificate of need application and route permit application to pay prevailing wages for applicable construction jobs. Local construction crew expenditures would result in temporary, positive impacts on local economies.

Workers would likely be commuting to the area instead of relocating to the project area. Construction workers traveling to the area might find temporary housing over the span of the project, but this might move with construction along the project area. The construction and operation of the project is not anticipated to create or remove jobs over the long-term or result in the permanent relocation of individuals to the area.

5.5.9.3 Mitigation

Adverse impacts are not expected; therefore, mitigation is not proposed.

5.5.10 Transportation and Public Services

The ROI for transportation and public services varies. For roadways and rail, the ROI is the local vicinity. For public utilities, the ROI is the ROW. For emergency services, the ROI is the four-county area. For airports, the ROI is within 3.78 miles. Impacts are expected to primarily be related to construction activities and would be short-term and minimal. Negative impacts, such as traffic delays, should be negligible. Long-term impacts to public services are also anticipated to be minimal. Impacts are unavoidable but can be minimized and mitigated.

5.5.10.1 Roadways/Railways Existing Conditions

In addition to numerous other county, city, and township roads, Segment 1 is located adjacent to or crosses the below-listed US highways and MN highways.

- US Highway 14, which Segment 1 South crosses once and is parallel to it for 3.9 miles.
- MN Highway 22, which Segment 1 North and Segment 1 South both cross once.
- MN Highway 13, which Segment 1 North and Segment 1 South both cross once. Segment 1 South is parallel to it for .8 miles.
- MN Highway 60, which Segment 1 North crosses eight times and Segment 1 South crosses once.
    - Segment 1 North is parallel to it for .3 miles.
    - Segment 1 South is parallel to it for 5.8 miles.

Both Segment 1 North and Segment 1 South cross the Dakota, Minnesota, and Eastern (DME) Railroad of the Tracy Subdivision once. Segment 1 North crosses the Union Pacific (UP) Railroad of the Mankato subdivision twice, and Segment 1 South crosses the UP Railroad of the Mankato subdivision twice (Map 12).

5.5.10.2 Public Utilities Existing Conditions

Electric utilities near the project are provided by numerous entities (reference (64)), including:

- Northern States Power Company
- Southern Minnesota Municipal Power Agency
- Benco Electric Cooperative
- Minnesota Valley Electric Cooperative
- Steele Waseca Cooperative Electric
- Frost-Benco Wells Cooperative Electric Association

Natural gas service in the project area is provided by CenterPoint Energy, Greater Minnesota Gas, Great Plains Natural Gas Company, Minnesota Energy Resources Corporation, and Xcel Energy. According to the joint certificate of need application and route permit application, Segment 1 North and Segment 1 South both cross a hydrocarbon pipeline owned by Enterprise Products and a hydrocarbon pipeline owned by Kinder Morgan.

Potable water in Segment 1 is largely supplied by local wells. Near urban areas, primarily within municipalities, water mains and other public utilities are provided. Blue Earth, Le Sueur, Waseca, and Rice Counties have septic programs that conduct inspection services, issue permits, and oversee installation and maintenance of private septic systems and wells. Public works and utility departments design, construct, and maintain sanitary sewers, streets and sidewalks, storm sewers, and water mains.

5.5.10.3 Emergency Services Existing Conditions

Emergency services in Segment 1's ROI are provided by local law enforcement and emergency response entities, fire departments, and ambulance services of various counties and communities. Sheriffs' offices and municipal police departments provide regional law enforcement to Blue Earth, Le Sueur, Waseca, and Rice counties and their respective cities of Mankato, Eagle Lake, Madison Lake, Elysian, Waterville, Morristown and Faribault. Fire services are provided by city and community fire departments in Mankato, Waterville, and Morristown. Eagle Lake, Elysian, and Madison Lake have volunteer fire departments. Ambulance districts provide emergency medical response services throughout Segment 1's ROI. Emergency medical response is available from local hospitals. The Mayo Medair Ambulance Service in Mankato provides emergency helicopter transport for patients in areas surrounding Mankato Regional Airport. Emergency services within the ROI are provided by:

- North Mankato Police Department
- Faribault Police Department
- Morristown Police Department
- Waterville Police Department
- Eagle Lake Police Department
- Madison Lake Police Department
- Morristown Police Department
- Le Sueur County Sheriff Department
- North Mankato Fire Department
- Mankato Fire Stations 1, 2, and 3
- Madison Lake Fire Department
- Elysian Fire Hall
- Morristown Fire Department
- Eagle Lake Volunteer Fire
- Waterville Fire Department
- Faribault Fire Department
- St. Francis Regional Medical Center Hospital
- Mayo Clinic Hospital and Urgent Care
- Mankato Clinic Urgency Care
- Faribault Clinic – Northfield Hospital & Clinics
- Allina Health – Faribault Clinic, Medical Center, and Emergency Department
- District One Hospital

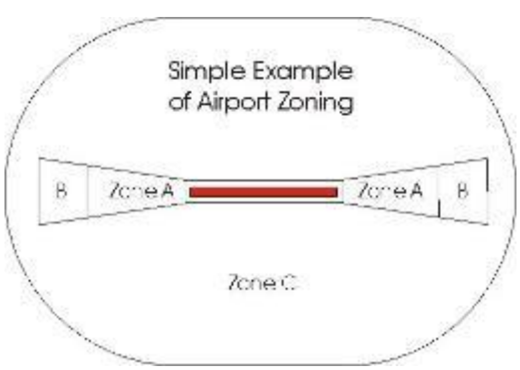
5.5.10.4 Airports Existing Conditions

Transmission line structures and conductors can conflict with the safe operation of an airport if they are located within applicable safety zones. Airports are defined by the state and the Federal Aviation Administration (FAA) as areas of land or water that are used or intended to be used for the landing and takeoff of aircraft, and includes the surrounding area used or intended to be used for airport buildings and facilities (14 C.F.R. Part 1, § 1.1 and Minnesota Rules 8800.0100, subpart 3). Different classes of airports have different safety zones depending on several characteristics, including runway dimensions, classes of aircraft they can accommodate, and navigation and communication systems (reference (65)). These factors determine the necessary take-off and landing glide slopes, which in turn determine the setback distance of transmission line structures.

The FAA and MnDOT have each established development guidelines on the proximity of tall structures to public-use airports. Transmission lines near public airports are limited by FAA height restrictions, which prohibit transmission line structures above a certain height, depending on the distance from the specific airport. Federal Aviation Regulation (FAR) Part 77 and Minnesota Rules 8800.1200 establish guidelines on heights for any structures that could endanger aircraft, which includes either structures exceeding 200 ft above ground level (AGL) or the airport elevation, whichever is greater. These guidelines impose stricter regulations for structures within a maximum distance of 20,000 ft (3.78 miles) of a public use or military airport. Regulatory obstruction standards only apply to those airports that are available for public use and are listed in the FAA airport directory. Per Minnesota Rules 8800.2400, private airstrips and personal use airstrips cannot be used in commercial transportation or by the public and are not subject to FAA regulatory obstruction standards.

In addition, MnDOT has established separate zoning areas around airports as shown in Figure 5-5. The most restrictive safety zones are safety zone A, which does not allow any buildings, temporary structures, places of public assembly, or transmission lines, and safety zone B, which does not allow places of public or semi-public assembly such as churches, hospitals, or schools. Permitted land uses in both zones include agricultural uses, cemeteries, and parking lots. Safety zone C, the horizontal airspace obstruction zone, encompasses all land enclosed within the perimeter of the imaginary horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs of specified radii (5,000 to 10,000 feet) from the center of each end of the primary surface of each runway, and which is not included in zone A or zone B. As with FAA regulations and per Minnesota Rules 8800.2400 subpart 1, MnDOT zoning requirements only apply to public airports and are recommended for private airports (reference (66)).

Figure 5-5 MnDOT Example of Airport Zoning



Source: reference (67)

There are two public airports within 20,000 feet (3.78 miles) of Segment 1, the Mankato Regional Airport and the Faribault Municipal Airport. The Mankato Regional Airport's airstrips are located 4,561 feet (0.86 miles) northeast of Segment 1 North and 12,374 feet (2.34) north of Segment 1 South (Map 12–1). It is at an elevation of 1,021 feet Above Sea Level (ASL). The Faribault Municipal Airport's airstrips are located 3.8 miles north of Segment 1 North; however, the airport's property boundary is located within 3.78 miles of Segment 1 North.

In addition to FAA and MnDOT, the area surrounding the Mankato Regional Airport is subject to the Mankato Regional Airport Zoning Ordinance (reference (68)), and the area surrounding the Faribault Municipal Airport is subject to the Airport Safety Zoning Ordinance 2013-001 for Faribault Municipal Airport (reference(69)). Each ordinance also notes the establishment of airport-specific joint zoning boards made up of township, city, and county representatives.

In addition to public airports, Minnesota Rules 8800.1200 also establishes height restrictions applicable to public heliports in subpart 6. The closest heliport is the District One Hospital in Faribault, which is 9,815 feet (1.85 miles) from Segment 1 North. The project ROW would be outside, where structures may be considered general obstructions.

5.5.10.5 Potential Impacts

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

Construction could cause moderate, localized impacts to roadways that would be short-term in nature. Construction activities occasionally cause lanes or roadways to be closed. These closures would only last for the duration of the construction activity in a given area. Construction equipment and delivery vehicles would increase traffic along roadways throughout project construction, with effects lasting from a few minutes to a few hours, depending upon the complexity and duration of the construction activities. Drivers could experience increased travel times as a result. Construction vehicles could temporarily block or alter public access to streets and businesses. Lane closures and traffic management might pose safety concerns to workers and the public as active traffic and workers move throughout the construction space. Additionally, construction along roadways can increase dust as grading occurs, which can obscure road lines or vision.

Vehicles and equipment that would be used for construction of the transmission line (for example, overhead line cranes, concrete trucks, construction equipment, and material delivery trucks) are generally heavy load vehicles and can cause more damage to road surfaces. Oversized/overweight load permits must be obtained from MnDOT and county road authorities when size and/or weight limits would be exceeded.

During operation, severe weather, including high winds, ice, snowstorms, and tornadoes, could result in structure damage. If structures and lines fall over or otherwise reach the ground, they would create safety hazards on any roadways located within the designed fall distance of an overhead transmission line parallel to existing roadways. Snow and ice accumulation and high winds could make the transmission line more susceptible to failure or collapse.

The applicant indicated that its design standards would meet or surpass NESC requirements for the safe design and operation of transmission lines. These standards include designing transmission lines to withstand severe winds from summer storms and the combination of ice and strong winds from winter weather.

Potential impacts to railways would be limited to short-term construction impacts and would be coordinated directly with the railroad operator. Impacts of stringing HVTL lines and maintenance of structures can include delays and safety concerns as trains are temporarily rerouted or crossings are postponed. Safety measures would be implemented during active construction around railroads. Construction workers would maintain regular contact with railroad personnel as electrical conductor stringing occurs over spanned rail lines to ensure appropriate safety standards are maintained throughout construction and operation. Negligible impacts during operation would be anticipated to railroads.

Potential impacts to the electrical grid and other utilities during construction are anticipated to be short-term, intermittent, and localized. In some areas, the project could cross over existing transmission lines, follow existing transmission line ROW, or cross or parallel electric distribution lines. An overarching project objective is to provide additional transmission capacity to reduce congestion and to improve electric system reliability throughout the region as more renewable energy resources are added to the high-voltage transmission system. Project operations would, therefore, have long-term beneficial impacts by providing additional transmission line capacity in the project area.

The project crosses pipeline ROWs in two locations in Segment 1. Potential pipeline impacts are expected to be avoided and mitigated by coordinating with the appropriate pipeline companies. The applicant indicated that they would use the Gopher State One-Call system to locate and mark underground utilities prior to ground disturbing activities. Transmission lines have the ability to cause AC interference on pipelines. Engineering analysis and induction study can be done to determine the extent of possible impacts and determine if co-location is feasible and reasonable.

The project is not anticipated to impact emergency services. Construction and operation of the project is not expected to impact heliports operating from hospitals. Temporary road closures required during construction would be coordinated with local jurisdictions to provide for safe access of police, fire, and other emergency service vehicles. Accidents that might occur during construction would be handled through local emergency services. Given the limited number of construction workers involved in the project and the low probability of a construction-related accident, the existing emergency services should have sufficient capacity to respond to emergencies. During operation, emergency services providers could receive 911 phone calls in the event of a fallen transmission line structure.

Potential airport impacts, as they exist today, are anticipated to be minimal as there are mitigation measures that can be employed to avoid these impacts, such as, routing away from the airport, the use of appropriate height structures to avoid impact to glide or approach slopes, and structure marking or lighting. Potential impacts to public airports would occur if the project is of a certain height and located within close proximity thereby limiting the potential for safe operations, including aircraft takeoff and landing. Potential impacts to public airports would be determined in relation to safety zones and through adherence to FAA design criteria and recommended setbacks. Height restrictions would apply if/when the airport's airstrips are within 3.78 miles.

The Mankato Regional Airport's airstrips are located within 3.78 miles of Segment 1 North and Segment 1 South. Transmission line structures would be less than 200 feet AGL. No impacts are anticipated to Faribault Municipal Airport as the airstrip is more than 3.78 miles away from the nearest potential transmission line structure.

5.5.10.6 Mitigation

The sample route permit (Sections 5.3.4 and 5.3.14 of Appendix H) contains the following mitigation related to transportation:

"The Permittee shall cooperate with county and city road authorities to develop appropriate signage and traffic management during construction."

"The Permittee shall keep records of compliance with this section and provide them upon the request of Commerce or Commission staff."

"The Permittee shall advise the appropriate governing bodies having jurisdiction over all state, county, city, or township roads that will be used during the construction phase of the Transmission Facility. Where practical, existing roadways shall be used for all activities associated with construction of the Transmission Facility. Oversize or overweight loads associated with the Transmission Facility shall not be hauled across public roads without required permits and approvals."

"The Permittee shall promptly repair private roads or lanes damaged when moving equipment or when accessing construction workspace, unless otherwise negotiated with the affected landowner."

The applicant committed to attempt to avoid or limit roadway closures to the maximum extent practicable and use conductor safety guides over roads or utilize helicopters for stringing activities where possible. The applicant also noted impacts to traffic would be mitigated by limiting construction traffic to the project right-of-way and existing access points to the maximum extent feasible, and minimizing impacts related to dust by proper use of BMPs (e.g., soil matting, wetting) to reduce the potential for dust. The applicant also committed to utilizing appropriate safety measures such as use of safety signage, installation of temporary barrier structures, and employing spotters during clearing or stringing activities. Finally, the applicant would meet with MnDOT, county highway departments, township road supervisors, and/or city road personnel to address any issues that occur during roadway construction.

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to public services and utilities: “During Transmission Facility construction, the Permittee shall minimize any disruption to public services or public utilities. To the extent disruptions to public services or public utilities occur, these shall be temporary, and the Permittee shall restore service promptly. Where any impacts to utilities have the potential to occur the Permittee would work with both landowners and local entities to determine the most appropriate mitigation measures if not already considered as part of this route permit.”

In the joint certificate of need application and route permit application, the applicant committed to ongoing coordination with MnDOT, local and county road authorities, railroad companies, and the FAA.

MnDOT and rail operator design guidelines would need to be met for any utility occupation of road and railroad ROW and a permit from MnDOT would be required to use any state highway ROWs. MnDOT has a formal policy and procedures for accommodating utilities within or as near as feasible to highway ROWs. The applicant would continue to work with MnDOT and as noted in Section 2.7.3, has completed ENMs and will be required to complete a constructability report. Additionally, the applicant has committed to coordinating with county and township road departments to minimize impacts on local roads and highways. The applicant also noted in the joint certificate of need application and route permit application that at the suggestion of MnDOT, they met with the Mississippi River Parkway Commission to discuss the crossing of Minnesota Highway 61, or the Great River Road, and explained that the crossing location would use existing structures.

If issued a route permit, the applicant would need to file notice with the FAA and work with both the FAA and MnDOT for compatibility between the transmission line and any airport and to identify appropriate mitigation measures. Structures within 3.78 miles of Mankato Regional Airport would be kept below 200 feet AGL, but if it was determined necessary to construct any structures with a height greater than 200 feet AGL, those structures would be marked and lighted in accordance with FAA Advisory Circular 70/7460-1K, Obstruction Marking and Lighting.

The applicant has committed to coordinating with the FAA and MNDOT to address any project-related concerns for aviation activities as the project progresses, if necessary. Structures within 3.78 miles of Mankato Regional Airport would be kept below 200 feet AGL, but if it was determined necessary to construct any structures with a height greater than 200 feet AGL, those structures would be marked and lighted in accordance with FAA Advisory Circular 70/7460-1K, Obstruction Marking and Lighting.

Where the project crosses pipeline ROWs, mitigation might be required. If induction mitigation is necessary, the pipeline company would have to approve the mitigation being installed and the applicant would be responsible for the added project costs.

The applicant committed to coordinating with local emergency services to ensure that emergency access to areas near construction activities is maintained.

5.6 Human Health and Safety

The ROI for electric and magnetic fields (EMF) is the ROW. Impacts to human health from possible exposure to EMFs are not anticipated. The HVTL would be constructed to maintain proper safety clearances. EMF associated with the project are below Commission permit requirements, and state and international guidelines. Potential impacts would be long-term and localized. These unavoidable impacts would be of a small size and can be mitigated. Impacts would be minimized by appropriate placement and adhering to electric field standards for transmission lines.

5.6.1 Electric and Magnetic Fields (EMF)

The ROI for electric and magnetic fields (EMF) is the ROW. Impacts to human health from possible exposure to EMFs are not anticipated. The HVTL would be constructed to maintain proper safety clearances. EMF associated with the project are below Commission permit requirements, and state and international guidelines. Potential impacts would be long-term and localized. These unavoidable impacts would be of a small size and can be mitigated. Impacts would be minimized by appropriate placement and adhering to electric field standards for transmission lines.

5.6.1.1 Existing Conditions

The term "EMF" is typically used to refer to electric and magnetic fields that are coupled together. EMF is associated with natural sources such as lightning and sunlight. EMFs are also invisible lines of force that surround electrical devices (for example, power lines, electrical wiring, and electrical equipment) which are produced through the generation, transmission, and use of electric power (reference). However, for lower EMF frequencies associated with power lines, electric and magnetic fields are relatively decoupled. Generally, electric fields are dependent on the voltage of a transmission line and magnetic fields are dependent on the current carried by a transmission line.

Electric fields are the result of electric charge, or voltage, on a conductor. Using a garden hose as an analogy, voltage is equivalent to the pressure of the water moving through the hose. The intensity of an electric field is related to the magnitude of the voltage on the conductor and is measured in kV per meter (kV/m). Magnetic fields are created and increase from the strength of the flow of current through wires or electrical devices. Using the same analogy, current is equivalent to the amount of water moving through the garden hose. The intensity of a magnetic field is related to the magnitude of the current flow through the conductor and is measured in units of Gauss (G) or milliGauss (mG).

Because the EMF associated with a transmission line is proportional to the amount of electrical current passing through the power line, it will decrease as distance from the line increases (reference (71)). This means that the strength of EMF that reaches a house adjacent to a transmission line ROW will be significantly weaker than it would be directly under the transmission line. Electric fields are easily shielded by conducting objects, such as trees and buildings, further shielding electric fields.

Magnetic fields, unlike electric fields, are not shielded or weakened by materials that conduct electricity (for example, trees, buildings, and human skin). Rather, they pass through most materials. Both magnetic and electric fields decrease rapidly with increased distance from the source. Electric and magnetic fields are invisible, just like radio, television, and cellular phone signals, all of which are part of the electromagnetic spectrum (reference (70)).

Electric and magnetic fields are found anywhere there are energized, current-carrying conductors, such as near transmission lines, local distribution lines, substation transformers, household electrical wiring, and common household appliances. The frequency from transmission lines is considered "non-ionizing, low-level radiation which is generally perceived as harmless to humans" (reference (70)). Table 5-8 illustrates the typical ranges of electric and magnetic fields of frequently and commonly used appliances that would be in a home (reference (70)).

Table 5-8 Electric and Magnetic Field Ranges for Common Household Appliances

Electric Field [1]		Magnetic Field [2]			
Appliance	kV/m	Appliance	mG		
	1 foot		1 inch	1 foot	3 feet
Stereo	0.18	Circular saw	2,100 to 10,000	9 to 210	0.2 to 10
Iron	0.12	Drill	4,000 to 8,000	22 to 31	0.8 to 2
Refrigerator	0.12	Microwave	750 to 2,000	40 to 80	3 to 8
Mixer	0.10	Blender	200 to 1,200	5.2 to 17	0.3 to 1.1
Toaster	0.08	Toaster	70 to 150	0.6 to 7	< 0.1 to 0.11
Hair Dryer	0.08	Hair dryer	60 to 200	< 0.1 to 1.5	< 0.1
Television	0.06	Television	25 to 500	0.4 to 20	< 0.1 to 1.5
Vacuum	0.05	Coffee maker	15 to 250	0.9 to 1.2	< 0.1

[1] German Federal Office for Radiation Safety
[2] Long Island Power Institute

Research on whether exposure to magnetic fields causes biological responses and health effects has been performed since the 1970s. The U.S. National Institute of Environmental Health Sciences and the World Health Organization's research does not support a relationship or association between exposure to electric power EMF and adverse health effects. The U.S. National Institute of Environmental Health Science evaluated numerous epidemiologic studies and comprehensive reviews of scientific literature regarding association of cancers with living near power lines, with magnetic fields in the home, and with exposure of parents to high levels of magnetic fields in the workplace. They concluded that "no consistent evidence for an association between any source of non-ionizing EMF and cancer has been found" (reference (72)).

Minnesota, Wisconsin, and California have performed literature reviews and research examining EMF. In 2002, Minnesota formed an Interagency Working Group to evaluate EMF research and develop public health policy recommendations for any potential problems arising from EMF effects associated with high-voltage transmission lines. The Working Group included staff from a number of state agencies and published its findings in a White Paper titled *EMF Policy and Mitigation Options*. Their research found that some epidemiological studies have shown no statistically significant association between exposure to EMF or health effects, and some have shown a weak association. Studies have not been able to establish a biological mechanism for how magnetic fields could cause cancer (reference (73)).

There is no federal standard for transmission line electric fields. The Commission has imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground (reference (74)). The Commission has not adopted a magnetic field standard for transmission lines. Appendix J provides detailed background on EMF health impact research.

5.6.1.2 Potential Impacts

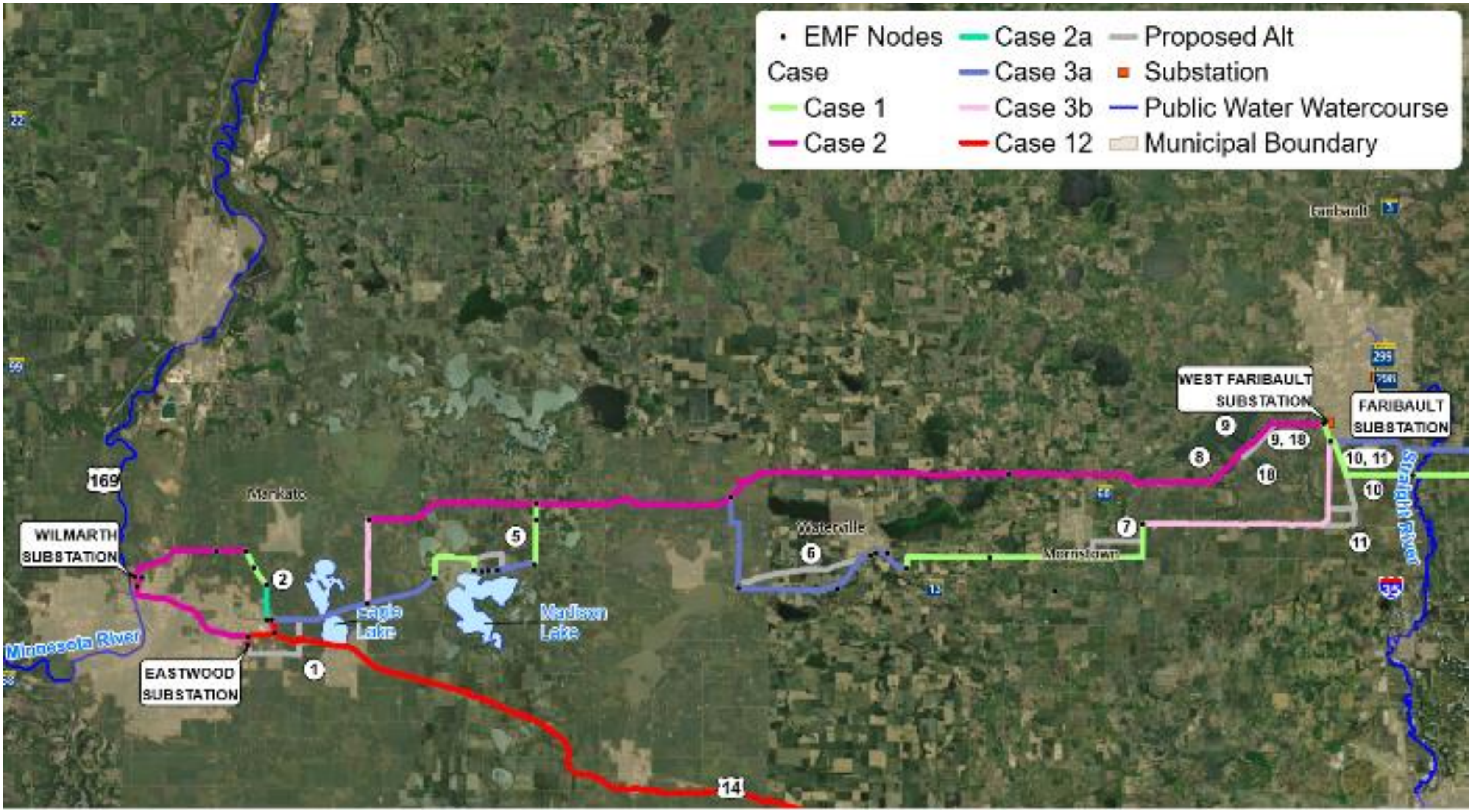
The magnitude of the voltage on a transmission line is near-constant and ideally within plus or minus five percent of the designed voltage. Because of this, the magnitude of the electric field will also be near constant regardless of the power flowing down the line. The maximum electric field associated with the project and measured at one meter (3.28 feet) above the ground, is calculated to be 6.9 kV/m. The strength of electric fields diminishes rapidly as the distance from the conductor increases. The maximum electric field values are provided in Table 5-9 and the corresponding case number is shown in Figure 5-6.

Table 5-9 Electric Field Calculations

Structure Type	Circuits Present	Case	Maximum within ROW
Single Pole, Davit Arm, 345 kV Single Circuit	Wilmarth – North Rochester 345 kV	Case 1	6.2 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild	Wilmarth – North Rochester 345 kV & Line 832 115 kV	Case 2	2 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild	Wilmarth – North Rochester 345 kV & Line 706, 707 or 708 69 kV	Case 3a, Case 3b, Case 3c	1.5 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit	Wilmarth – North Rochester 345 kV / Line 964 345 kV	Case 4	6.4 kV/m
Single Pole, Tangent/Dav it Arm, 345 kV Double Circuit	Wilmarth – North Rochester 345 kV & Line 964 345 kV	Case 5	5.2 kV/m
Single Pole, Tangent/Dav it Arm, 345 kV Double Circuit with 69 kV Underbuild	Wilmarth – North Rochester 345 kV , Line 964 345 kV & Line 739 69 kV	Case 6	1.2 kV/m
Single Pole, Davit, 161/69 kV Double Circuit	North Rochester – Chester 161 kV & Peoples Line 69 kV	Case 7	1.5 kV/m
Single Pole, Tangent, 345 kV Double Circuit	North Rochester – Tremval 345 kV, Line 965 345 kV	Case 8	6.3 kV/m

Structure Type	Circuits Present	Case	Maximum within ROW
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 9	1.3 kV/m
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit	North Rochester – Chester 161 kV & Line 979 345 kV	Case 10a	6.9 kV/m
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit	North Rochester – Chester 161 kV / Line 965 345 kV, North Rochester – River 345 kV	Case 10b	6.2 kV/m
Single Pole, Davit, 161 kV Single Circuit	North Rochester – Chester 161 kV	Case 11	2.7 kV/m
Single Pole, Tangent, 345 kV Double Circuit Single Circuit	Wilmarth – North Rochester 345 kV	Case 12	6.2 kV/m
Single Pole, Tangent, 345 kV Double Circuit	Wilmarth – North Rochester 345 kV, Line 979 345 kV	Case 13	4.9 kV/m
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit	North Rochester –Chester 161 kV, Line 5310 161 kV / Wilmarth –North Rochester 345 kV, Line 979 345 kV	Case 14	5.0 kV/m

Figure 5-6 **Segment 1, EMF Nodes**



The projected magnetic fields are provided in Table 5-10 and the corresponding case number is shown in Figure 5-6. Because magnetic fields are dependent on the current flowing on the line, calculations were based on two typical system conditions that are likely to occur during the project's first year in service. The two scenarios are system peak energy demand and system average energy demand.

Table 5-10 Calculated Magnetic Flux density (mG)

Structure Type	Circuits Present	Case	Maximum within ROW (mG)
Single Pole, Davit Arm, 345 kV Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV	Case 1	77
Single Pole, Davit Arm, 345 kV Single Circuit (Max Loading)		Case 1	167
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 832 115 kV	Case 2	65
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild (Max Loading)		Case 2	114
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 708 69 kV	Case 3a	55
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3a	96
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 707 69 kV	Case 3b	27
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3b	59
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 706 69 kV	Case 3c	31
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3c	62
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV /Line 964 345 kV	Case 4	78
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit (Max Loading)		Case 4	246

Structure Type	Circuits Present	Case	Maximum within ROW (mG)
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit (Average Loading)	Wilmarth – North Rochester 345 kV & Line 964 345 kV	Case 5	74
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit (Max Loading)		Case 5	224
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV , Line 964 345 kV & Line 739 69 kV	Case 6	19
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit with 69 kV Underbuild (Max Loading)		Case 6	59
Single Pole, Davit, 161/69 kV Double Circuit (Average Loading)	North Rochester – Chester 161 kV & Peoples Line 69 kV	Case 7	5 mG
Single Pole, Davit, 161/69 kV Double Circuit (Max Loading)			21 mG
Single Pole, Tangent, 345 kV Double Circuit with 69 kV Underbuild (Average Loading)	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 8	105 mG
Single Pole, Tangent, 345 kV Double Circuit with 69 kV Underbuild (Max Loading)			190 mG
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild (Average Loading)	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 9	23 mG
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild (Max Loading)			41 mG
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit (Average Loading)	North Rochester – Chester 161 kV & Line 979 345 kV	Case 10a	150 mG
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit (Max Loading)			400 mG
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit (Average Loading)	North Rochester – Chester 161 kV / Line 965 345kV, North Rochester – River 345 kV	Case 10b	111 mG
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit (Max Loading)	North Rochester – Chester 161 kV / Line 965 345kV, North Rochester – River 345 kV		205 mG

Structure Type	Circuits Present	Case	Maximum within ROW (mG)
Single Pole, Davit, 161 kV Single Circuit (Average Loading)	North Rochester – Chester 161 kV	Case 11	8 mG
Single Pole, Davit, 161 kV Single Circuit (Max Loading)	North Rochester – Chester 161 kV		27 mG
Single Pole, Tangent, 345 kV Double Circuit Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV	Case 12	76 mG
Single Pole, Tangent, 345 kV Double Circuit Single Circuit (Max Loading)			164 mG
Single Pole, Tangent, 345 kV Double Circuit (Average Loading)	Wilmarth – North Rochester 345 kV, Line 979 345 kV	Case 13	85 mG
Single Pole, Tangent, 345 kV Double Circuit (Max Loading)			222 mG
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Average Loading)	North Rochester –Chester 161 kV, Line 5310 161 kV / Wilmarth –North Rochester 345 kV, Line 979 345 kV	Case 14	85 mG
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Max Loading)			222 mG

System peak energy demand represents the current flow on the line during the peak hour of system-wide energy demand. Peak demand is 1,200 amps on both conductors. Whereas system average energy demand represents the current flow on the line during a non-peak time, average demand is 560 amps on both conductors. For both scenarios, the magnetic field values were calculated at a point where the conductor is closest to the ground. Like electric fields, magnetic field levels decrease rapidly as the distance from the centerline increases. In addition, because the magnetic field produced by the transmission lines is dependent on the current flow, the actual magnetic fields when the project is placed in service would vary as the current flow on the line changes throughout the day.

5.6.1.3 Mitigation

The sample route permit (Section 5.4.2 of Appendix H) states: "The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms."

Mitigation of magnetic field strength would be achieved by increasing distance from the HVTL to the receptor. The Commission has, however, 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.

5.6.2 Implantable Medical Devices

The ROI for implantable medical devices is the ROW. Potential impacts associated with the project are anticipated to be negligible. If impacts occur, they can be mitigated. Impacts would be minimized by appropriate grounding and adherence to electric field standards for transmission lines.

5.6.2.1 Existing Conditions

Implantable medical devices, such as an implantable cardioverter defibrillator (ICD) or a pacemaker, are battery-powered devices that help keep a person's heartbeat in a regular rhythm. These devices are implanted into the heart tissue and can deliver electrical shocks to correct the heart's rhythm to prevent sudden cardiac issues and help people at risk for recurrent, sustained ventricular tachycardia or ventricular fibrillation (reference (75)). Instances of interference attributed to EMF are recognized, commonly referred to as electromagnetic interference (EMI). EMF exposure produced by transmission lines generally does not affect implantable devices.

Electromechanical implantable medical devices, such as cardiac pacemakers, ICDs, neurostimulators, and insulin pumps could be subject to interference from EMF, which could mistakenly trigger a device or inhibit it from responding appropriately (reference (76)). While EMI can result in either inappropriate triggering or inhibition of a device from responding properly, only a small percentage of these occurrences are caused by external EMI. Electrical interference at levels above 1.5 kV/m have the potential to interfere with modern, bipolar pacemaker behavior, but some models have been unaffected at as high as 20 kV/m (reference (77)). There is the potential for interference at lower levels, as differing manufacturers vary in susceptibility to EMI (reference (78)). During the peak hour of system-wide energy demand, the maximum electric field within the ROW was calculated to be 6.9 kV/m.

Workers who have cardiac pacemakers have separate guidelines for EMF exposure. The American Conference of Governmental Industrial Hygienists (ACGIH) recommended magnetic and electric field exposure limits for workers who have ICDs are 1 G and 1 kV/m, respectively (reference (79)). While ICD's vary and questions and concerns should be directed to the specific manufacturer, ICD manufacturers' recommended threshold for modulated magnetic fields is 1 G (reference (76)). One gauss is five to 10 times greater than the magnetic field likely to be produced by a high-voltage transmission line (references (76); (80)). During the peak hour of system-wide energy demand, the maximum magnetic field was calculated to be 0.246 G.

It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line, inducing a voltage on the object. Induced voltage is further discussed in Section 5.6.5.

5.6.2.2 Potential Impacts

While EMI can result in either inappropriate triggering or inhibition of a device from responding properly, only a small percentage of these occurrences are caused by external EMI. The project is under ACGIH and ICD manufacturers' recommended threshold for magnetic fields. Additionally, shocks from induced voltage from transmission lines are considered more of a nuisance than a danger. Impacts of induced voltage are further discussed in Section 5.6.5.

In the event ICDs are impacted by EMF, it generally results in a temporary asynchronous pacing (reference (76)). Therefore, health impacts or permanent impacts on implantable medical devices could be possible.

5.6.2.3 Mitigation

The sample route permit (Section 5.4.1 of Appendix H) contains the following mitigation related to grounding, electric field, and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the National Electric Safety Code. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

"The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms."

Electric and magnetic field strength is mitigated by increasing the distance from the transmission line and structures. Workers with ICDs should consult with their doctors directly with concerns about work in electrical or magnetic environments (references (81); (82)). Medical devices will return to normal operation when the person moves away from the source of the EMF (reference (76)). Transmission lines will not be energized during construction; therefore, construction workers would not be at risk of EMF or magnetic field exposure. The project would be designed in accordance with applicable NESC standard and to keep electric fields below the 8 kV/m standard set by the Commission. Individuals are expected to follow the recommendations of their medical provider.

5.6.3 Public and Worker Safety

The ROI for public and worker safety is the ROW. Any construction project has potential risks, which can include potential injury from falls, equipment and vehicle use, and electrical accidents. Risks for the public involve electrocution. Potential impacts are anticipated to be minimal, short- and long-term, and can be mitigated. Impacts would be minimized by appropriate adherence to relevant local and state codes, the NESC, and NERC requirements.

5.6.3.1 Existing Conditions

The most recent data from the Bureau of Labor Statistics for injuries and illnesses was used to find the recent number of injuries and illnesses for Power and Communication Line and Related Structures Construction (North American Industry Classification System Code No. 237130). From 2021 to 2022 there were a total of 4,520 nonfatal occupational injuries and illnesses, with around four percent of them being classified as traumatic. From 2021 to 2022 there were 18 fatal injuries, 10 fatal transportation incidents (roadway accident or being struck by a vehicle), and four fatal incidents from coming into contact with an object or equipment (being hit, crushed, caught, struck, etc. by an object or equipment) associated with Power and Communication Line and Related Structures Construction (reference (83)).

5.6.3.2 Potential Impacts

As with any construction project, there are construction-related risks. These could include potential injury from falls, equipment and vehicle use, and electrical accidents. There is potential for construction to disturb existing environmental hazards.

Electrocution is a risk that could occur with direct contact to lines. Between 2011 and 2015, power-line installers in the U.S. had 32 deaths related to electrocution, a rate of 29.7 deaths per 100,000 full-time workers (reference (84)). It could also happen when working near power lines, like when using heavy equipment. Electrocution could occur when there is electrical contact between an object on the ground and an energized conductor, but this situation is most likely with distribution lines (reference (76)).

Any accidents that might occur during construction of the project would be handled through local emergency services. Existing emergency services should have sufficient capacity to respond to any emergencies.

5.6.3.3 Mitigation

The sample route permit (Section 5.5.1 of Appendix H) contains the following mitigation related to safety: “The Permittee shall design the transmission line and associated facilities to meet or exceed all relevant local and state codes, the National Electric Safety Code, and NERC requirements. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, strength of materials, clearances over roadways, ROW widths, and permit requirements.”

Proper safeguards would be implemented for construction and operation of the transmission line. The project would be designed to meet or exceed local, state, and the applicant’s standards regarding clearance to the ground, clearance to crossing utilities, strength of materials, and ROW distances.

The project must comply with the NESC.89 and Occupational Safety and Health Administration standards (reference (85)). Construction crews and contract crews would also comply with local, state, and NESC standards for installation and construction practices. The applicant would use their established safety procedures, as well as industry safety procedures, during and after installation of the transmission line, including appropriate signage during construction.

5.6.4 Stray Voltage

The ROI for stray voltage is the ROW. Potential impacts to residences and farming operations from stray voltage are not anticipated. Transmission lines do not produce stray voltage during normal operation, as they are not directly connected to businesses, residences, or farms. The project would be constructed to NESC standards, and therefore, impacts are anticipated to be minimal. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

5.6.4.1 Existing Conditions

"Stray voltage" is a condition that can potentially occur on a property or on the electric service entrances to structures from distribution lines connected to these structures. The term generally describes a voltage between two objects where no voltage difference should exist. The source of stray voltage is a voltage that is developed on the grounded neutral wiring network of a building and/or the electric power distribution system. Stray voltage is not created by transmission lines, as they do not directly connect to businesses or residences (reference (86)).

Where utility distributions systems are grounded, a small amount of current will flow through the earth at those points. This is called neutral-to-earth voltage (NEV), which is voltage that is associated with distribution lines and electrical wiring within buildings and other structures (reference (87)). Electrical systems that deliver power to end-users and electrical systems within the end-user's business, home, farm, or other buildings are grounded to the earth for safety and reliability reasons. Stray voltage could arise from neutral currents flowing through the earth via ground rods, pipes, or other conducting objects, from faulty wiring or faulty grounding of conducting objects in a facility. Thus, stray voltage could exist at any business, house, or farm which uses electricity, independent of whether there is a transmission line nearby. Site-specific mitigation measures are required to address potential stray voltage impacts.

Stray voltage is a natural phenomenon that can be found at low levels between two contact points at any property where electricity is grounded; it is measured between two points that livestock can simultaneously touch (reference (87)). Stray voltage and its effects on farms have been studied for nearly 30 years. Numerous studies have found that though it is likely to exist on farms, it is rarely strong enough to affect the behavior or production of dairy cattle (reference (88)). The Commission issued a report in 1998 supporting the conclusion that no credible scientific evidence has been found to show that currents in the earth or associated electrical parameters, such as voltages, magnetic fields, and electric currents, are causes of poor health and mild production in dairy herds (references (88)).

5.6.4.2 Potential Impacts

Stray voltage is, generally, an issue associated with electrical distribution lines and electrical service at a residence or on a farm. Under normal operating conditions, transmission lines do not create stray voltage as they do not directly connect to businesses, residences, or farms. The project would not directly connect to businesses or residences in the area and would not change local electrical service. Accordingly, impacts due to stray voltage are anticipated to be negligible.

Transmission lines, however, can induce voltage on a distribution circuit that is parallel and immediately under the transmission line. This is discussed in Section 5.6.5.

5.6.4.3 Mitigation

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to grounding, electric field, and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between the ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the NESC. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

The sample route permit (Section 5.4.2 of Appendix H) contains the following mitigation related to electric fields: "The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms." The applicant has committed to work with landowners that have any issues with stray voltage following construction of the project.

5.6.5 Induced Voltage

The ROI for induced voltage is the ROW. It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line. This could induce a voltage on the object. Smaller conductive objects near the line could cause a nuisance shock to a person, but it is not a potential safety hazard. Metal buildings within the ROW might require grounding. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

5.6.5.1 Existing Conditions

It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line. Conductive objects include vehicles, including tractors and automobiles, in part because tires are made electrically conductive to eliminate static discharge building up when moving (reference (89)). This might induce a voltage on the object; the magnitude of the voltage depends on several factors, such as the size, shape, and orientation of the object along the ROW. Smaller conductive objects near the transmission line that are insulated or semi-insulated from the ground could cause a nuisance shock to a person from a small current passing through the person's body to the ground. If there were insulated pipelines, electric fences, telecommunication lines, or other conductive objects such as tractors or automobiles with greater lengths and sizes, induced voltage from a transmission line could produce a larger shock. This larger shock has not been found to be a health safety hazard (reference (90)). Similar to stray voltage, transmission lines could cause additional current on distribution lines where they parallel. If the distribution lines are not properly wired or grounded, induced voltage could be created.

5.6.5.2 Potential Impacts

Shocks from induced voltage from transmission lines are considered more of a nuisance than a danger. The transmission line would follow NESC standards, which require the steady-state (continuous) current between the earth and an insulated object located near a transmission line to be below 5 milliamps (mA). A shock at 5 mA is considered unpleasant, not dangerous, and allows for a person to still release the energized object that they are holding that is causing the shock (reference (91)). In addition, the Commission imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground. The standard is designed to prevent serious hazards from shocks when touching large objects parked under AC transmission lines of 500 kV or greater (reference (73)). In the Brookings County to Hampton 345 kV transmission line project (Commission docket number TL-08-1474), the ALJ and Commission determined that Minnesota's current electric field exposure standard of 8 kV/m is adequately protective of human health and safety (references (92); (93)).

5.6.5.3 Mitigation

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to grounding, electric field, and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the NESC. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

The applicant committed to meeting electrical performance standards. Appropriate measures would be taken to prevent induced voltage problems when the project parallels or crosses objects. Metal buildings might have unique issues due to induction concerns. For example, conductive buildings near power lines of 200 kV or greater must be properly grounded. Any person with questions about a new or existing metal structure can contact the applicant for further information about proper grounding requirements.

5.6.6 Electronic Interference

The ROI for electronic interference is the ROW. Transmission lines do not generally cause interference. If electronic interference does occur, in most cases it can be mitigated by either increasing the distance or adjusting the placement of the device to the transmission line or other transmission line structure. If ongoing interference due to a transmission line does occur, the

applicant would be required to take feasible actions to restore electronic reception to pre-project quality. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

5.6.6.1 Existing Conditions

Electronic Interference refers to the disturbance of electrical circuits or equipment caused by electromagnetic radiation emitted from external sources, in this case, high-voltage transmission lines. Transmission lines generate EMFs depending on the distance from sources and the type of line configuration. The EMFs decrease as the distance increases from the conductors (reference (94)).

There are a number of FM and AM radio broadcasting stations that operate or can be heard within the project area, such as KYSM (103.5) FM, KJLY (104.5) FM, KBGY (107.5) FM, KMSU (89.7) FM, KNGA (90.5) FM, KRUE (92.1) FM, KATO (93.1) FM, KCHK (95.5) FM, KQCL (95.9) FM, K250CD (KDHL-AM) (97.9) FM, KEEZ (99.1) FM, KDHL (920) AM, KFOW (1170) AM, KFSP (1230) AM, KTOE (1420) AM.

There are also many television channels that broadcast throughout the project area. These channels are received from cable, satellite providers, and/or digital antennas.

Wireless internet and cellular phones use frequencies in the 900 MHz ultra-high frequency (UHF) range—a range for which impacts from corona-generated noise are anticipated to be negligible.

Global positioning systems (GPS) is used in daily life, aviation, vehicle navigation, surveying, aerial drones, and agricultural activities. GPS works by sending radio-frequency signals from a network of satellites to the receiver. Because of this, buildings, trees, and other physical structures have the potential to interfere with a GPS signal. GPS provides locational information for navigation between endpoints, as well as geographic orientation for farm and other equipment. GPS is used throughout the project area.

The Continuously Operating Reference Station (CORS) Network is a cooperative effort between MnDOT, other state agencies and institutions, counties, cities, and private enterprises, with the goal of providing Global Navigation Satellite System (GNSS) corrections statewide. Using signals from all available GNSS satellites and receivers at over 140 known positions, MnCORS is able to continuously provide survey-grade positioning corrections via the internet. Users with Real-Time Kinematic (RTK) capable equipment can receive real-time corrections to their geospatial positions, yielding a more accurate horizontal and vertical measurement.

5.6.6.2 Potential Impacts

No impacts to electronic devices are anticipated. No GPS impacts are expected from the construction or operation of the project. Research evaluating the potential for interference in the use of GPS satellite-based microwave signals under or near power line conductors indicates it is unlikely that there would be electronic interference while using GPS (reference (95)). Interference would be more likely near a transmission line structure and unlikely under a transmission line (reference (96)) due to shadow effects.

Electronic interference from HVTLs can impact electronic communications like radios, television, and microwave communications in three ways: corona noise, shadowing effect, and gap discharge.

Corona “noise” primarily occurs in the radio frequency range of amplitude modulated (AM) signals. This generated noise typically occurs underneath a transmission line. It dissipates rapidly as the distance increases from the transmission line. FM radio receivers usually do not pick up interference from transmission lines because corona-generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (reference (97)). In most cases, the strength of the radio or television broadcast signal within a broadcaster’s primary coverage area is great enough to prevent interference. Additionally, due to the higher frequencies of television broadcast signals (54 MHz and above), a transmission line seldom causes reception problems within a station’s primary coverage area. Anticipated electric fields are below levels expected to produce significant levels of corona.

Shadowing effect comes from physically blocking communication signals. This primarily can impact two-way mobile radio communications and television signals. Digital and satellite television transmissions are more likely to be affected by shadowing generated by nearby towers. Interference could occur if the device was located immediately adjacent to a tower structure, blocking its signal. While television interference is rare, it can happen when a structure is aligned between a receiver and a weak, distant signal. Telecommunication towers can be susceptible to the shadowing effect.

Gap discharge interference is the most noticed form of power line interference with radio and television signals, and typically the most easily fixed. Gap discharges are usually caused by hardware defects or abnormalities on a transmission or distribution line, causing small gaps to develop between mechanically connected metal parts. As sparks discharge across a gap, they create the potential for electrical noise, which, in addition to audible noise, can cause interference with radio and television signals. The degree of interference depends on the quality and strength of the transmitted communication signal, the quality of the receiving antenna system, and the distance between the receiver and the power line. Because gap discharges are a hardware issue, they can be repaired relatively quickly once the issue has been identified.

5.6.6.3 Mitigation

The sample route permit (Section 5.4.3 of Appendix H) contains the following mitigation related to electronic interference: “If interference with radio or television, satellite, wireless internet, GPS-based agriculture navigation systems or other communication devices is caused by the presence or operation of the Transmission Facility, the Permittee shall take whatever action is necessary to restore or provide reception equivalent to reception levels in the immediate area just prior to the construction of the Transmission Facility. The Permittee shall keep records of compliance with this section and provide them upon the request of Commerce or Commission staff.”

The applicant committed to taking feasible action to restore electronic reception to pre-project quality in the case of electronic interference. Interference could be due to line-of-sight obstruction (shadowing) in select areas but could be mitigated by either increasing the distance or adjusting the placement of transmission line structures and electronic antennas. For example, if interference occurs for an AM radio station within a station's primary coverage area where good reception existed before the project was built, reception can be regained by adjusting or moving the receiving antenna system. This is unlikely to occur to AM radio frequency, except for immediately under a transmission line, and interference would dissipate rapidly with increasing distance from the line.

5.7 Land-Based Economies

The ROI for land-based economies is the route width except for tourism which is the local vicinity. The ROI for recreation is more localized (the route width) as potential impacts to the tourism economy would be experienced at a broader scale. The short and long-term impacts of land-based economies are assessed for agriculture, forestry, mining, and tourism.

Constructing and operating the project could potentially affect land-based economies in the project area. Transmission lines are a physical, long-term presence on the landscape which could prevent or otherwise limit use of land for other purposes. The primary land-based economic activity in the project area is agriculture. Other potential economic activities connected to land usage in the project area include forestry, mining, and tourism. The primary means of mitigating impacts to land-based economies is prudent routing (that is, by choosing route alternatives that avoid such economies).

5.7.1 Agriculture

Agriculture is the predominant land-use within the ROI, and when structures are placed within an agricultural field, they would interfere with farming operations. Potential impacts are assessed through consideration of total agricultural land use, presence of prime farmlands, and agricultural practices. The footprint of the transmission line structures is land that can no longer be used for agricultural production and could adversely impact farms based on a variety of other factors. Impacts to agriculture would be mitigated through implementation of the Agricultural Impact Mitigation Plan and prudent routing.

5.7.1.1 Existing Conditions

Segment 1's predominant land cover (approximately 72% of Segment 1 North's ROI and approximately 69% of Segment 1 South's ROI) is agriculture (Map 8). In each of the counties within the ROI, crops account for more than half of the share of sales by type and the average farm size is less than 470 acres (Table 5-11). As noted in the joint certificate of need application and route permit application, principal crops include grain, soybeans, hay/haylage, sweet corn, corn for silage, green peas, corn for grain, and oats for grain. Farmers in the area also raise livestock, including hogs and pigs, dairy cows, beef cattle, and poultry.

Table 5-11 Segment 1 Agricultural Products Sold and Average Size of Farm

County	Market Value of Agricultural Products Sold (percent)		Average size of farm (acres)
	Crops	Livestock	
Blue Earth [1]	55	45	469
Le Sueur [2]	65	35	230
Rice [3]	63	37	225

[1] Source: reference (98)
[2] Source: reference (27)
[3] Source: reference (99)

One apiary is present within Segment 1 South's ROI (Map 13–18). There are no center pivot irrigation systems or private airstrips used for agricultural purposes in Segment 1's ROI.

Three categories of soils identified by the Soil Survey Geographic Database (SSURGO) database are subject to protection under the Farmland Protection Policy Act (FPPA): prime farmland, prime farmland when drained, and farmland of statewide importance. Prime farmland is defined by the NRCS as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Prime farmland, when drained, includes soils that have the potential to be prime farmland but require drainage or hydrologic alteration to achieve high productivity. Farmland of statewide importance includes soils that are nearly prime, but are not as productive due to permeability, slope, erosion potential, or some other soil property.

The ROI includes areas of prime farmland, prime farmland if drained, and farmland of statewide importance (Map 16). Approximately 49% of Segment 1 North's ROI is designated prime farmland, and approximately 63% of Segment 1 South's ROI is designated prime farmland (Appendix G).

The 2024 directory of Minnesota organic farms from the Minnesota Department of Agriculture (MDA) lists 29 potential organic farms in the four-county area (reference (100)). However, because organic farmers are not required to register with the MDA, there could be additional, unregistered organic farms within the project area. In addition, organic farm registration does not give the precise location of organic fields, only the registrant's mailing address.

Agriculture in this area also includes precision farming practices. Precision farming involves the use of global positioning systems (GPS) to guide farming equipment. One of the most precise types of GPS systems is known as real-time kinematic GPS (RTK GPS). Precision farming minimizes the potential for waste from, for example, duplicate row seeding or overlap in fertilizer or pesticide application.

5.7.1.2 Potential Impacts

Transmission lines have the potential to impact agriculture both temporarily and permanently. Temporary impacts result from transmission line construction, the extent of which are limited to the duration of construction, and annual transmission line inspections, the extent of which are temporary and periodic during operation. Impacts could include limiting the use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Temporary impacts from annual transmission line inspections might include pedestrian or light vehicle access, which would be limited to the ROW and areas where obstructions might require access from off the ROW. Impacts associated with annual transmission line inspections would be coordinated as part of easement negotiations between the applicant and the landowner before construction of the project.

Permanent transmission line impacts result from the placement of transmission line structures within crops, pastures, and other agricultural lands. The footprint of the transmission line structures is land that can no longer be used for agricultural production. This footprint can adversely impact farm income and property values depending on placement, structure type, and a variety of other factors. Permanent structures can have varying-sized footprints due to the structure design and distance from each other. The project anticipates using steel monopole structures with concrete pier foundations ranging from 7 to 12 feet in diameter and a typical span of 1,000 feet between structures (Section 3.2.1). Single-circuit and double-circuit structures are anticipated to have similar impacts to agriculture because farming can occur around both types.

Structures can impede the efficient use of farm equipment and can significantly limit the management options for agricultural operations. The presence of structures can also impede the efficiency of a farming operation, as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields. Transmission line structures in agricultural fields could also potentially impede the use of irrigation systems such as center pivot 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 using the same practice.

Apiaries could be affected by EMF changes due to powerlines. Studies have found that EMF negatively affects honey bees, including their ability to learn, fly, and forage, their sense of balance, memory, and pollination behavior, increasing aggression, and changes in metabolism (references (101), (102), (103), (104),(105)). Decreases in energy metabolism could result in lower honey production.

While the presence of the project on or near an unregistered 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. For example, construction vehicles would need to be cleaned prior to entering organic farms to prevent tracking offsite soil or plant material onto the farm, and throughout operational maintenance of the ROW certain herbicides or pesticides could not be used on or near the organic farm. These measures would need to be coordinated on an individual basis between the applicant and the affected organic farm owner.

Livestock operations are present within the project area and could be temporarily affected during construction of the project. Construction activities could temporarily disrupt livestock access to pasture lands, and construction noise might disturb livestock. In addition, poultry could be sensitive to disease caused by pathogens introduced by offsite soils tracked on-site during construction.

Though stray voltage impacts are not anticipated to be caused by the project, stray voltage could be of concern to livestock farmers, particularly on dairy farms. NEV is by and large an issue associated with distribution lines and electrical service at a residence or on a farm (Section 5.6.4). Transmission lines do not create NEV stray voltage as they do not directly connect to businesses, residences, or farms (Section 5.6.4).

Transmission lines have the potential to interfere with RTK and standard GPS used for precision farming in two ways: (1) electromagnetic noise from a transmission line could potentially interfere with the frequencies used for RTK and standard GPS signals and (2) transmission line structures could cause line-of-site obstructions or create multi-path reflections such that sending and receiving of signals would be compromised. Interference could occur where the spectrum of transmission line electromagnetic noise overlaps the frequency spectrum used by RTK or standard GPS systems. As discussed earlier in this chapter, no GPS impacts are expected from the construction or operation of the project (Section 5.6.6).

Interference due to line-of-sight obstruction or multi-path reflection could occur in two ways: (1) obstruction of, or other reflection interference with, a GPS satellite signal and (2) obstruction of radio transmissions from an RTK base station to a mobile receiving unit. GPS uses information from multiple satellite signals to determine specific locations. Interference with one signal would not cause inaccurate navigation; however, simultaneous interference with two signals could lead to inaccurate navigation. Because simultaneous interference with two signals is relatively unlikely and any line-of-sight obstruction would be resolved with movement of the GPS receiver (for example, tractor) such that proper GPS reception would be quickly restored, line-of-sight obstruction impacts to precision farming systems are anticipated to be minimal and temporary.

A transmission line structure located very near an RTK base station could cause a line-of-sight obstruction in the signal from a base station. A transmission line structure near an RTK base station (within 100 feet) could also cause multi-path reflections that interfere in the signal from a base station. An RTK base station would need to be at least outside of the transmission line ROW, or 75 feet away. Multi-path reflections can also be caused by other structures and landscape features including homes, trees, sheds, and sudden changes in ground elevation.

5.7.1.3 Mitigation

Mitigation and restoration measures for vegetation on landowner property are standard Commission route permit conditions. The sample route permit (Section 5.3.7 of Appendix H) contains the following mitigation related to land-based economies: “The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads.”

The applicant would implement an Agricultural Impact Mitigation Plan (AIMP) and reasonably restore and/or compensate landowners, as appropriate, for damages caused by the applicant as a result of transmission line construction. A draft version of the AIMP is provided in Appendix K. The applicant would work with landowners to determine whether to restore land and/or compensate landowners after discussions with them. The applicant would also implement a vegetation management plan to reduce impacts on agriculture, as appropriate.

To further mitigate impacts to agriculture and as described in the AIMP (Appendix K), the applicant would implement measures to reduce compaction, soil erosion, and sedimentation and would compensate producers for crop or livestock loss or damage. Post-construction restoration efforts would include restoration of any temporary access modifications and deep plowing to remove compaction. Both crop and livestock activities would be able to continue around project structures and facilities after construction.

The applicant notes in the joint certificate of need application and route permit application that no impacts are anticipated to affect agricultural activities during winter as the crop fields are unplanted and the ground is frozen. Construction is anticipated to occur year-round, and impacts to agriculture could be avoided in winter months.

Impacts to agricultural operations could also be mitigated by prudent routing. Specifically, prudent routing could include selecting route alternatives that prioritize paralleling existing infrastructure (including roads and transmission lines) to maximize potential opportunity for ROW sharing and minimize potential interruptions or impediments of the use of farm equipment. Prudent routing would secondarily prioritize following existing division lines (including field, parcel, and section lines) where paralleling existing infrastructure is not an option. Following existing division lines could minimize impacts to the use of farm equipment if, for example, row crops start and stop along the division lines. Opportunities for paralleling existing infrastructure and division lines are summarized in Table 5-3.

5.7.2 Forestry

The ROI for the land-based economy of forestry is the route width. No notable forestry resources within Segment 1's ROI were identified and potential impacts to forestry resources or operations are not anticipated.

5.7.2.1 Existing Conditions

None of the following resources were identified within the ROI:

- DNR forestry lands
- State forests
- Forests for the Future state conservation easement areas
- Sustainable Forest Incentive Act land
- School Trust land

As such, potential impacts to land-based economies for forestry would be negligible.

5.7.2.2 Potential Impacts

There are no notable forestry resources within the ROI of Segment 1 and therefore no impacts to forestry operations are anticipated.

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

5.7.2.3 Mitigation

Impacts on forested areas would be reduced by minimizing the tree clearing to the extent feasible; however, tall-growing vegetation within the ROW would be cleared. The applicant would work with landowners to come to an agreement of any timber removed from private lands, as appropriate.

5.7.3 Mining

The ROI for the mining land-based economy is the route width. Potential impacts are assessed through identification of known, existing mining operations and assessing potential impacts to those operations given the potential introduction of the HVTL. Documented prospect mines are also noted where present within the ROI. No impacts to active facilities are anticipated. If the potential for impacts to mining operations would occur, the applicant would be required to coordinate those impacts with the mining operator.

5.7.3.1 Existing Conditions

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.

Mining operations are prevalent in the project area and consist of aggregate mining operations and bedrock quarries owned either by individuals, private companies, or MNDOT. These aggregate mining sites are primarily mined for local use such as making concrete for highways, roads, bridges, and other construction projects. One quarry and one gravel pit were identified within the route width of Segment 1 North. The quarry and gravel pit appear to be inactive based on a review of aerial imagery or would not be crossed by the ROW (Map 13–1, Map 13–7). Eighteen gravel pits, including MNDOT ASIS Numbers 7020, 40014, and 40021, were identified within the route width of Segment 1 South. The gravel pits appear to be inactive based on a review of aerial imagery or would not be crossed by the ROW (Map 13–23, Map 13–25, Map 13–26, and Map 13–28).

5.7.3.2 Potential Impacts

Existing aggregate mines and prospective sites could be negatively impacted by transmission line structures if the structures interfere with access to aggregate resources or the ability to remove them. Impacts are most likely to occur during transmission line construction if resource extraction must be ceased temporarily in order to safely string a transmission line. To the extent there are potentially recoverable aggregate reserves in the project area, construction of the project could limit the ability to successfully mine these reserves depending on the route selected for the project and the location of these reserves.

The construction of electrical utility facilities would likely interfere with any future geophysical surveys because the surveying technology cannot accurately assess what is underground when transmission lines are above the survey location.

Construction of the project would require sand and aggregate for structure backfill and concrete, and to maintain reliable access routes. Some of the aggregate material could come from local sources. Although demand would temporarily increase during construction, it's anticipated that no new aggregate source facilities would be constructed, nor would any existing facilities be expanded.

5.7.3.3 Mitigation

If the potential for impacts to mining operations would occur, the applicant would be required to coordinate those impacts with the mining operator.

5.7.4 Tourism

The ROI for the tourism land-based economy is the local vicinity. Potential impacts are assessed through identification of known resources utilized by non-residents that would likely be recreating in the area and bringing in non-local revenue (or tourism dollars) to the area. Most opportunities for tourist activities within the ROI include use of publicly accessible lands and water for outdoor activities (Section 5.5.8). Impacts to tourism are anticipated to be negligible to minimal.

5.7.4.1 Existing Conditions

Segment 1 includes the city of Mankato. Tourism opportunities in Mankato include the Children's Museum of Southern Minnesota, City Art Walking Sculpture Tour, River Hills Mall, Mankato Symphony Orchestra, Minnesota State University Mankato Theater and Dance performances, local shopping, historic homes, restaurants, and annual events (references (106); (107)). Arts, Entertainment, and Recreation and Accommodation and Food Services account for 11.2 percent of the jobs in Blue Earth County (reference (108)).

Other human-built tourism opportunities in the four-county area include county fairs, arts and crafts fairs, farmers markets, and smaller community events. These events and other opportunities for tourism are advertised in nearby incorporated towns and the activities are not located within the ROI.

Recreational opportunities identified within the ROI include publicly accessible lands and waters used for outdoor activities (Section 5.5.8). Nonresidents or tourists could visit the project area to take advantage of the area's hunting and fishing opportunities. Public and designated lands are discussed in Section 5.9.6.

5.7.4.2 Potential Impacts

Impacts to the tourism economy are anticipated to be negligible to minimal.

5.7.4.3 Mitigation

If the potential for temporary interference with public access to trails (i.e., the Sakatah Singing Hills State Trail) is identified, the applicant would attempt to avoid or limit trail closures to the maximum extent practicable. No restricted access to other recreational areas that may be used by tourists is anticipated.

5.8 Archaeological and Historic Resources

The ROI for archaeological and historic resources is the route width. Direct and indirect impacts could occur from construction and operation of the project. Direct impacts to archaeological and historic resources could result from construction activities such as ROW clearing, placement of structures, the construction of new substations and access roads, temporary construction areas, and vehicle and equipment operation. Direct impacts could also result from the removal of historic buildings or structures. Direct impacts to historic resources could occur if the project is located near or within view of a resource (typically a historic building, structure, or traditional cultural property [TCP]).

Potential impacts are assessed through identification of documented archaeological and historic resources within one mile of the route alternatives. An emphasis is placed on resources within the route widths, which could have the most potential impact.

5.8.1 Existing Conditions

Cultural resources consist primarily of archaeological sites and historic architectural resources. Archaeological sites are defined as the material remains of past human life or activities (reference (109)). Historic architectural resources are sites, buildings, and structures greater than 45 years in age that "create tangible links to the American past, whether in relation to historical events and people, traditional ways of life, architectural design, or methods of construction," as defined in the Minnesota Historic and Architectural Survey Manual (reference (110)). Traditional Cultural Properties (TCP) are also considered cultural resources. TCPs are defined as locations of significance to a community because of their association with important cultural practices and beliefs (reference (111)).

Federal laws and regulations, including Section 106 of the National Historic Preservation Act (NHPA) of 1966, its implementing regulations found in 36 CFR 800, and the Archaeological Resources Protection Act of 1979, provide the standards for cultural resources identification, evaluation, and mitigation of impacts. Pursuant to Section 106 of the NHPA, a historic property is any archaeological site, historic architectural resource, or traditional cultural property included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Potential cultural resources investigations that could be required under Section 106 include archaeological surveys, historic architectural surveys, and/or TCP surveys which serve to identify TCPs. Section 106 applies to all undertakings that take place on federal lands, require federal permitting, and/or utilize federal funds.

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

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

Coordination with the Tribal Historic Preservation Offices (THPO) prevents impacts from the project to known TCPs. THPOs are officially designated by Tribes and serve the same function as a SHPO (reference (112)). THPOs assist with the preservation of Tribal historic properties and cultural traditions. They are also available to advise federal, state, and local agencies on the management of tribal interests. As noted in Section 8.1.1 of the joint certificate of need application and route permit application, the applicant has engaged with multiple tribes and is committed to continued engagement and consultation.

Minnesota is divided into nine Archaeological Regions, which were defined by former State Archaeologist Scott Anfinson (reference (113)), as part of a framework for building a predictive model developed by the Minnesota Department of Transportation (MNDOT) for the presence of archaeological sites, called the MnModel (reference (113)). These regions characterize features of the natural environment that have been fairly stable throughout precontact and contact periods. The distribution of resources among the nine regions is assumed to have influenced the distribution of precontact peoples (reference (113)).

Segment 1 falls within the Prairie Lakes Archaeological Region (Region 2). Region 2 includes a large portion of southern Minnesota, including Big Stone, Blue Earth, Brown, Carver, Chippewa, Cottonwood, Faribault, Freeborn, Jackson, Lac Qui Parle, Le Sueur, Lyon, McLeod, Martin, Nicollet, Redwood, Renville, Scott, Sibley, Stevens, Swift, Watonwan, and Yellow Medicine counties and portions of Douglas, Grant, Kandiyohi, Lincoln, Meeker, Nobles, Otter Tail, Pipestone, Pope, Rice, Steele, Traverse, and Waseca counties. This region is characterized by “swell and swale topography”, hilly end moraines, features such as the Minnesota River trench, the Prairie des Coteau scarp, and numerous shallow lake basins (reference (113)). Precipitation ranges between 28 inches per year in the southeast to 22 inches annually in the northwest. At the time of Euroamerican contact, the region was characterized by tallgrass prairie, river-bottom forests, and oak woodland. Big Woods vegetation, consisting of Elm, Maple, and Basswood, began developing during the contact period. Bison were the dominant game animal during the late Holocene period, with white tail deer and elk also present in smaller numbers.

Glacial ice had fully retreated from this region by approximately 11,000 BC, allowing for human occupation of the area. Early hunter-gatherers maintained small group sizes and were very mobile, with subsistence patterns centered on hunting large and medium-sized game animals, primarily bison, in the Prairie Lakes region. This period, known as the early Paleoindian, spanned from approximately 11,200 to 10,500 BC, and is characterized by its distinctive fluted projectile points (e.g., Clovis, Folsom, Holcombe). Early prehistoric artifacts (fluted and Plano projectile points) have been recovered in this region, and there is potential for deeply buried early to middle prehistoric sites, particularly in the Minnesota River Valley. The late Paleoindian/early Archaic period (10,500 to 7,500 BC) saw an increase in subsistence diversification, evidenced in part in the archaeological record by a more diverse and specialized tool assemblage (reference (114)).

During this period and continuing into the Middle Archaic (7,500 to 3,000 BC), gradually increasing population sizes resulted in decreased, but still expansive, 'home range' areas for these hunter gatherers, who still relied heavily on larger forest game animals for subsistence. The suite of stone tools continued to increase during this period, and copper tools made their first appearance at the end of the middle Archaic (reference (114)).

The Late Archaic period (approximately 3,000 to 500 BC) is characterized by the appearance of exotic materials, such as marine shells, communal burial sites, and a more diverse material culture, including tools used in the manufacturing of dugout canoes. Copper tools were also prevalent during this time period. Lifeways during the late Archaic period relied more heavily on second-order foods, such as fish and other aquatic resources, as well as plant life (e.g., wild rice). The Late Archaic was a period of resource intensification and, therefore, saw a decrease in mobility and home range areas, and an increase in group sizes (reference (114)). In Region 2, many sites in the middle prehistoric period are located on islands and peninsulas on larger-sized lakes or along major rivers. Lifeways continued to evolve during the Woodland period (between 1,000 to 500 BC to approximately 1650 AD). The Woodland period is generally characterized by the appearance of pottery and burial mounds. Later, Woodland habitation sites in the Prairie Lakes region are most likely in river valleys, in sheltered, wooded areas.

Contact period sites (circa 1700) are mostly associated with the Dakota tribes (Yankton, Wahpeton, and Sisseton), and with French and Euroamerican fur traders (reference (113)).

The ROI for archaeological and historic architectural resources is the route width. However, for the purposes of analysis, documented archaeological and historic architectural resources were reviewed to understand the broader potential for archaeological and/or historic architectural resources within a 1-mile buffer of Segment 1 North, Segment 1 South, and their alternatives.

Because proximity to fresh water and food resources was vital to the survival of the early inhabitants of Minnesota, archaeological sites are typically concentrated on well-drained upland terraces along bodies of water. In the project area for Segment 1, archaeological sites are mostly found along the shores of the lakes present throughout Blue Earth, Le Sueur, and Rice Counties.

To determine potential cultural resource impacts on cultural resources, known archaeological sites and historic architecture in or adjacent to the project were identified through a review of the OSA's online portal and MnSHIP, the Minnesota SHPO's online portal. MnSHIP is a comprehensive database of documented historic architectural resources for the entire state, while the OSA portal is a database of previously recorded archaeological sites in the state. The OSA portal was also reviewed for estimated locations of historic cemeteries, as recorded in 2011 by Vermeer and Terrell (reference (115)). This study identified unrecorded historic cemeteries based on various forms of documentation, such as historic maps and aerial imagery. These cemeteries are often mapped to a much larger area, such as section or township level, than their actual locations, as the exact locations might not be known or verified. Therefore, even in cases where an unrecorded historic cemetery appears to intersect the segment's route width, the resource may not be present in this location. These unrecorded Euroamerican cemeteries are therefore discussed as an added precaution.

Documented archaeological and historic resources within the study area of Segment 1 are summarized in the following tables.

- Table 5-12 summarizes the number of archaeological and historic resources within the project area (which is within one mile of the anticipated alignments) and the ROI (route width).
- Table 5-13 provides descriptions of the resources located within the route widths.

Map 17 show locations of cultural resources within the ROI of Segment 1.

Additional cultural resources beyond those summarized below might be located during future survey efforts prior to construction.

Sections 5.8.1.1.1 through 5.8.1.1.4 provide further detail on the cultural resources within the ROI that are listed, or eligible for listing, on the NRHP.

Table 5-12 Segment 1 North and Segment 1 South, Number of Archaeological and Historic Resources within the Project Area and Route Width

	Segment 1 North Project Area	Segment 1 North Route Width	Segment 1 South Project Area	Segment 1 South Route Width
Archaeological Sites	54	3	35	4
Historic Architecture	127	25	202	40
Historical Cemeteries	13	1	16	8

Table 5-13 Segment 1 Archaeological and Historic Resources within the Route Width Summary

Resource present within the ROI of:		Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
Segment 1 North	Segment 1 South					
X		21BEbc	Archaeological Site	Park/Post-Contact ghost town	Unevaluated	This alpha site consists of a historic Euroamerican town mapped in section 22 of Township 109N, Range 25W. No additional information is available.
X		21LE0008	Archaeological Site	Lake Tetonka I/ Precontact Habitation	Unevaluated	This precontact habitation site consists of lithic tools and ceramics recorded by Fisk of the University of Minnesota in 1966. The artifacts were reported as part of a private collection, and were recovered from an upland terrace in Section 17 of Township 109N, Range 23W [1]
X	X	21BEe	Archaeological Site	Indeterminate	Unevaluated	This alpha site consists of an unspecified artifact scatter reported in 1955 in Section 21 of Township 108N, Range 26W.
	X	21BE0298	Archaeological Site	Schrami Site/ Precontact lithic scatter	Unevaluated	This site consists of a single Archaic period projectile point, likely composed of Prairie du Chien chert, and two bifaces in Section 34 of Township 109N, Range 25W. The find was reported by an informant and recorded by the OSA in August 2010.
	X	21LEab	Archaeological Site	Contact Period trading post	Unevaluated	This alpha site consists of a historic Euroamerican trading post in Section 25 of Township 109N, Range 23W. No additional information is available.
	X	21WEg	Archaeological Site	Okaman/Post-Contact ghost town	Unevaluated	This alpha site consists of the historic town of Okaman, dating between 1857-1882, and mapped in Section 1 of Township 108N, Range 24W.
		21BE0301	Archaeological Site	Megley Schoolhouse/ Post-Contact structural ruin	Recommend-ed Not Eligible	The Megley Schoolhouse consists of concrete and limestone foundation of this former schoolhouse, constructed in 1863. A small associated scatter of iron fragments was also identified. The site was recorded by the 106 Group Ltd in 2013 in Section 11 in Township 108N, Range 26W.
X		XX-RRD-CGW004	Historic Architecture	Sakatah Singing Hills State Trail	Eligible	Historically the MN Central/WI, MN & Pacific/Chicago, Rock Island & Pacific/Chicago Great Western & Chicago & North Western Railway (c. 1882-1887)
X	X	XX-RRD-00015	Historic Architecture	Sakatah Singing Hills State Trail	Eligible	Historically the MN Central/WI, MN & Pacific/Chicago, Rock Island & Pacific/Chicago Great Western & Chicago & North Western Railway) (c. 1884-1887)
X	X	XX-RRD-CNW006	Historic Architecture	St. Paul and Sioux City Railroad Company	Eligible	Also known as the Chicago St. Paul Minneapolis and Omaha Railway Company (Omaha)/Chicago and North Western Railway Company/Minnesota Valley Railroad Company mainline (c. 1865-1870)
	X	LE-WTC-00032	Historic Architecture	Sakatah Singing Hills State Trail Bridge - SSH007	Eligible	Historically associated with the Wisconsin, Minnesota & Pacific Railway line from Waterville to Mankato, and likely constructed by the Chicago Great Western (c. 1930)
X		BE-LER-00019	Historic Architecture	Wisconsin Minnesota & Pacific Railway/ Chicago Great Western Railway/ Chicago & North Western Railway Culvert/Culvert	Unevaluated	N/A
X		BE-LIM-00003	Historic Architecture	Farmstead	Unevaluated	N/A
X		BE-LIM-00013	Historic Architecture	Mendota-Big Sioux River Military Road: Lime Section/ Roadway	Unevaluated	Constructed 1850-1870
X		BE-LIM-00022	Historic Architecture	Borgmeier Farmstead	Unevaluated	Constructed 1910
X		BE-MKT-00028	Historic Architecture	Farmhouse	Unevaluated	Constructed 1900
X		BE-MKT-00029	Historic Architecture	Farmhouse	Unevaluated	Constructed 1920
X		BE-MKT-00030	Historic Architecture	District School No. 55	Unevaluated	Constructed 1880/1910
X		BE-MKT-00036	Historic Architecture	Sakatah Singing Hills State Trail Bridge - Bridge SSH011	Unevaluated	Constructed 1930
X		LE-KSC-00020	Historic Architecture	Mendota-Big Sioux River Road	Unevaluated	Constructed 1850-1870
X		LE-KST-00013	Historic Architecture	Mendota-Big Sioux River Road: Kasota Twp. Section	Unevaluated	Constructed 1850-1870
X		LE-KST-00014	Historic Architecture	Mendota-Big Sioux River Road: Kasota Twp. Section	Unevaluated	Constructed 1850-1870
X	X	XX-ROD-00042	Historic Architecture	Trunk Highway 60	Unevaluated	Constructed 1921

Resource present within the ROI of:		Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
Segment 1 North	Segment 1 South					
X	X	XX-ROD-00056	Historic Architecture	Trunk Highway 22	Not Eligible	N/A
X	X	XX-ROD-00164	Historic Architecture	Trunk Highway 13	Not Eligible	Constructed 1921
X	X	XX-ROD-00178	Historic Architecture	Trunk Highway 65	Not Eligible	Constructed 1920
X	X	XX-RRD-CNW004	Historic Architecture	Minneapolis and St. Louis Railway Company/ Albert Lea Route: Minneapolis to Merriam Junction Segment	Unevaluated	N/A
X	X	XX-RRD-CNW010	Historic Architecture	Minneapolis and St. Louis Railway Company/ Chicago and North Western Railway Company: Minneapolis to Iowa	Not Eligible	Constructed 1981
X	X	XX-RRD-CNW012	Historic Architecture	Minneapolis and St. Louis Railway Company/ Chicago and North Western Railway Company: Merriam Junction to Iowa State Line at Emmons	Not Eligible	Constructed 1877-1879
X	X	XX-RRD-CSP017	Historic Architecture	Milwaukee and St. Paul Railway Company/ Chicago Milwaukee and St. Paul Railway Company/ Chicago Milwaukee St. Paul and Pacific Railroad Company: Iowa and Minnesota Division Main Line	Not Eligible	Constructed 1864-1869
X	X	XX-RRD-CSP018	Historic Architecture	Minnesota Central Railway Company/ Milwaukee and St. Paul Railway Company/Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company	Not Eligible	N/A
X	X	XX-RRD-CSP021	Historic Architecture	Minnesota Central Railway Company/Milwaukee and St. Paul Railway Company/Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company, Minneapolis to Owatonna	Not Eligible	Constructed 1865
X	X	XX-RRD-CSP041	Historic Architecture	Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company: Mankato-Farmington Branch	Not Eligible	Constructed 1903
	X	BE-JAM-00006	Historic Architecture	Sakatah Singing Hills State Trail Culvert	Unevaluated	Constructed 1884
	X	BE-JAM-00009	Historic Architecture	Wisconsin Minnesota & Pacific Railway/Chicago Great Western Railway/Chicago & North Western Railway Culvert	Unevaluated	N/A
	X	BE-LER-00018	Historic Architecture	Sakatah Singing Hills State Trail Culvert	Unevaluated	Constructed 1884
	X	BE-LER-00019	Historic Architecture	Wisconsin Minnesota & Pacific Railway/Chicago Great Western Railway/Chicago & North Western Railway Culvert	Unevaluated	N/A
	X	BE-MKC-00337	Historic Architecture	Mendota-Big Sioux River Road: Mankato Section	Unevaluated	N/A
	X	BE-MKC-00426	Historic Architecture	Bridge No. 07016	Unevaluated	Constructed 1976
	X	BE-MKC-00432	Historic Architecture	Bridge No. 07015	Not Eligible	N/A
	X	BE-MKC-00433	Historic Architecture	Bridge No. 07017	Not Eligible	N/A
	X	BE-MKC-00434	Historic Architecture	Bridge No. 07018	Not Eligible	N/A
	X	BE-MKC-00435	Historic Architecture	Bridge No. 07019	Not Eligible	N/A
	X	BE-MKC-00436	Historic Architecture	Bridge No. 07020	Not Eligible	N/A
	X	BE-MKC-00443	Historic Architecture	Bridge No. 07009	Not Eligible	N/A
	X	BE-MKC-00444	Historic Architecture	Bridge No. 07010	Not Eligible	N/A
	X	BE-MKT-00018	Historic Architecture	House	Unevaluated	Constructed 1940

Resource present within the ROI of:		Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
Segment 1 North	Segment 1 South					
	X	BE-MKT-00019	Historic Architecture	House	Unevaluated	Constructed 1910
	X	BE-MKT-00029	Historic Architecture	Farmhouse	Unevaluated	Constructed 1920
	X	BE-MKT-00036	Historic Architecture	Sakatah Singing Hills State Trail Bridge - Bridge SSH011	Unevaluated	Constructed 1930
	X	BE-MLC-00012	Historic Architecture	Wisconsin, Minnesota & Pacific Railway/Chicago Great Western Railway/Chicago & North Western Culvert	Unevaluated	N/A
	X	LE-KSC-00020	Historic Architecture	Mendota-Big Sioux River Road	Unevaluated	N/A
	X	LE-KST-00013	Historic Architecture	Mendota-Big Sioux River Road: Kasota Twp. Section	Unevaluated	N/A
	X	LE-KST-00014	Historic Architecture	Mendota-Big Sioux River Road: Kasota Twp. Section	Unevaluated	N/A
	X	LE-WTC-00039	Historic Architecture	Bridge No. 5467	Unevaluated	N/A
	X	LE-WTC-00042	Historic Architecture	Trunk Highway 60	Unevaluated	Constructed 1921
	X	LE-WTT-00005	Historic Architecture	Fur Trading Post	Unevaluated	N/A
	X	LE-WTT-00034	Historic Architecture	Bridge No. 8566	Unevaluated	N/A
	X	XX-ROD-00016	Historic Architecture	Trunk Highway/U.S. Highway 14 (formerly Trunk Highway 7)	Not Eligible	Constructed 1921/1956
X	X	Cemetery ID 19491	Historic Cemetery	Pilgrims Rest Cemetery	N/A	Mapped at the Section level in Section 31 of Township 109N, Range 26W. Est. 1858.
	X	Cemetery ID 19457	Historic Cemetery	Calvary Cemetery	N/A	Mapped at the PLS Forty level in Section 8 of Township 108N, Range 26W. Est. 1886.
	X	Cemetery ID 21716	Historic Cemetery	Calvary Cemetery 1/2	N/A	Mapped at the PLS Forty level in Section 25 of Township 109N, Range 23W. Two parcels (also present in Section 26)
	X	Cemetery ID 21715	Historic Cemetery	Calvary Cemetery 2/2	N/A	Mapped at the PLS Forty level in Section 26 of Township 109N, Range 23W. Two parcels (also present in Section 25)
	X	Cemetery ID 19495	Historic Cemetery	Calvary Cemetery (Old)	N/A	Also known as the "Old Catholic Cemetery. Mapped at PLS Forty level in Section 5, of Township 108N, Range 26W. Est 1857. Many burials were relocated to the new Calvary Cemetery, est. 1885.
	X	Cemetery ID 19456	Historic Cemetery	Rural Grove Cemetery 2/2	N/A	Mapped at the PLS Forty level in Section 5 of T108N, R26W. Est. 1864. May also be present in Section 8 of Township 108N, Range 26W.
	X	Cemetery ID 21716	Historic Cemetery	Sakatah Cemetery 1/2,	N/A	Mapped at Section level in Section 26, Township 109N, Range 23W.
	X	Cemetery ID 21717	Historic Cemetery	Sakatah Cemetery 2/2	N/A	Mapped at Section level in Section 35, Township 109N, Range 23W.

[1] Source: reference (116)
[2] Source: reference (117)
[3] Source: reference (118)
[4] Source: reference (119)

5.8.1.1 NRHP-Eligible Resources

There are 11 NRHP-eligible cultural resources within the ROI of Segment 1. Additional information regarding each is provided in Sections 5.8.1.1.1 through 5.6.2.1.11.

5.8.1.1.1 Sakatah Singing Hills State Trail (Resource ID XX-RRD-CGW004)

The now abandoned segment of railroad ROW was originally extended between Red Wing and Waterville, MN, and now serves as a multi-use recreational trail. It is eligible for the NRHP under Criterion A for its significant contribution to the expansion of industry and commerce by facilitating the transportation of goods between portions of rural Minnesota and larger industrial centers. This segment of the trail parallels County Road 60 on the north side (reference (120)). These documented sections of the trail do not intersect the 1 North ROW.

5.8.1.1.2 Sakatah Singing Hills State Trail (Resource ID XX-RRD-00015)

Currently functioning as a recreational trail, this resource was formerly the WM&P line from Waterville to Mankato. It crosses the 1 North and 1 South route segments east of Mankato, in Township 108N, Ranges 25 and 26W, and parallels Segment 1 South through much of Blue Earth County, intersecting again in Waterville. This resource is eligible for listing on the NRHP under Criterion A for its significant role in the expansion of industry and commerce by facilitating the transportation of goods between portions of rural Minnesota and larger industrial centers.

5.8.1.1.3 Sakatah Singing Hills State Trail Bridge (Resource ID LE-WTC-00032)

This resource is historically associated with the Wisconsin, Minnesota & Pacific Railway line from Waterville to Mankato and was likely constructed by the Chicago Great Western Railway in 1930. It consists of a four-span timber trestle, which was located along the railway extension from Red Wing to Waterville. This resource is eligible for the NRHP under criterion A for its association with this railway, which was vital to the stoneware industry of Red Wing, allowing transportation of the raw materials from southern Minnesota quarries (reference (122)). It intersects Segment 1 South in Section 27 of Township 109N, Range 23W.

5.8.1.1.4 St. Paul and Sioux City Railroad Company ROW (Resource ID XX-RRD-CNW006)

This resource consists of a railroad ROW extending between Saint Paul to the east and Saint James, MN to the west. The majority of the railway is active, with a 2-mile stretch in Saint Paul that is no longer in use. The remainder is an active railroad currently owned by Union Pacific. It intersects the Segment 1 North route width in Section 32 of Township 109N, Range 26W, and the Segment 1 South route width in Section 5 of Township 108N, Range 26W. This resource is eligible for listing on the NRHP under Criterion A for its significance as an early transportation route, facilitating the settlement and development of southwestern Minnesota (reference (123)).

5.8.1.1.5 Sakatah Singing Hills State Trail Culvert (Resource ID LE-WTT-00011)

This culvert is associated with the Wisconsin, Minnesota & Pacific Railroad Company's line from Red Wing to Waterville and is eligible for the NRHP under Criterion A for its contribution to XX-RRD-015 Railroad ROW (reference (124)). It is in Section 31 of Township 109N, Range 23W.

5.8.1.1.6 Sakatah Singing Hills State Trail Bridge/SSH 010 (Resource ID LE-WTT-00012)

This resource is a four-span timber trestle associated with the Wisconsin, Minnesota & Pacific Railroad Company's line from Red Wing to Waterville, and is eligible for the NRHP under Criterion A for its contribution to XX-RRD-015 Railroad ROW (reference (125)). It is in Section 33 of Township 109N, Range 23W.

5.8.1.1.7 Sakatah Singing Hills State Trail Bridge/SSH 009 (Resource ID LE-WTT-00013)

This resource is a three-span timber trestle associated with the Wisconsin, Minnesota & Pacific Railroad Company's line from Red Wing to Waterville, and is eligible for the NRHP under Criterion A for its contribution to XX-RRD-015 Railroad ROW (reference (126)). It is in Section 33 of Township 109N, Range 23W.

5.8.1.1.8 Sakatah Singing Hills State Trail Culvert (Resource ID LE-WTT-00014)

This resource is a stacked limestone slab culvert associated with the Wisconsin, Minnesota & Pacific Railroad Company's line from Red Wing to Waterville, and eligible for the NRHP under Criterion A for its contribution to XX-RRD-015 Railroad ROW (reference (127)). It is in Section 34 of Township 109N, Range 23W.

5.8.1.1.9 Sakatah Singing Hills State Trail Railroad Signal (Resource ID LE-WTT-00015)

This resource consists of a cast iron railway signal and is associated with the Wisconsin, Minnesota & Pacific Railroad Company's line from Red Wing to Waterville. It is eligible for the NRHP under Criterion A for its contribution to XX-RRD-015 Railroad ROW (reference (128)). It is in Section 34 of Township 109N, Range 23W.

5.8.1.1.10 Sakatah Singing Hills State Trail Bridge/SSH-008 (Resource ID LE-WTT-00016)

This resource is a single-span timber trestle associated with the Wisconsin, Minnesota & Pacific Railroad Company's line from Red Wing to Waterville. It is eligible for the NRHP under Criterion A for its contribution to XX-RRD-015 Railroad ROW (reference (129)). It is in Section 34 of Township 109N, Range 23W.

5.8.1.1.11 Sakatah Singing Hills State Trail Railroad Marker (Resource ID LE-WTT-00017)

This resource consists of a rectangular, cast concrete railroad marker "WX", indicating a whistle crossing. It is associated with the Wisconsin, Minnesota & Pacific Railroad Company's line from Red Wing to Waterville, and is eligible for the NRHP under Criterion A for its contribution to XX-RRD-015 Railroad ROW (reference (130)). It is in Section 34 of Township 109N, Range 23W.

5.8.2 Potential Impacts

Potential impacts are assessed through identification of documented archaeological and historic resources within one mile of the anticipated alignments. An emphasis is placed on resources within the route width (i.e., the ROI), which could have the most potential impact. The majority of Segment 1 North and Segment 1 South could be double-circuited along the existing transmission line, which would minimize impacts to archaeological resources. However, within the double-circuited portions, structures may be replaced and/or relocated, which could result in additional ground disturbance.

Direct impacts to archaeological and historic architectural resources could result from construction activities, such as ROW clearing, placement of structures, new access roads, temporary construction areas, vehicle and equipment operation, and removal of historic buildings or structures. Additional direct impacts can result from transmission line location and operation, such as placement within view of a resource (typically a historic building, structure, or TCP) that results in a negative effect on the setting, feeling, and/or association of the resource in the viewshed. This issue is particularly applicable when considering cultural resources where the surrounding environment plays an essential role in defining the character.

Within the route width of Segment 1 North, there are three previously documented archaeological sites, all unevaluated for the NRHP, three previously documented NRHP-eligible historic architectural resources, and 13 historic architectural resources which are unevaluated for the NRHP. One historic cemetery may be within the route width of Segment 1 North. However, it is mapped at the PLS Section level, and the exact location is unknown.

Within the route width of Segment 1 South, there are four previously documented archaeological sites, all unevaluated for the NRHP, three previously documented NRHP-eligible historic architectural resources, and 20 historic architectural resources which are unevaluated for the NRHP. Eight historic cemeteries may be within the route width. However, these are all mapped at either the PLS Section or PLS Forty level, and the exact locations are unknown.

5.8.2.1 Segment 1 North: Route Width

Three archaeological sites intersect the 1 North route width, all of which are unevaluated for listing on the NRHP. These consist of a post-contact townsite and two precontact artifact scatters. The majority of the study area for Segment 1 North is of unknown potential for the presence of archaeological sites, according to the Survey Implementation Model (MnModel 4) available on the OSA portal (reference (131)). However, this model shows high potential for sites along the shores of lakes present in some portions of the study area.

Of the 25 historic architectural resources that intersect the route width, three are eligible for listing on the NRHP: XX-RRD-00015 and XX-RRD-CGW004 (segments of the Sakatah Singing Hills State Trail), and XX-RRD-CNW006 (an active railroad). Resource XX-RRD-00015 consists of the Sakatah Singing Hills State Trail and crosses the route width east of Mankato, parallels the route width for approximately 2.75 miles in Blue Earth County, and crosses the route width again along Morrison Blvd, approximately ½ mile west of Warsaw. Resource XX-RRD-CGW0004 also represents portions of the Sakatah Singing Hills Trail, intersecting the route width in portions of Rice County near Faribault. Impacts to these resources would likely be limited to visual and/or noise impacts to trail users during construction. These portions of Segment 1 North would employ double-circuiting along the existing transmission line; therefore, no impacts to this resource during normal operations are anticipated. Resource XX-RRD-CNW006 is an active railroad which crosses the route width immediately east of the Wilmarth Substation. The project would not affect this resource's functioning as an active railroad, and because this section of Segment 1 North would employ double-circuiting on the existing transmission line, no impacts to this resource are anticipated.

There are 13 unevaluated resources consisting primarily of railroads, roadways, and domestic dwellings, and nine ineligible resources consisting of railroads and roadways. In addition, the Dakota and Ho-Chunk Forced Relocation Route may be in or near the westernmost portion of Segment 1 North and Segment 1 South in Mankato, south of the Wilmarth Substation. This portion of the segments could be double-circuited with an existing transmission line. Dakota and Ho-Chunk THPOs should be consulted to determine whether this resource is present and whether mitigation measures are warranted.

5.8.2.2 Segment 1 South: Route Width

The four archaeological sites intersect the 1 South route width, all of which are unevaluated for listing on the NRHP. Of the 40 historic architectural resources, three are eligible for listing on the NRHP: XX-RRD-00015 (Sakatah Singing Hills State Trail), XX-RRD-CNW006 (an active railroad), and LE-WTC-00032/Sakatah Singing Hills State Trail Bridge. The majority of the study area for Segment 1 South is of unknown potential for the presence of archaeological sites, according to the Survey Implementation Model (MnModel 4) available on the OSA portal (reference (131)). However, this model shows high potential for sites along the shores of lakes present in some portions of the study area, particularly around Watertown and Warsaw.

Resource XX-RRD-00015 consists of the Sakatah Singing Hills State Trail and crosses the route width east of Mankato, parallels the route width for approximately five miles in Blue Earth County, and crosses the route width again in the western and eastern sides of Madison Lake. Impacts to this resource would likely be limited to visual and/or noise impacts to trail users during construction. These portions of Segment 1 South would mostly employ double circuiting along the existing transmission line, with the exception of the segment of the route width that intersects the resource east of Madison Lake, along 631st Ave, which would parallel the property line but not an existing transmission line. Therefore, if structures were to be strategically placed so as to avoid disturbance to the trail right-of-way, no impacts to this resource during normal operations are anticipated. Resource XX-RRD-CNW006 is an active railroad which crosses the route width immediately east of the Wilmarth Substation. The project would not affect this resource's functioning as an active railroad, and because this section of Segment 1 South would employ double circuiting on the existing transmission line, no impacts to this resource are anticipated. LE-WTC-00032/Sakatah Singing Hills State Trail Bridge is within the route width along the Sakatah Singing Hills State Trail. This resource is positioned 400 feet north of the anticipated alignment and would therefore not be affected by project construction. Additionally, because this portion of

Segment 1 South could be double-circuited, effects to this resource would be limited to visual and/or noise impacts to trail users during project construction. Impacts are not anticipated during normal operations.

There are 20 unevaluated resources consisting primarily of railroads, roadways, bridges, culverts, and domestic dwellings, and 17 ineligible resources consisting of bridges, railroads, and roadways.

As noted above, the Dakota and Ho-Chunk Forced Relocation Route may be in or near the western-most portion of Segment 1 North and Segment 1 South in Mankato, south of the Wilmarth Substation. This portion of the segments could be double-circuited with an existing transmission line. Dakota and Ho-Chunk THPOs should be consulted to determine whether this resource is present and whether mitigation measures are warranted.

5.8.3 Mitigation

As noted in the joint certificate of need application and route permit application, the applicant designed routes to avoid physical impacts to known cultural resources. If a Route Permit is issued, and upon route selection, the applicant would consult with SHPO concerning additional required mitigation measures and would develop a Phase I Cultural Resource Survey Strategy and associated Cultural Resource Survey Reconnaissance survey to identify unknown cultural resources along the proposed route. All investigations would be conducted by a professional archaeologist meeting the Secretary of the Interior's Standards for Archaeology as detailed in the Title 36 Code of Federal Regulations, Part 6. SHPO and interested Tribes will be consulted on methodology prior to completing the study.

As noted in Section 7.5.2 of the joint certificate of need application and route permit application, the applicant will develop an Unanticipated Discoveries Plan, which will outline protocol and mitigation measures should archaeological resources or human remains be encountered during project construction. The plan will include contact information for SHPO officials, environmental inspectors, archaeologists, geologists, and county sheriffs.

The applicant has engaged, and will continue to engage, with THPOs and interested Tribes to share project information and to glean information about resources of tribal significance that may be impacted by the project.

5.9 Natural Environment

5.9.1 Air Quality

The ROI for air quality is the project area. Impacts can occur during construction and operation of a transmission line and substation. Potential impacts to air quality during construction would be intermittent, localized, short-term, and minimal. Impacts are associated with fugitive dust and exhaust and can be mitigated. Long-term impacts to air quality would also be minimal and are associated with the creation of ozone and nitrous oxide emissions along the HVTL and substations.

These localized emissions would be below state and federal standards. Impacts are unavoidable and do not affect a unique resource.

5.9.1.1 Existing Conditions

The Clean Air Act is a federal law that regulates air emissions from stationary and mobile sources. The Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants, referred to as "criteria pollutants". The six criteria pollutants are ground-level ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and lead (Pb) (reference (132)). NAAQS are set to address the public health and welfare risks posed by certain widespread air pollutants (references (133); (134)).

The Clean Air Act identifies two classes of NAAQS: primary standards, which are limits set to protect the public health of the most sensitive populations, such as asthmatics, children, and the elderly; and secondary standards, which are limits set to protect public welfare, such as protection against visibility impairment or damage to vegetation, wildlife, and structures. Compliance with the national and state air quality standards in the state of Minnesota is assessed at the county level. Minnesota's state air quality standards align with NAAQS. The EPA designates all counties traversed by Segment 1 to be in attainment for all NAAQS.

In Minnesota, air quality is monitored using stations located throughout the state. The MPCA uses data from these monitoring stations to calculate the Air Quality Index (AQI) on an hourly basis for O_3, $PM_{2.5}$, SO_2, NO_2, and CO. Each day is categorized based on the pollutant with the highest AQI value for a particular hour (reference (135)).

The South Metro air quality monitoring station is in Dakota County, approximately 20 miles northeast of Segment 1. The station monitors for O_3 and $PM_{2.5}$. Table 5-14 summarizes the days in each AQI category at the South Metro monitoring station for the most recent five-year period available, 2019-2023.

Table 5-14 Days in Each Air Quality Index Category – South Metro Monitoring Station

Year	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy
2023	167	178	15	5	0
2022	257	108	0	0	0
2021	231	131	1	2	0
2020	252	113	1	0	0
2019	247	118	0	0	0

Air quality at the South Metro monitoring station has been considered "good" for the majority of the past five reported years, except for 2023. The reporting period 2023 had the largest number of days classified as moderate or worse, with 178 days classified as moderate, 15 days classified as unhealthy for sensitive groups, and five days classified as unhealthy.

5.9.1.2 Potential Impacts

Air emissions during construction would primarily consist of emissions from construction equipment and vehicles and would include pollutants such as CO_2, nitrogen oxides (NO_x), and PM. Dust generated from earth disturbing activities also gives rise to PM_{10}/$PM_{2.5}$. Double-circuiting with an existing transmission line would result in less PM_{10}/$PM_{2.5}$ emissions due to less ground disturbance. Adverse effects on the surrounding environment are expected to be negligible due to the temporary disturbance during construction and the intermittent nature of the emission- and dust-producing construction phases.

During operations, air emissions would not require any air quality permits. Small amounts of emissions would be associated with the intermittent project operation and maintenance activities via mobile combustion and particulate roadway dust generation.

During operation, small amounts of NO_X and O_3 would be created due to corona from the operation of transmission lines. The production rate of O_3 due to corona discharges decreases with humidity and less significantly with temperature. Rain causes an increase in O_3 production. In addition to weather conditions, design of the transmission line also influences the O_3 production rate. The O_3 production rate decreases significantly as the conductor diameter increases and is greatly reduced for bundled conductors over single conductors. Conversely, the production rate of O_3 increases with applied voltage (reference (136)). The emission of O_3 from the operation of a transmission line of the voltages proposed for the project would be minimal.

Emissions would be generated from fuel combustion during routine inspection and maintenance activities. The applicant would perform an annual aerial inspection of the line. Once every four years, crews would visually inspect the lines from the ground. Additionally, vegetation maintenance would generally occur once every four years. Emissions from routine inspection and maintenance activities would be minimal.

5.9.1.3 Mitigation

As noted in the joint certificate of need application and route permit application, if construction activities generate problematic dust levels, the applicant would employ construction-related practices to control fugitive dust as needed. This could include application of water or other commercially available non-chloride dust control agents on unpaved areas subject to frequent vehicle traffic, reducing the speed of vehicular traffic on unpaved roads, and covering open-bodied haul trucks.

As also noted in the route permit application, corona effects would be minimized during operation by using good engineering practices, such as the use of bundled conductors. A corona signifies a loss of electricity, so the applicant would engineer the transmission lines to limit corona.

5.9.2 Climate

The ROI for climate change is the project area. The impact analysis for climate considers existing patterns in the ROI and how the project could be impacted by climate change, as well as how the project could affect climate change. For the counties crossed by Segment 1, flood risk is minor or moderate, and fire risk is moderate. The project would minimally contribute to climate change impacts as a result of GHG emissions. The project would be engineered to be resilient under changing climatic factors, including increased average temperatures and changes in precipitation intensities and quantities.

5.9.2.1 Existing Conditions

Climate change is observed as changes in temperature and precipitation patterns, increases in ocean temperatures and sea levels, changes in extreme weather events, and ecosystem changes. These changes are largely attributed to the greenhouse effect. As the amount of greenhouse gases (GHGs) in the Earth's atmosphere increases, the greenhouse effect causes the Earth to become warmer (reference (137)).

There are also naturally occurring climate variations. These are cyclical patterns caused by variations in ocean circulation and atmospheric pressure patterns that occur on timescales of weeks to decades. Increased global surface temperatures could change these natural climate patterns and the resulting impact on regional precipitation and temperature anomalies (reference (138)).

Warmer and wetter conditions have been observed in Minnesota since observations first began in 1895, especially in the past several decades. An increase in precipitation volume and intensity has also been observed, including large-area extreme rainstorms. A rise in temperatures, particularly during the winter season in Minnesota, has been occurring as well. These trends are expected to continue (reference (139)).

To understand how climate change is anticipated to affect the project area, historical and projected climate data is considered, as well as climate hazard projections.

Climate projections are based on the Minnesota dynamically downscaled climate model data that was developed by the University of Minnesota and are summarized in three scenarios: Shared Socioeconomic Pathway (SSP) 245, SSP370, and SSP585. SSP is a measure adopted by the Intergovernmental Panel on Climate Change (IPCC) to represent various greenhouse gas concentration pathways as well as social and economic decisions (reference (140)).

SSP245 represents a "Middle of the Road" scenario where economic, social, and technological trends follow historical patterns, population growth is moderate, and inequality persists. Additionally, SSP245 includes an intermediate emissions scenario, where a net radiative forcing of 4.5 watts per meter squared (W/m^2) is received by the earth due to the greenhouse gas (GHG) effect and emissions begin to decrease around 2040 (reference (140)).

SSP370 represents a "Regional Rivalry" scenario where nations focus on regional issues instead of cross-collaboration and development. SSP370 also includes a high emissions scenario, where a net radiative forcing of 7.0 W/m^2 is received by the earth (reference (140)).

SSP585 represents a "Fossil-fueled Development" scenario where there is increased development in competitive markets driven by an increased global consumption of fossil fuels. SSP585 also includes a very high emissions scenario, where a net radiative forcing of 8.5 W/m^2 is received by the earth and no emissions are reduced through 2100 (reference (140)).

Table 5-15 shows the modeled historical and projected temperature values for the project.

Table 5-15 Modeled Historical and Projected Temperature Trends for the Project

Scenario	Time Period	Average Daily Temperature (°F) – Ensemble Mean	Minimum Daily Temperature (°F) – Ensemble Mean	Maximum Daily Temperature (°F) – Ensemble Mean
Historical	1995-2014	44.9	35.4	57.3
SSP245	2040-2059	48.6 (3.7)	39.2 (3.9)	60.8 (3.5)
SSP245	2060-2079	49.9 (5.0)	40.6 (5.3)	62.0 (4.7)
SSP245	2080-2099	51.6 (6.7)	42.2 (6.8)	63.8 (6.5)
SSP370	2040-2059	50.0 (5.1)	40.2 (4.9)	62.7 (5.4)
SSP370	2060-2079	52.0 (7.2)	42.4 (7.0)	64.6 (7.3)
SSP370	2080-2099	53.9 (9.0)	44.5 (9.1)	66.1 (8.8)
SSP585	2040-2059	49.2 (4.3)	39.8 (4.4)	61.4 (4.1)
SSP585	2060-2079	51.9 (7.0)	42.6 (7.3)	63.9 (6.6)
SSP585	2080-2099	56.2 (11.3)	47.3 (11.9)	67.9 (10.6)

[1]Values in parentheses represent the difference from the modeled historical value.

Table 5-16 shows the model historical and projected precipitation values for the project.

Table 5-16 Modeled Historical and Projected Precipitation Trends for the Project

Scenario	Time Period	Total Annual Precipitation (in) - Ensemble Mean
Historical	1995-2014	35.3
SSP245	2040-2059	37.1 (1.8)
SSP245	2060-2079	36.3 (1.1)
SSP245	2080-2099	34.3 (-1.0)
SSP370	2040-2059	30.0 (-5.3)
SSP370	2060-2079	31.6 (-3.7)
SSP370	2080-2099	34.6 (-0.7)
SSP585	2040-2059	35.3 (0.1)
SSP585	2060-2079	38.6 (3.3)
SSP585	2080-2099	40.6 (5.3)

[1] Values in parentheses represent the difference from the modeled historical value.

The EPA Climate Resilience Evaluation and Awareness Tool (CREAT) provides 100-year storm intensity projections to help with planning for water, wastewater, and stormwater utilities (references (141); (142)). A 100-year storm is an event that has a one percent chance of occurring in a given year. The CREAT tool considers two time periods, 2035 and 2060. For each time period, two scenarios are considered, from a 'Not as Stormy' future to a 'Stormy' future. Within the counties traversed by the project, the 2035 time period shows a 1 to 5 percent increase in the 100-year storm intensity for the 'Not as Stormy' scenario, and an 11 to 20 percent increase for the 'Stormy' scenario. The 2060 time period shows a 6 to 10 percent increase in the 100-year storm intensity for the 'Not as Stormy' scenario, and a 26 to 30 percent increase for the 'Stormy' scenario.

The EPA Streamflow Projections Map summarizes general projections related to streamflow under climate change (reference (143)). The EPA Streamflow Projections Map for 2071 to 2100 (RCP 8.5) anticipates a general change in average streamflow of streams within the Segment 1 project area by a ratio of 1.29 (90th percentile) under wetter projections and a ratio of 0.83 to 0.89 (10th percentile) under drier projections when compared to baseline historical flows (1976 to 2005).

The First Street Risk Factor risk assessment and map tool was used to determine a risk assessment for each of the counties traversed by Segment 1 to help identify current and future climate change risks (reference (144)). Table 5-17 summarizes risks for flood, fire, wind, air quality, and heat as defined by Risk Factor (references (145); (146); (147); (148); (149)).

Table 5-17 Climate Change Risks for Counties Traversed by Segment 1

County	Flood Risk	Fire Risk	Wind Risk	Air Quality Risk	Heat Risk
Blue Earth	Minor	Moderate	Minor	Minor	Minor
Le Sueur	Moderate	Moderate	Minor	Minor	Minor
Waseca	Minor	Moderate	Minor	Minor	Minor
Rice	Moderate	Moderate	Minor	Minor	Minor

Flood risk is minor or moderate for all counties. The fire risk is moderate for all counties. The wind risk, air quality risk, and heat risk are all minor for all counties.

5.9.2.2 Potential Impacts

The project would result in GHG emissions that could minimally contribute to climate change impacts such as changes in temperature, precipitation, and extreme weather events. These emissions are discussed in Section 5.9.4. Double-circuiting with an existing transmission line would result in less GHG emissions from land use change. The climate change risks most susceptible to the project include increases in 100-year storm frequencies and soil erosion from increased storm intensities. The project could also be susceptible to more frequent wildfires.

5.9.2.3 Mitigation

The project would be engineered to be resilient under changing climatic factors including increased average temperatures and changes in precipitation intensities and quantities.

There may be periods of dry weather and concerns of wildfires. However, the transmission lines would be maintained following or exceeding NERC reliability standards that address vegetation management, including the increase of noxious weeds that could occur from changed conditions that allow them to spread. Surface water temperatures could increase in locations where the project requires tree clearing along shorelines, increasing sun exposure. This would be exacerbated by increased temperatures.

5.9.3 Geology and Topography

The ROI for geology and topography is the route width. Structure foundations have the potential to impact bedrock. Minimal impacts are anticipated to geologic features given the anticipated depth to bedrock. Minimal impacts are anticipated to topography along the route width given that original surface contours are re-graded and revegetated to the extent feasible.

5.9.3.1 Existing Conditions

Surface geology is dominated by quaternary-aged glacial deposits from the most recent Wisconsin glaciation. Sandy loam, sand, and gravel deposited by ice of the Des Moines lobe are most prevalent and are part of the New Ulm Formation. Deposits of glaciolacustrine silt and clay sediments and post-glacial floodplain alluvium are also present (reference (150)). Thickness of the glacial deposits varies depending on the location and type of deposit; thickness generally ranges from less than 50 feet to over 300 feet (reference (151)). The project area is underlain by bedrock formed primarily during the Cambrian and Ordovician periods in the Paleozoic Era, and consists of sandstone, siltstone, shale, and dolostone (reference (152)).

No karst features were identified within the route width. The nearest karst features are approximately 12 miles northeast and east of Faribault, respectively (reference (153)).

No springs were identified within the route width based on a search of the Minnesota Spring Inventory database (reference (154)).

Elevations along the route width range from about 840 feet above mean sea level (AMSL) near Mankato and gradually increase to about 1,080 feet AMSL near Faribault. Topography is generally flat with localized areas of steeper slopes occurring adjacent to waterbodies.

The project area seismic risk is very low; it is located within an area rated as less than a two-percent chance of damage from natural or human-induced earthquake in 10,000 years (reference (155)).

The type of landslide most common in Minnesota is shallow slope failure triggered by a heavy rain event. This slope failure is generally less than 3 feet deep but can erode the entire length of a slope. Deeper landslides, mudflows, and debris flows are much less common in Minnesota than in more mountainous areas. Less destructive landslides, such as slow-moving earthflows and soil creep, can also occur when soil moisture and shallow groundwater saturate sediments during heavy rain events or snowmelt. Human factors, including inadequate storm water management, undercutting of slopes, placement of artificial fill, and land-use changes, such as urbanization and agricultural practices, can lead to erosion and landslides (reference (156)). The USGS United States Landslide Inventory includes records of landslide activity within the Segment 1 North route width, approximately 0.5 miles west of Highway 22 (Figure 5-7; reference (157)). No records of landslides within the Segment 1 South route width were noted.

5.9.3.2 Potential Impacts

Thick glacial deposits cover most of the project area. Bedrock is generally deeper than 50 feet; however, in some areas, bedrock may be present just below the surface. Construction and operation of transmission line projects can impact geology through temporary, construction-related impacts and/or long-term impacts.

Impacts to topography, such as the creation of abrupt elevation changes, are not expected. Transmission line structures would be installed at existing grade. Changes in slope are not anticipated during the project, so there would be limited risk of landslides.

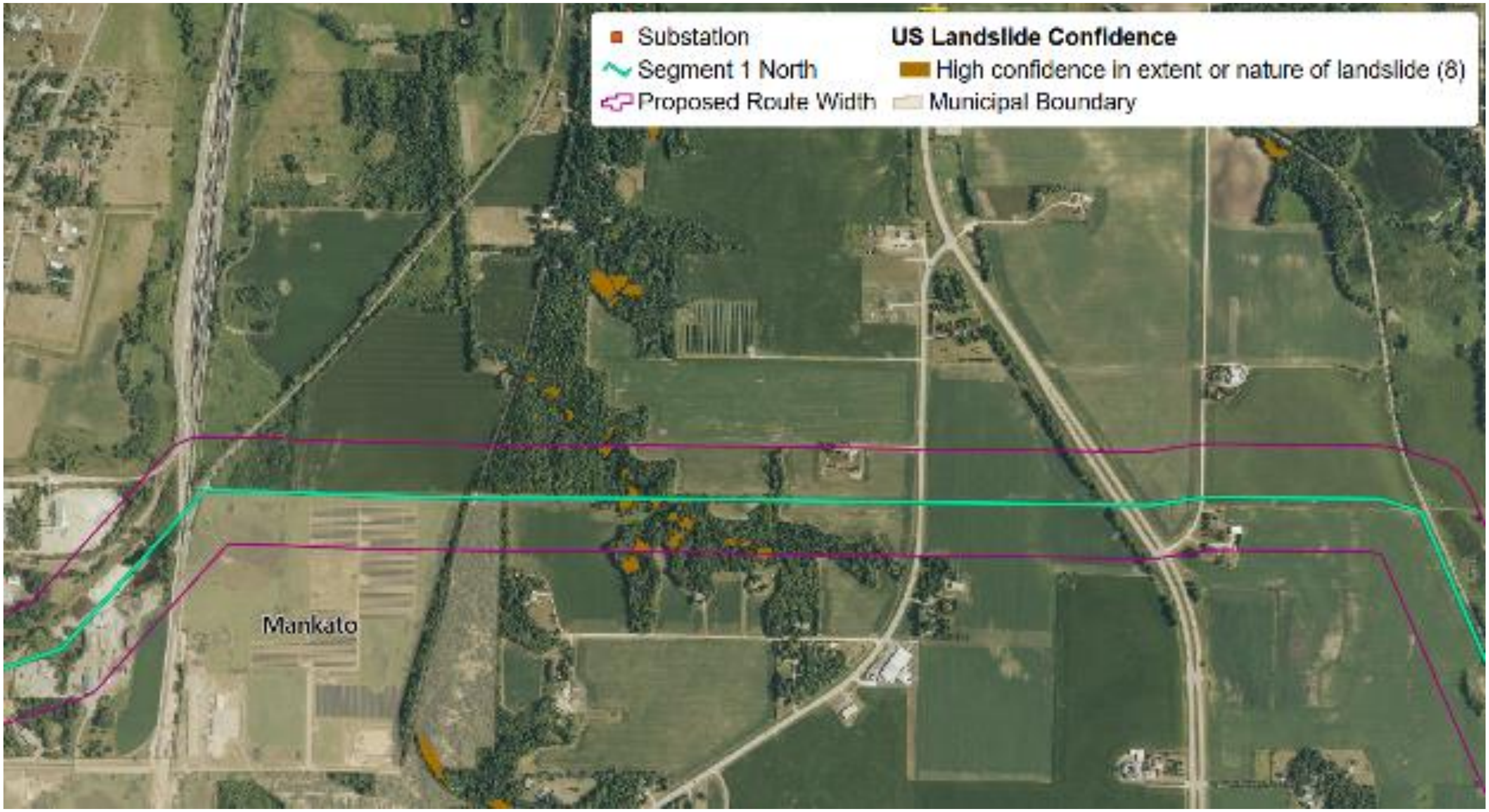
5.9.3.3 Mitigation

The applicant would conduct geotechnical evaluations prior to project construction to identify structure placements and avoid impacts to subsurface geological features.

Geotechnical analyses would evaluate whether karst areas are present at structure locations, and micro-siting and structure foundation design would account for the presence of karst. If geotechnical analyses determine karst features are present where construction will occur, the applicant will comply with MPCA stormwater requirements and would prohibit infiltration of stormwater runoff within 1,000 feet up-gradient or 100 feet down-gradient of active karst features.

Should grading occur for installation of the HVTL structures, it would be restricted to establishing a flat, safe workspace. Major topographical changes to the landscape would not occur. Once construction is complete, disturbed areas would be regraded to restore original surface contours and revegetated to the maximum extent feasible.

Figure 5-7 USGS United States Landslide Inventory: Activity Documented Within Segment 1 North Route Width



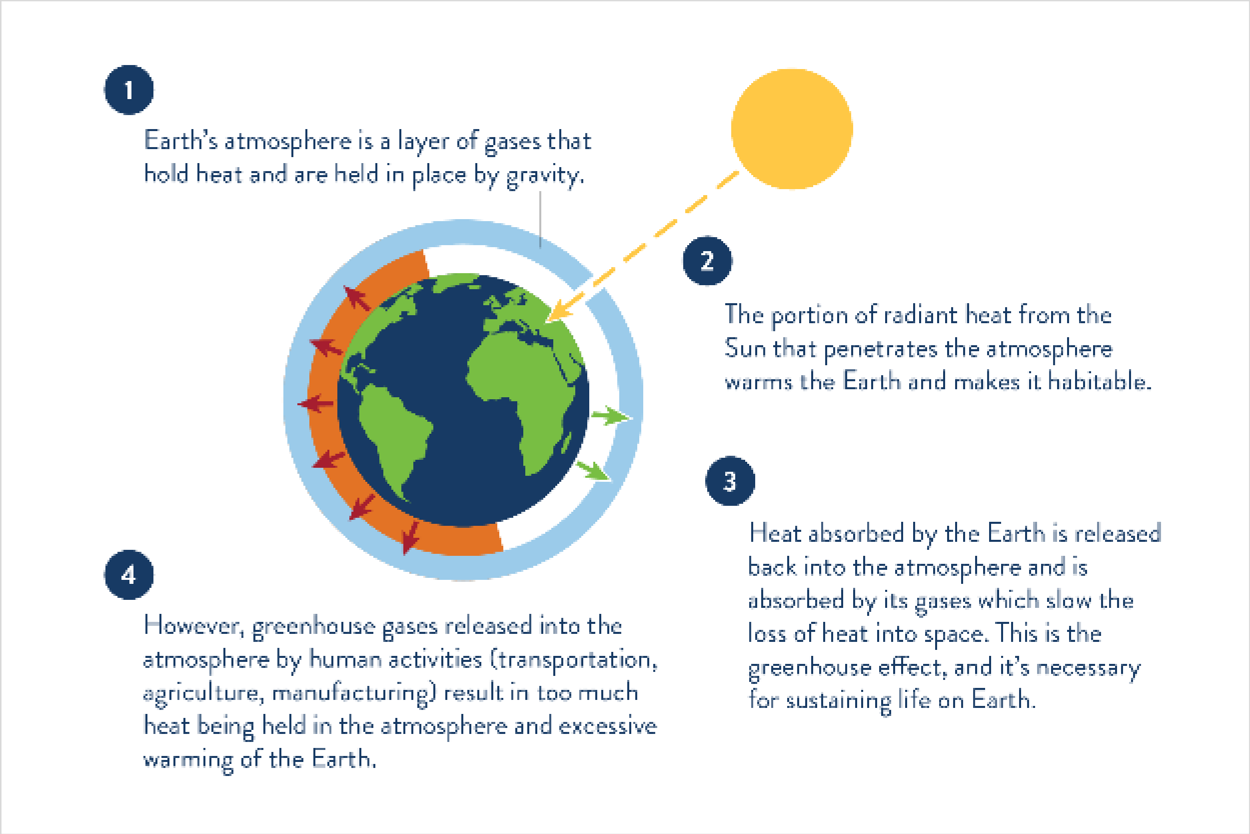
5.9.4 Greenhouse Gases

The ROI for greenhouse gas (GHG) emissions is the ROW. Construction activities would result in short-term increases in GHG emissions because of the combustion of fossil fuels in construction equipment and vehicles. These emissions would be short-term and dispersed over the ROI; therefore, total emissions would be minimal and not result in a direct impact to any one location. Maintenance activities would also cause GHG emissions, but to a much lesser extent. Operational impacts from formation of nitrous oxide and release of sulfur hexafluoride would be minimal. Impacts are unavoidable but can be minimized.

5.9.4.1 Existing Conditions

GHGs are gases that trap heat in the atmosphere. Some of the solar radiation that reaches Earth's surface radiates back toward space as infrared radiation. GHGs trap heat in the atmosphere from the absorption of this infrared radiation, which causes a rise in the temperature of Earth's atmosphere as illustrated in Figure 5-8. This warming process is known as the greenhouse effect (reference (158)).

Figure 5-8 Greenhouse Gases and Earth's Atmosphere



The most common GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases. GHG emissions are calculated as carbon dioxide equivalent (CO_2e), which is equal to the global warming potential (GWP) for each pollutant multiplied by the potential pollutant emissions.

CO_2e normalizes all GHGs emissions to CO_2 for comparability across different pollutants. Human GHG emissions are responsible for about two-thirds of the energy imbalance that is causing Earth's temperature to rise, which has direct and cascading effects on weather and climate patterns, vegetation, agriculture, disease, availability of water, and ecosystems (reference (159)).

Climate change and decarbonization have been discussed for decades at all levels of government, as well as in global, national, and local institutions. The state of Minnesota has established a goal for the reduction of GHG emissions, set forth in Minnesota Statute § 216H.02:

> *It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions by at least the following amounts, compared with the level of emissions in 2005: (1) 15 percent by 2015; (2) 30 percent by 2025; (3) 50 percent by 2030; and (4) to net zero by 2050.*

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

5.9.4.2 Potential Impacts

GHG emissions associated with the construction and operation of the project consist of direct emissions generated from combustion sources (for example, mobile on- and off-road sources) and land use change. Double-circuiting with an existing transmission line would result in less GHG emissions from land use change. Indirect emissions associated with the operation of the project include the GHG emissions associated with electrical consumption.

Construction emissions from mobile combustion were calculated for on-road vehicles and off-road construction equipment. Construction emissions from combustion sources are anticipated to be similar for each alternative. Therefore, the total construction combustion emissions and length of the applicant-proposed segments were used to calculate an emission rate per segment length, in metric tons CO_2e/mile, to quantify combustion emissions for each alternative. Construction emissions from temporary land use changes were calculated with an assumed construction duration of 60 days for each land use change area. The calculated emission rate per segment length is 70.86 metric tons CO_2e/mile. GHG emissions calculations are summarized in Appendix L.

Identified GHG emissions associated with operation of the project include direct emissions generated from combustion sources (for example, mobile on- and off-road sources) and land use change, and indirect emissions from electrical consumption. Operational emissions from mobile combustion are anticipated to be similar for each alternative. Therefore, operational emissions from mobile combustion have only been calculated for the applicant-proposed segments. Operational emissions from temporary land use changes were calculated with the assumption that forest land, cropland, and settlement land would be converted to grassland following completion of the project and for the duration of operations. Operational emissions from electrical consumption are assumed to be negligible and have not been calculated.

The Prevention of Significant Deterioration (PSD) is a Clean Air Act permitting program for new or modified major sources of air pollution in attainment areas. It is designed to prevent NAAQS violations, preserve and protect air quality in sensitive areas, and protect public health and welfare (reference (160)). The current threshold for new facilities with operational GHG emissions is 100,000 tons CO_2e per year. Estimated project GHG emissions are below this threshold.

Potential emissions from the use of fluorinated gas, sulfur hexafluoride (SF_6), is also associated with this project. SF_6 is used in high-voltage circuit breakers in transmission systems. It is a powerful GHG. The use of such a substance is common due to its stability and effectiveness at insulating electrical equipment. However, potential SF_6 emissions from high-voltage circuit breakers are minimal and not expected routinely because they are largely attributed to faulty equipment and leakage. Equipment containing SF_6 is designed to avoid SF_6 emissions (reference (161)).

5.9.4.3 Mitigation

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

The project would ultimately result in a net decrease of GHG emissions during operation, as it would facilitate the replacement of legacy fossil fuel generation with renewable resources. The project would also increase regional transmission reliability and allow additional carbon-free energy sources to be integrated into the power supply. The project will therefore assist in achieving climate goals.

5.9.5 Groundwater

The ROI for groundwater is the ROW. Documented active wells and DWSMA/WHPAs are present within the ROI. Associated wellhead protection plans should be reviewed by the applicant. To minimize impacts, the applicant would store materials, including fuel and gasoline, in sealed containers to prevent spills, leaks, or other discharges to soil and groundwater in accordance with the SWPPP during construction. Potential impacts to groundwater could also occur during construction (specifically installation of foundations) if artesian groundwater conditions are present and the confining layer is breached. Artesian groundwater conditions can be found throughout the state of Minnesota and are not limited to certain areas of geography. Provided the pressurized conditions and

extents are identified and understood, and a plan is implemented to manage pressurized groundwater conditions should they be encountered, impacts would be minimized and/or mitigated.

5.9.5.1 Existing Conditions

The DNR divides Minnesota into six groundwater provinces based on bedrock and glacial geology. The aquifers within these provinces occur in two general geologic settings: bedrock and unconsolidated sediments deposited by glaciers, watercourses, and waterbodies. The ROW crosses the South-Central Province. Water availability in the South-Central Province is limited in surficial sands and moderate in buried sands. The South-Central province contains thick loam and clayey unconsolidated sediments, with limited extent surficial and buried sand aquifers, overlying thick sandstone and carbonate aquifers (reference (162)).

Groundwater flow direction in these shallow, unconsolidated sediments is expected to follow surface topography and surface water flow. However, groundwater flow direction could vary depending on factors such as the presence of shallow bedrock, underground utilities, and/or other surficial features. The depth to the water table is generally less than 50 feet below ground surface along the ROW (reference (163)).

The EPA defines a sole source aquifer (SSA) or principal source aquifer area as:

- One that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer
- Where contamination of the aquifer could create a significant hazard to public health
- Where there are no alternative water sources that could reasonably be expected to replace the water supplied by the aquifer

There are currently no EPA-designated SSAs along the ROW (reference (164)).

Wells are abundant within the project area. The Minnesota Well Index (MWI), which is managed by the MDH, provides information about wells and borings such as location, depth, geology, construction, and static water level at the time of construction. According to the MWI, there are two domestic wells within the ROW (Table 5-18; reference (165)).

Table 5-18 MWI Water Wells within ROW

MWI Unique Well ID	Status	Depth (feet)	Static Water Level (feet)	Use	Segment	Map
529964	Active	202	50	Domestic	Segment 1 South, Route Segment 7 Equivalent	Map 9–4
402873	Sealed	134	108	Domestic	Route Segment 1 Refinement	Map 9–1

The Wellhead Protection Area (WHPA) program administers the public and non-public community water supply source-water protection (SWP) in Minnesota. WHPAs are areas surrounding public water supply wells that contribute groundwater to the well. In these areas, contamination on the land surface or in water can affect the drinking water supply. WHPAs for public and community water-supply wells are delineated based on a zone of capture for 10-year groundwater time-of-travel to the well and are available through a database and mapping layer maintained by MDH (reference (166)). The viewer also includes the Drinking Water Supply Management Areas (DWSMA) and DWSMA Vulnerability. DWSMAs are delineated areas within the WHPA and are managed in a wellhead protection plan, usually by a city.

Table 5-19 summarizes the DWSMAs/WHPAs included in the MDH database that are crossed by ROW.

Table 5-19 DWSMA/WHPAs Crossed by Segment 1's ROW

County	DWSMA/WHPA Name	Location	Segment	Vulnerability to Contamination	Map
Blue Earth	Madison Lake	Directly west of Madison Lake	Segment 1 South	Moderate	Map 9–2
Rice	Morristown	Directly south of Morristown	Segment 1 South	High to Moderate	Map 9–4

A Special Well and Boring Construction Area, or well advisory, is a mechanism that provides for controls on the drilling or alteration of public and private water-supply wells and environmental wells in an area where groundwater contamination has, or might, result in risks to public health. There are no MDH-designated Special Well and Boring Construction Areas along the ROW (reference (167)).

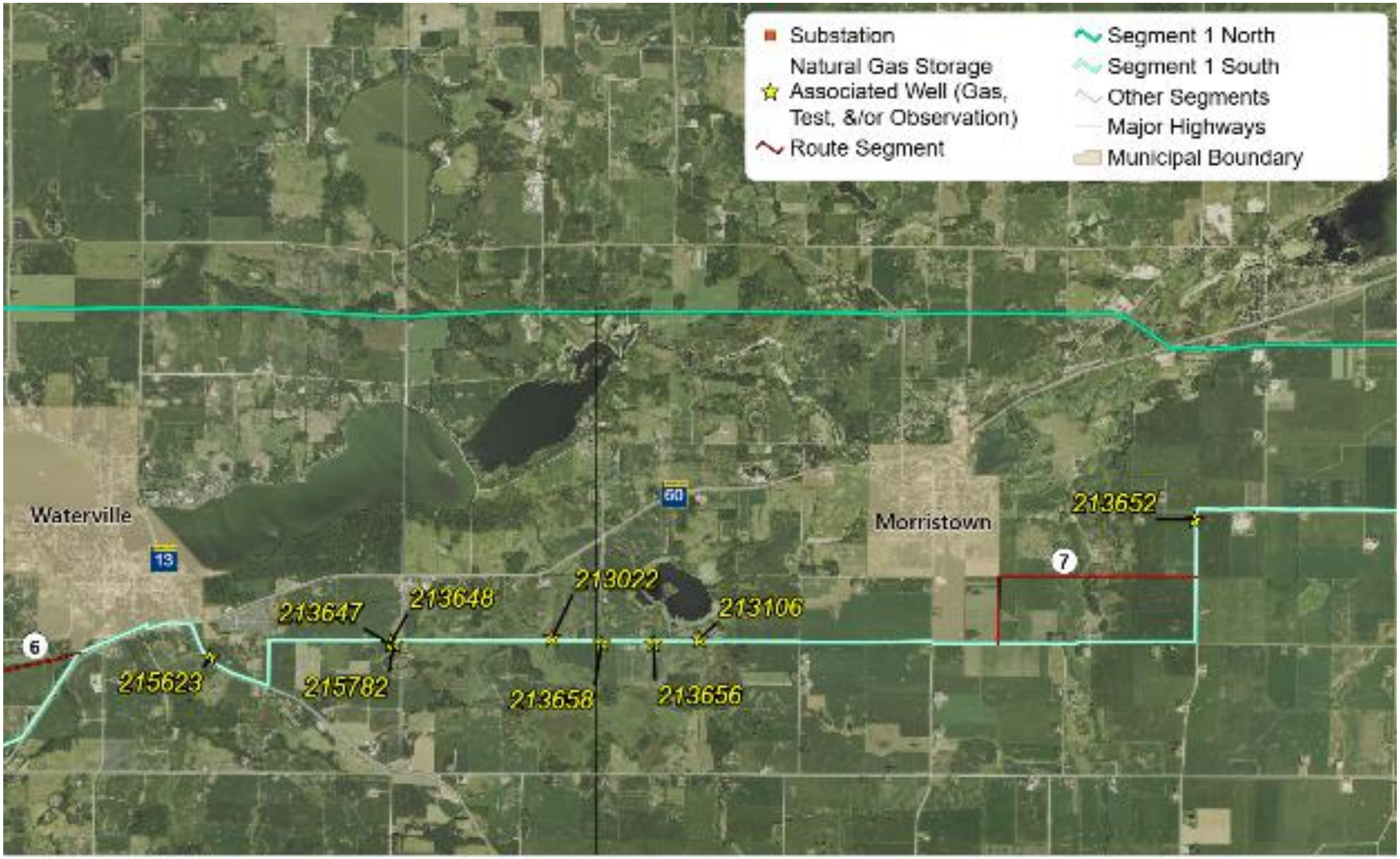
Flowing wells and borings are drilled holes that encounter an aquifer with sufficient natural pressure to force water above the ground surface, so that water will flow without pumping. Flowing artesian conditions exist when a low-permeability confining layer, such as clay or shale, overlies the aquifer. This puts the groundwater under pressure because the material doesn't permit water to flow through it. When a well or boring is completed, the confining layer is breached, creating a pressure relief valve that allows the water to rise above the top of the aquifer. If the pressure in the aquifer is great enough to force water to rise above the land surface, the well flows. Flowing conditions can also occur in an unconfined aquifer, most often at lower elevations in groundwater discharge areas near rivers, lakes, or other waterbodies. These unique features can be found throughout the state of Minnesota and are not limited to certain areas or geography (reference (168)).

CenterPoint Energy operates underground natural gas aquifer storage and production facilities near Waterville, MN. The facilities are used to store natural gas at a depth of approximately 800 to 900 feet below ground surface (bgs), beneath an anticline formation of non-porous shale. Below the non-porous shale, the natural gas is held in place by the natural pressure of the water in the Mt. Simon aquifer. The natural gas is stored in the summer and withdrawn during periods of peak needs in the winter. The storage formation holds up to ten billion cubic feet of natural gas, of which two billion cubic feet can be cycled each year for storage and production. The natural gas is withdrawn from the storage field, compressed, dried, and delivered to the interstate pipeline system near Medford, MN. The storage facility has been in continuous service since the first gas was injected in 1968 (reference (169)). There are numerous gas injection/withdrawal wells, water observation wells, and test wells within the extent of the gas storage field and lands under lease as shown on the DNR Waseca-Waterville Gas Storage Field Map (reference (170)). According to the MWI, there are nine wells that appear to be associated with facility operations located within the Segment 1 South ROW, as shown in Table 5-20 and Figure 5-9.

Table 5-20 Natural Gas Storage Associated Wells within Segment 1 South ROW

MWI Unique Well ID (Well Name)	Well Type	Well Depth (in feet)	Aquifer	Depth to First Bedrock (in feet)
215623 (Waterville WV-3)	Test Well	315	NL	190
213647 (Hering H-1)	Gas Well	1115	Mt. Simon	134
213648 (Hering 2; DNR 40000)	Observation Well	445	Jordan	144
215782 (Hering 3; DNR 40004)	Observation Well	861	NL	138
213022 (Morristown 30 MO-30)	Test Well	418	Prairie Du Chien-Jordan	180
213658 (Morristown 9 MO-9)	Test Well	220	NL	209
213656 (Morristown 6 MO-6)	Test Well	150	NA	Bedrock not encountered
213106 (Melstrom 1; DNR OB 66003)	Observation Well	1302	Mt. Simon	171
213652 (Morristown 2 MO-2)	Test Well	140	NL	130

Figure 5-9 Natural Gas Storage Associated Wells within Segment 1 South ROW



5.9.5.2 Potential Impacts

When an unexpected artesian condition is found, it can have a substantial impact that could compromise the condition and use of the area in which the flow is encountered and could cause challenges with construction of transmission line tower foundations along the routes. Artesian groundwater conditions, when unintentionally encountered, can cause excavation stability issues and uncontrolled release of groundwater at the ground surface and to surface waters. If uncontrolled, artesian groundwater conditions can be extremely difficult to repair and in some instances are un-repairable. However, subsurface investigations and construction in artesian groundwater conditions can be completed successfully provided the pressurized conditions and extents are identified and understood, and a plan is implemented to manage pressurized groundwater conditions should they be encountered.

Segment 1 South crosses a portion of the CenterPoint Energy underground gas storage field and lands under lease. The natural gas is stored at a depth of approximately 800 to 900 feet , beneath an anticline formation of non-porous shale (Eau Claire Formation), and held in place by the natural pressure of the water in the Mt. Simon aquifer. Nine wells located within the Segment 1 South ROW appear to be associated with facility operations. The MWI well logs indicate thick glacial deposits, with the depth to first bedrock ranging from 134 to 209 feet bgs in this area. Deeper bedrock of the Eau Claire Formation (anticline formation of non-porous shale) is present in three of the nine wells at depths of 749 feet bgs (MWI 213647), 743 feet bgs (MWI 215782), and 844 feet bgs (MWI 213106), respectively (reference (171)). Installation of structure foundations along the Segment 1 South ROW would not encounter bedrock of the anticline formation. Structure foundations would generally range from 20 feet to 60 feet in depth.

5.9.5.3 Mitigation

The applicant would coordinate with the DNR, as necessary, to confirm that ground disturbing activities such as geotechnical investigation and structure installation placement does not disrupt groundwater hydrology.

The applicant would conduct geotechnical evaluations prior to project construction to identify locations where potential groundwater impacts could occur. The applicant noted in the joint certificate of need application and route permit application that they would identify shallow depth to aquifer areas during geotechnical investigation, would continue to work with landowners to identify springs and wells, and if shallow depth aquifer areas are discovered, would use specialty structures that require wider, shallower excavation areas to avoid impacts to groundwater resources.

Depending on the results of the geotechnical evaluations, the applicant would obtain a Water Appropriation Permit from DNR if groundwater dewatering activities would be greater than 10,000 gallons of water per day or 1 million gallons per year.

The applicant would assess any wells identified within the ROW during project construction to determine if they are open, and seal them, if necessary, in accordance with MDH requirements.

Indirect impacts to groundwater can be mitigated by avoiding or minimizing impacts to surface waters. Measures to control soil erosion and sedimentation would be implemented during construction activities.

Two DWSMAs/WHPAs are crossed by the Segment 1 South ROW. Associated wellhead protection plans would be reviewed by the applicant. To minimize impacts, the applicant would store materials, including fuel and gasoline, in sealed containers to prevent spills, leaks, or other discharges to soil and groundwater in accordance with the SWPPP during construction.

The applicant would coordinate with CenterPoint Energy and the DNR, as necessary, to confirm that ground disturbing activities such as geotechnical investigation and structure installation placement does not disrupt underground natural gas storage, and/or would reposition proposed infrastructure if necessary.

5.9.6 Public and Designated Lands

The ROI for public and designated lands is the ROW. Public and designated lands often involve unique resources intended for protection, preservation, and/or recreational use. Public lands (local, state, or federal level) and conservation easements within the ROI are identified and qualitatively assessed for potential impact (e.g., vegetation clearing). Public lands within the ROI include Wildlife Management Areas, an Aquatic Management Area, and a Scientific and Natural Area – all of which are owned by the DNR. No other public lands, such as local parks, state forests, or national forests, were identified. Designated lands with easements within the ROI include Conservation Reserve Enhancement Program (CREP) and Permanent Wetlands Preserves (PWP)/RIM easements. Occupying public and designated lands would require coordination with the landowner (Section 3.3.2.2).

5.9.6.1 Existing Conditions

Public lands include those owned at the local, state, and federal levels. No locally-owned (city or county) or federally-owned lands are present within the ROI. State public lands within Segment 1's ROI include four WMAs, one AMA, and one SNA, all of which are owned by the DNR.

The Dove Lake WMA and Earl Swain WMA are present within the ROI (Map 13–24). In addition to these two WMAs, Segment 1 North's ROI also includes the following DNR-owned public lands:

- Gilfillan Lake WMA (Map 13–20),
- Tetonka Lake AMA (Map 13–10),
- Townsend Wood SNA (Map 13–11 and Map 13–12), and
- Cannon River WMA (Map 13–14).

Privately held land could also be subject to special designations. The project crosses lands that are part of various conservation easement programs, including the Reinvest in Minnesota (RIM) Reserve program and Conservation Reserve Enhancement Program (CREP). The Minnesota Board of Water and Soil

Resources (BWSR) acquires, on behalf of the state, conservation easements to permanently protect, restore, and manage critical natural resources without owning the land outright. The RIM Reserve program compensates landowners for granting conservation easements and establishing native vegetation habitat on economically marginal, flood-prone, environmentally sensitive, or highly erodible lands (reference (172)). Segment 1 North's anticipated alignment crosses RIM land (Map 13–14) in a location where the project could be double-circuited with an existing 115 kV line.

CREP is a federal program that leverages federal and non-federal funds to target specific state, regional, or nationally significant conservation concerns. In exchange for removing environmentally sensitive land from production and establishing permanent resource-conserving plant species, farmers and ranchers are paid an annual rental rate along with other federal and non-federal incentives as specified in each CREP agreement (reference (173)). No CREP land is present within the ROI of Segment 1 North or Segment 1 South.

The Permanent Wetlands Preserves (PWP) Program intends to protect at-risk wetlands through permanent easements where landowners receive rental payments that are calculated based on a percentage of the assessed value (reference(174)). Similar to RIM, BWSR administers the program at the state level; locally, the program is administered by the soil and water conservation districts (reference (175)). Segment 1 South's anticipated alignment crosses a PWP once (Map 13–29).

The Forest Legacy Program is a conservation program administered by the DNR to encourage the protection of privately owned forest lands through conservation easements or land purchases (reference). It is a federally funded program that provides matching funds to DNR Forestry to purchase land or conservation easement. Segment 1 North's anticipated alignment crosses Forest Legacy Land (Map 13–12).

5.9.6.2 Potential Impacts

In all cases, both for Segment 1 North and Segment 1 South, where WMAs are present within the ROI, the project could be double-circuited. The Dove Lake WMA and Earl Swain WMA could be double-circuited with an existing 115 kV line in these locations (Map 13–24). The Gilfillan Lake WMA could be double-circuited with an existing 69 kV line (Map 13–20). The Cannon River WMA could be double-circuited with an existing 115 kV line (Map 13–14). Additionally, the Tetonka Lake AMA could be double-circuited with an existing 115 kV line (Map 13–10).

The anticipated alignment of Segment 1 South abuts a PWP (Map 13–29). This PWP land could potentially be avoided depending upon the final alignment.

The Townsend Wood SNA crossing could be double-circuited with an existing 115 kV line (Map 13–11 and Map 13–12) and impacts to the SNA are discussed in Section 5.9.7.2.3.

The Forest Legacy Land crossing could be double-circuited with an existing 115 kV line (Map 13–12). The forested area has already been subject to fragmentation but would be subject to additional clearing for a wider ROW.

Public lands and the lands subject to conservation easement programs aim to establish native and permanent plant species and/or conserve and protect the natural habitat. Permanent clearing of vegetation, or the expansion of the cleared areas in cases where an existing line is already present, within the conservation areas would impact the function and intent of these areas and potentially have long-term effects to the unique resources.

5.9.6.3 Mitigation

Coordination would be required to occupy public lands within the ROW and/or temporary workspace areas for construction activities within the route width. As described in Section 3.3.2.2, where new ROW would be required, rights would consist primarily of permanent electric transmission easements, providing a 150-foot-wide easement area for Segment 1. Where an existing ROW would be used for the project, the applicant’s ROW agents would contact each property owner as an expansion of the ROW would more than likely be required.

The sample route permit (Section 5.3.17 of Appendix H) contains the following mitigation related to public and designated lands: “The Permittee shall restore the ROW, temporary workspaces, access roads, abandoned ROW, and other public or private lands affected by construction of the Transmission Facility.” The applicant avoided areas with designated easements as practicable and identified these areas as a routing constraint in the joint certificate of need application and route permit application. If easements are crossed, the applicant would work with landowners to determine measures to avoid and minimize impacts on these agricultural resources and to avoid interfering with landowner participation in the CREP, RIM, PWP, or Forest Legacy programs. Additionally, the applicant would continue to coordinate potential easement crossings with BWSR.

5.9.7 Rare and Unique Natural Resources

Rare and unique natural resources include federally and state-protected species and sensitive ecological resources. The ROI for protected species is the project area (1 mile), and the ROI for sensitive ecological resources is the route width. Impacts to protected species are evaluated by reviewing documented occurrences of these species within the ROI. Potential impacts to sensitive ecological resources, which could provide suitable habitat for protected species, are evaluated by assessing the presence of these resources within the ROI.

One federally protected species and several state-protected species have been documented within the ROI for Segment 1. Potential direct or indirect impacts to protected species could occur should they be present within or near the ROW during construction or maintenance activities. While more mobile species would leave the area for nearby comparable habitats, non-mobile species, such as vascular plants or nesting birds, could be directly impacted. Several sensitive ecological resources, such as native plant communities, intersect the ROI for Segment 1. Construction activities also have the potential for direct impacts to sensitive ecological resources if they are present within the area subject to construction disturbance. Long-term impacts would involve permanent clearing of vegetation in areas identified as sensitive ecological resources which could indirectly impact any protected species associated with these habitats.

Several measures could be implemented to avoid, minimize, or mitigate impacts to protected species and sensitive ecological resources, including those provided in the DNR's Natural Heritage Review response (Appendix M). Some measures are specific to the protected species and their associated habitats and could include rare species surveys to confirm ahead of construction activities or monitoring during construction. Measures to avoid, minimize, or mitigate impacts include but not limited to prudent routing, implementation of BMPs, working in already disturbed areas, and working in frozen ground conditions. The applicant committed to continuing to work with the DNR to minimize and mitigate potential impacts.

5.9.7.1 Existing Conditions

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

At the state level, the evaluation and protection of Minnesota's rare and unique natural resources are overseen by the DNR Division of Ecological and Water Resources through the identification and evaluation of threatened and endangered species and sensitive ecological resources. State-endangered or threatened species are protected under the Minnesota Endangered Species Statute (Minnesota Statute § 84.0895).

The DNR Natural Heritage Inventory System (NHIS) database (License Agreement #2022-008) was used to assess the presence of state-protected species within the Segment 1 project area. Although the NHIS database does not represent a comprehensive survey, it provides information on the potential presence of protected species. The NHIS is continually updated as new information becomes available and is the most complete source of data on Minnesota's protected species. Although reports or queries might not show records for state-protected species within the vicinity of a project, it does not necessarily mean that they are not present. It could simply mean that the area has not been surveyed or that records have not been reported to the DNR.

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

Map 18–1 provides an overview of sensitive ecological resources within Segment 1's ROI. In order to protect federally and state-protected species from exploitation or destruction, documented locations of these species are not identified on any maps.

5.9.7.1.1 Federal Protected Species

The USFWS IPaC online tool was queried on January 17, 2025, for a list of federally threatened and endangered species, proposed species, candidate species, and designated critical habitat that may be present within the vicinity of Segment 1 (Appendix M). Neither Segment 1 North nor Segment 1 South would traverse any federally designated critical habitat or proposed critical habitat. The IPaC query identified eight federal species that could potentially be in the project area of Segment 1 North and Segment 1 South, including three endangered species, four proposed endangered or threatened species, and an experimental population, nonessential species. The species identified in the IPaC query and their typical habitats are summarized in Table 5-21.

Table 5-21 Federal Species Potentially Present within Vicinity of Segment 1 North and Segment 1 South

Scientific Name	Common Name	Federal Status	State Status	Habitat
Myotis septentrionalis	Northern long-eared bat	Endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Bombus affinis	Rusty Patched bumble bee	Endangered	Watchlist	Areas with consistent flowering vegetation throughout the growing season. Overwinter in upland forests and woodlands.[1]
Erythronium propullans	Minnesota dwarf trout lily	Endangered	Endangered	River terrace, mesic oak-basswood forest, or mesic maple-basswood forest on a north-facing slope above or near a stream.[1]
Perimyotis subflavus	Tri-colored bat	Proposed endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Simpsonaias ambigua	Salamander mussel	Proposed endangered	Endangered	Swift flowing rivers and streams under flat rocks or under ledges of rock walls.[1]
Argynnis idalia occidentalis	Western regal fritillary	Proposed threatened	Not listed	Tall grass prairie, wet fields, meadows, marshes.[2]
Danaus plexippus	Monarch butterfly	Proposed threatened	Not listed	Areas with a high number of flowering plants. Presence of milkweed (*Asclepias* spp.) to complete the caterpillar life stage.[3]
Grus americana	Whooping crane	Experimental population, non-essential	Not listed	Wetlands, lakes, ponds, rivers, and agricultural fields.[4]

[1] Habitat information from reference (176)).
[2] Habitat information from reference (177)).
[3] Habitat information from reference (178)).
[4] Habitat information from reference (179)).

Federally proposed threatened or endangered species are species that the USFWS has determined are in danger of extinction throughout all or a significant portion of their range and have proposed a draft rule to list them as threatened or endangered. Proposed species are not protected by the take prohibitions of the federal ESA. A non-essential experimental population is a designation that refers to a population that has been established within its historical range under Section 10(j) of the ESA to aid in recovery of the species. Species designated as non-essential experimental populations are only protected by the federal ESA within a national wildlife refuge or a national park; the route widths of Segment 1 North and Segment 1 South do not intersect a national wildlife refuge or a national park.

5.9.7.1.2 State Protected Species

The DNR's NHIS database was queried in January 2025 (Barr License Agreement LA-2022-008) to determine if any state-endangered, threatened, or special concern species have been documented within 1 mile of Segment 1 North or Segment 1 South; the DNR uses a 1-mile buffer as a standard distance to capture the range of species that have already been documented and could be present in a particular area, given presence of suitable habitat. The NHIS database identified records for three state-endangered species, eight state-threatened species, 11 state special concern species, and one state watchlist species (also a federally endangered species) within 1 mile of Segment 1 North and/or Segment 1 South. State-endangered, threatened, and watchlist/federally endangered species documented in the NHIS database, along with their typical habitats, are summarized in Table 5-22. State special concern species documented in the NHIS database within 1 mile of Segment 1 North and/or Segment 1 South are summarized in Appendix M. While these species are tracked by the DNR, they are not legally protected under the Minnesota Endangered Species Statute.

Table 5-22 Natural Heritage Information System Database Records of State or Federally Threatened or Endangered Species within 1 Mile of Segment 1 North and Segment 1 South

Scientific Name	Common Name	Type	Federal Status[1]	State Status[2]	Habitat[3]	Segment 1 North			Segment 1 South		
						ROW	Route width	1 mile	ROW	Route width	1 mile
Arcidens confragosus	Rock pocketbook	Mussel	Not listed	END	Medium to large rivers.		X	X		X	X
Lampsilis teres	Yellow sandshell	Mussel	Not listed	END	Large rivers.		X	X		X	X
Lanius ludovicianus	Loggerhead shrike	Bird	Not listed	END	Upland native and non-native grasslands; perching sites contain shrubs or small trees.			X	X	X	X
Berula erecta	Stream parsnip	Vascular Plant	Not listed	THR	Wet seepage meadows, calcareous fens, and spring-fed streams in forested ravines.		X	X			X
Emydoidea blandingii	Blanding's turtle	Reptile	Not listed	THR	Calm, shallow waters with rich, aquatic vegetation for foraging and adjacent sandy uplands for nesting.	X	X	X	X	X	X
Eurynia dilatate	Spike	Mussel	Not listed	THR	Small to large rivers.			X			
Notropis anogenus	Pugnose shiner	Fish	Not listed	THR	Clear glacial lakes and low gradient small-to-moderate-sized streams in areas of little current.		X	X		X	X
Polyodon spathula	Paddlefish	Fish	Not listed	THR	Open waters of large rivers and river lakes.		X	X		X	X
Rhynchospora capillacea	Hair-like beak rush	Vascular Plant	Not listed	THR	Calcareous fens and spring fens in large peatland complexes.	X	X	X			X

Scientific Name	Common Name	Type	Federal Status[1]	State Status[2]	Habitat[3]	Segment 1 North			Segment 1 South		
						ROW	Route width	1 mile	ROW	Route width	1 mile
Sagittaria calycina var. calycina	Hooded arrowhead	Vascular Plant	Not listed	THR	Soft mud or loose and wet sand associated with lakes, river banks, ponds, and marshes.			X			X
Theliderma metanevra	Monkeyface	Mussel	Not listed	THR	In Minnesota, the St. Croix River is the only large river that supports a population of this species.		X	X		X	X
Bombus affinis	Rusty-patched Bumble Bee	Insect	END	WL	Areas with consistent flowering vegetation throughout the growing season.			X			X

[1] "END" = endangered
[2] "END" = endangered ; "THR" = threatened; "WL" = watchlist (tracked by the DNR but not protected at the state level)
[3] Habitat information from reference (176)).

5.9.7.1.3 Sensitive Ecological Resources

The DNR has established several classifications for sensitive ecological resources across the state, many of which are scattered throughout the Segment 1 geographic area (Map 18). Some of these sensitive ecological resources are crossed by the ROI for Segment 1 North and/or Segment 1 South, including Scientific and Natural Areas, Sites of Biodiversity Significance (SBS), native plant communities, Lakes of Biological Significance, and a designated old growth stand.

The DNR designates Scientific and Natural Areas to protect natural features with exceptional scientific or educational value including native plant communities, populations of rare species, and geologic features (reference (180)). As shown on Map 18-3, the Townsend Woods Scientific and Natural Area intersects the ROI for Segment 1 North.

The DNR maps SBS and assigns a biodiversity significance rank to sites surveyed across the state. These ranks are used to communicate statewide native biological diversity of each site and help to guide conservation and management activities (reference (181)). As shown on Map 18, several SBS intersect the ROI for Segment 1 North and Segment 1 South. The DNR assigns biodiversity significance ranks, as follows:

- **Outstanding** – best occurrences of the rarest species and native plant communities.
- **High** – good quality occurrences of the rarest species and high-quality examples of native plant communities.
- **Moderate** – occurrences of rare species, moderately disturbed native plant communities.
- **Below** – sites with moderately disturbed native plant communities, but lacking occurrences of rare species).

The DNR identifies and maps areas containing native plant communities across the state. A native plant community is a group of native plants that interact with each other and their environment in ways that have not been greatly altered by modern human activity or introduced organisms (reference (182)). The DNR provides a state conservation status to each native plant community, as follows:

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

As shown on Map 18, several native plant communities intersect the ROI for Segment 1 North and/or Segment 1 South, including the following types and associated state conservation status (or range of statuses if multiple subtypes):

- Cattail - Sedge Marsh (Northern); S2
- Mesic Prairie (Southern); S2
- Northern Mixed Cattail Marsh; S2
- Sugar Maple - Basswood - (Bitternut Hickory) Forest; S2
- Sugar Maple Forest (Big Woods); S2
- Northern Bulrush-Spikerush Marsh; S2, S3
- Mud Flat (Inland Lake), Non-Saline Subtype; S3
- Pin Oak - Bur Oak Woodland; S3
- Red Oak - Sugar Maple - Basswood - (Bitternut Hickory) Forest; S3
- Graminoid Rich Fen (Basin); S4
- Sedge Meadow; S4 or S5
- Southern Mesic Maple-Basswood Forest; S2, S3
- Bulrush Marsh (Northern); S3

On state-administered lands, the DNR maps and designates old-growth stands, future old-growth stands, and candidate old-growth stands. As shown on Map 18–3, a designated old-growth stand intersects the ROI for Segment 1 North.

The DNR maps certain waterbodies as Lakes of Biological Significance based on the unique presence of aquatic plants or animals (reference (183)). The DNR assigns biological significance classes (outstanding, high, or moderate) to these waterbodies based on a variety of factors, such as the quality of the lake/habitat and the presence of certain plants and animals. As shown on Map 18, several Lakes of Biological Significance intersect the ROI for Segment 1 North and/or Segment 1 South, including Eagle Lake, Fish Lake, Tetonka Lake, and Lily Lake.

State and federal lands that are preserved or managed for wildlife are scattered throughout Segment 1; these areas would also be considered sensitive ecological resources and are discussed in Section 5.9.6 and Section 5.9.12.1.

5.9.7.2 Potential Impacts

Project construction and operation have the potential to impact protected species and sensitive ecological resources. Construction-related potential short-term impacts on federally or state-protected wildlife species would be similar to those described for non-listed species in Section 5.9.12.2 and could include displacement during construction activities that generate noise, dust, or disturbance of habitat. Ground-disturbing activities (e.g., grading), permanent vegetation clearing, and construction activities in areas identified as sensitive ecological resources could impact protected species associated with these habitats.

5.9.7.2.1 Federal Protected Species

The species identified in the IPaC query are potentially present within the vicinity of Segment 1 North and/or Segment 1 South, where suitable habitat is present.

The NHIS database does not document the presence of northern long-eared bats, maternity roost trees, or hibernacula within 1 mile of Segment 1 North or Segment 1 South. However, suitable forested habitat is present in the route widths of Segment 1 North and Segment 1 South. Impacts to northern long-eared bats could occur if tree clearing or construction take place during the bat's active season, when the species are breeding, foraging, or raising pups in forested habitat. Bats could be injured or killed if occupied trees are cleared during the active season, and the species could be disturbed during clearing or construction activities due to noise or human presence.

The NHIS database does not identify any records of tricolored bats within 1 mile of Segment 1 North or Segment 1 South; however, forested areas within the route widths of Segment 1 North and Segment 1 South could provide suitable habitat for the species. Potential impacts to tricolored bats would be similar to those described for northern long-eared bats.

The NHIS database does not identify any records of salamander mussel within 1 mile of Segment 1 North or Segment 1 South; however, the species could be present in larger streams in the vicinity of Segment 1, such as the Minnesota River. However, as discussed in Section 5.9.9.2, watercourses would be spanned and appropriate BMPs would be employed; as such, impacts to the salamander mussel or other aquatic protected species are not anticipated.

The NHIS database does not identify any records of Minnesota dwarf trout lily within 1 mile of Segment 1 North or Segment 1 South. However, suitable basswood forest habitat for this species could be present within the route widths of Segment 1 North and Segment 1 South. The ROW of Segment 1 North intersects a Southern Mesic Maple-Basswood Forest native plant community; this native plant community is one in which Minnesota dwarf trout lily is found. Segment 1 North intersects this native plant community in an existing transmission line ROW that would require widening, as it could be double-circuited with an existing 115 kV transmission line in this location. Impacts to Minnesota dwarf trout lily could occur should this species or suitable habitat be present in areas undergoing grading or clearing activities associated with project construction.

As noted in Table 5-22, the NHIS database has documented records of rusty patched bumble bees within 1 mile of both Segment 1 North and Segment 1 South. Although the route widths of Segment 1 North and Segment 1 South are primarily agricultural, suitable foraging habitat for rusty patched bumble bees is present in non-agricultural areas with flowering plants, and suitable overwintering habitat present in the forested areas within the route widths. In addition, as shown on Map 18, both Segment 1 North and Segment 1 South intersect rusty patched bumble bee high potential zone, an area identified by the USFWS where rusty patched bumble bees are likely to be present. Potential impacts to rusty patched bumble bees could occur as a result of ground disturbing activities and/or removal of vegetation that serves as habitat.

The NHIS database does not track documented records of western regal fritillary. Suitable habitat for western regal fritillary is present in the wet meadows and marshes that intersect the route widths of Segment 1 North and Segment 1 South. Potential impacts to western regal fritillary could occur as a result of ground disturbing activities and/or removal of vegetation that serves as habitat.

The NHIS database does not track documented records of monarch butterflies. Suitable habitat for monarch butterflies is present in the non-agricultural parts of the route width and ROW of Segment 1

North and Segment 1 South. Potential impacts to monarch butterflies could occur as a result of ground disturbing activities and/or removal of suitable reproductive (milkweed plants) or feeding (flowering plants) habitat.

Whooping cranes are rare in the state of Minnesota, and the NHIS database does not track documented records of them. Potential impacts to whooping cranes would be similar to those described for other waterfowl/avian species in Section 5.9.12.2.

5.9.7.2.2 State Protected Species

The state-threatened and endangered species identified in Table 5-22 and special concern species identified in Appendix M are known to occur in the vicinity of Segment 1 North and Segment 1 South where suitable habitat is present. The discussion below is focused on potential impacts to state-threatened and endangered species; however, impacts to and mitigation measures for special concern species would generally be similar for many species occupying similar habitats.

As noted in Table 5-22, three state-threatened vascular plant species have been documented within 1 mile of Segment 1 North and Segment 1 South; if present, these species and/or their habitats could be impacted as a result of grading and/or clearing activities associated with project construction. Table 5-22 indicates that one of the three vascular plant species, hair-like beak rush, was documented within the ROW of Segment 1 North. However, the exact location of this hair-like beak rush record is uncertain and as a result, the DNR identifies a large polygon (with a diameter of approximately 2 miles) to cover the possible location of this record. Suitable habitat for this species consists of calcareous fens; this habitat does not appear to be present within the ROW of Segment 1 North or Segment 1 South; as such, impacts to this species are not anticipated.

The other two state-threatened vascular plant species, stream parsnip and hooded arrowhead, have not been documented within the ROW of Segment 1 North or Segment 1 South and both species are associated with wetlands and other aquatic habitats. Watercourses and waterbodies, and wetlands to the extent feasible, would be spanned by transmission line infrastructure; as such, impacts to these species are not anticipated.

Blanding's turtles have been documented within the ROW of both Segment 1 North and Segment 1 South. Potential impacts to Blanding's turtles could occur during project construction as a result of construction equipment and ground disturbing activities in wetland habitat and adjacent sandy upland nesting habitat.

The loggerhead shrike has been documented within the ROW of Segment 1 South; however, suitable habitat is also present in the ROW of Segment 1 North. Potential impacts to the loggerhead shrike would be similar to those described for other avian species in Section 5.9.12.2.

The applicant has designed the project to minimize impacts to watercourses and waterbodies to the extent practicable and would avoid placement of structures within surface waters. However, where not feasible (e.g., possibly Eagle Lake), impacts to the state-protected aquatic species identified in Table 5-22 could occur should they be present.

5.9.7.2.3 Sensitive Ecological Resources

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

Creation of new transmission line rights-of-way or expansion of existing rights-of-way through sensitive ecological resources could impact protected species associated with habitats within them. This could occur as a result of habitat conversion or fragmentation or due to the placement of structures and other infrastructure within them. The route widths and rights-of-way of both Segment 1 North and Segment 1 South would intersect sensitive ecological resources, as summarized in Table 5-23 and shown on Map 18. However, as discussed in Section 5.4, 96 percent of Segment 1 North could be double-circuited with an existing 69 or 115 kV line and 69 percent of Segment 1 South could be double-circuited with existing 69 kV or 115 kV line. Additional areas of each segment would parallel existing road rights-of-way. In areas where Segment 1 North or Segment 1 South could be double-circuited with an existing transmission line and/or where the segments would parallel existing ROW, impacts to sensitive ecological resources would be minimized.

The route width and ROW of Segment 1 North would intersect the Townsend Woods Scientific and Natural Area, while Segment 1 South would avoid this resource. This Scientific and Natural Area also contains an SBS ranked outstanding and a Sugar Maple Big Woods native plant community, which the DNR has designated as an old growth stand. However, these resources have been previously impacted by the existing 115 kV transmission line, and Segment 1 North could be double-circuited with this transmission line. The ROW width required would likely be wider than the existing ROW and could require permanent vegetation removal beyond the existing ROW. The applicant would be required to coordinate potential easement modifications with the DNR (Section 5.9.6).

The route width and ROW of both Segment 1 North and Segment 1 South would intersect several SBS and native plant communities, which are often associated with an SBS. Segment 1 North would intersect more acreage of SBS and native plant communities relative to Segment 1 South. However, impacts would be minimized, as locations where the ROW and/or anticipated alignment of either Segment 1 North or Segment 1 South intersect an SBS or native plant community occur in areas that could be double-circuited with an existing transmission line.

Eagle Lake is the only Lake of Biological Significance within the ROW of Segment 1 North and Segment 1 South. Eagle Lake is already crossed by an existing 69 kV transmission line and Segment 1 North and Segment 1 South would cross Eagle Lake while double-circuiting the existing transmission line.

Table 5-23 Sensitive Ecological Resources within the Route Width and ROW of Segment 1 North and Segment 1 South

Resource	Units	Segment 1 North		Segment 1 South	
		Route width	ROW	Route width	ROW
Scientific and Natural Area	Total acres	28	2	0	0
Sites of Biodiversity Significance	Outstanding rank (acres)	16	1	0	0
	High rank (acres)	159	21	92	8
	Moderate rank (acres)	41	3	8	1
	Below rank (acres)	136	16	21	1
	Total acres	352	41	121	10
Native Plant Communities	Conservation Status S1 (community is critically imperiled), S2 (community is imperiled), or S3 (community is vulnerable to extirpation or extinction) (acres)	149	14	46	2
	Conservation Status S4 (community is apparently secure) and S5 (community is demonstrably widespread, abundant, and secure) (acres)	42	9	23	5
	Total acres (Conservation Status S1-S5)	191	23	69	7
Designated Old Growth	Total acres	6	<0.1	0	0
Lakes of Biological Significance	Outstanding rank (count)	0	0	1	0
	High rank (count)	1	0	1	0
	Moderate rank (count)	2	1	1	1
	Total count	3	1	3	1

5.9.7.3 Mitigation

Through prudent routing and implementation of BMPs and mitigation measures, impacts to federally or state-protected species and sensitive ecological resources can be minimized. The primary means to mitigate potential impacts to federally and state-protected species is to avoid routing through habitat used by these species. Additionally, impacts can be mitigated by incorporating species (or species type) specific BMPs in coordination with the USFWS and/or the DNR. The primary means to mitigate impacts to sensitive ecological resources is by avoiding and/or spanning these communities if possible. In addition, double-circuiting and/or paralleling existing rights-of-way, such as roads, would reduce the potential for fragmentation of these resources.

Mitigation and minimization measures for potential impacts to rare and unique natural resources are not standard Commission route permit conditions. However, as noted in Appendix H, there are standard route permit conditions to minimize potential impacts to vegetation and avian species, which would be applicable to minimizing impacts to federal and state-protected species and sensitive ecological resources; these are summarized in Section 5.9.10.3 and Section 5.9.12.3, respectively.

As summarized in their route permit application, the applicant has committed to the following measures to minimize the potential for impacts to federal and state-protected species and sensitive ecological resources:

- Obtaining available USFWS and DNR rare species databases prior to construction activities to determine locations where the routes and structures are near or adjacent to known locations of listed species.
- Conducting rare species surveys in those areas and similar high-quality habitats preferred by listed species.
- Avoiding impacts to federal- and state-listed species to the maximum extent practicable and coordinating with the appropriate federal and/or state agency in the unlikely event of unavoidable impacts to listed species.
- Continuing to work with the DNR to refine the final alignments and reduce impacts to natural resource sites.
- Potentially incorporating some seasonal restrictions, such as fencing of rare features, and vegetation restoration as applicable.
- Working with the DNR to refine the final alignments and reduce impacts to SBS and native plant communities.
- Implementation of integrated vegetation management plans associated with its existing pollinator initiative, which was created to enhance pollinator habitat.

In their Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR recommended the following to minimize potential impacts to sensitive ecological resources:

- Avoid working in Minnesota Biological Survey and rare (S1-S3) native plant communities.
- As much as possible, operate within already-disturbed areas.
- Retain a buffer between proposed activities and Minnesota Biological Survey Sites.
- Confine construction activities to the opposite side of the road from Minnesota Biological Survey Sites. If this is not feasible, confine construction activities to the existing road rights-of-way.
- Minimize vehicular disturbance in the area (allow only vehicles necessary for the proposed work).
- Do not park equipment or stockpile supplies in the area.
- Do not place spoil within Minnesota Biological Survey Sites or other sensitive areas.

- If possible, conduct the work under frozen ground conditions.
- Inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of invasive species.
- Use effective erosion prevention and sediment control measures.
- Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible.
- Use only weed-free mulches, topsoils, and seed mixes. Of particular concern is birdsfoot trefoil (Lotus corniculatus) and crown vetch (Coronilla varia), two invasive species that are sold commercially and are problematic in prairies and disturbed open areas, such as roadsides.

In their Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR recommended the following to minimize potential impacts to state-listed species:

- To minimize potential impacts to loggerhead shrike, tree and shrub removal must not occur within potential habitat during the breeding season, April through July. If avoiding tree or shrub removal within potential habitat from April through July is not feasible, a qualified surveyor will need to conduct a survey for active nests before any trees or shrubs will be removed.
- To avoid impacts to Blanding's turtles, the following avoidance measures are required:
    - Avoid wetland and aquatic impacts during hibernation season, between September 15th and April 15th, if the area is suitable for hibernation.
    - Erosion and sediment control should be limited to wildlife friendly erosion control to avoid the inadvertent take of Blanding's turtles.
    - Hydro-mulch products should not contain any materials with synthetic (plastic) fiber additives, as the fibers can re-suspend and flow into waterbodies.
    - Construction areas, especially aquatic or wetland areas, should be thoroughly checked for turtles before the use of heavy equipment or any ground disturbance.
    - Check any holes that have been left unattended for prolonged periods for turtles before being filled.
    - The DNR's Blanding's turtle flyer must be given to all contractors working in the area (reference (184)).
    - Illegal collection is a concern with wood turtles; therefore, no signs that would bring attention to the presence of wood turtles should be posted.
    - Monitoring during construction should be completed, and any sightings should be reported to Reports.NHIS@state.mn.us including date, observer, location, and photograph of the Blanding's turtle.
    - If turtles are in imminent danger, they must be moved by hand out of harm's way, otherwise they are to be left undisturbed. Directions on how to move turtles safely are found in reference (184)).

- To avoid impacting timber rattlesnakes the following avoidance measures are required:
  - Crews working in the area should be advised that if they encounter any snakes, the snakes should not be disturbed.
  - Erosion and sediment control should be limited to wildlife friendly erosion control to avoid the inadvertent take of timber rattlesnakes.
- Timber rattlesnake precautions may include, but are not limited to, the following recommendations:
  - Wear appropriate personal protection equipment, such as thick pants, boots, and leather gloves.
  - Care should be taken around stockpiled materials as snakes may be using these materials for shelter.
  - Sightings should be reported to Reports.NHIS@state.mn.us; including date, observer, location, and photograph of the timber rattlesnake.
- To avoid impacts to aquatic species, stringent erosion prevention and sediment control practices should be maintained throughout the duration of the project to prevent adverse debris and material from impacting downstream populations.
- To avoid impacting state-protected plants, all known occurrences of state-protected plant species and all potential habitats must be avoided. If this is not feasible, a qualified surveyor will need to (1) resurvey known occurrences and (2) determine if suitable habitat exists within the activity impact area and, if so, conduct a survey prior to any project activities.
- To minimize impacts to northern long-eared bats and other bat species, tree removal should be avoided from June 1 through August 15.

5.9.8 Soils

The ROI for soils is the ROW. Existing soil types and associated qualities are reviewed to better understand the most likely impacts to occur as a result of construction activities. Nearly all soils within the ROI have a moderate or severe rutting hazard rating. Common soil impacts include rutting, compaction, and erosion. Potential impacts would be short-term during construction, localized, and can be minimized. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicant would obtain a NPDES/State Disposal System Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicle trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored in a suitable location. Disturbed areas would be promptly seeded after construction.

5.9.8.1 Existing Conditions

Soil information for Segment 1 was obtained from the USDA-Natural Resource Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database. Map 19 shows the surface soil textures across Segment 1. Soil types within the ROI of Segment 1 were reviewed to identify soil characteristics that could be more prone to impacts in some areas versus others (Table 5-24).

Table 5-24 Segment 1 NRCS Mapped Soils within ROI

Segment ID	Buffer Width (ft.)	Total Acreage	Compaction Prone Medium or higher rating (acres (%))	Erosion Hazard Moderate or higher rating (acres (%))	Rutting Hazard Moderate or severe rating (acres (%))	Hydric Soils [1] 67-99% or 100% (acres (%))	Revegetation Concerns [2] NCC class of 3 or greater (acres (%))
Segment 1 North	75	766	437 (57%)	307 (40%)	752 (98%)	322 (42%)	91 (12%)
Segment 1 South	75	866	473 (55%)	214 (25%)	855 (99%)	375 (43%)	65 (8%)

[1] A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil profile. Hydric soils are typically associated with lowlands and wetlands and are rated by their proportion of hydric soil in the map unit.
[2] Soils with a non-irrigated land capability classification of 3 or greater were considered to have low revegetation potential.

Nearly all of the soils within the ROI of Segment 1 North and Segment 1 South have a moderate or severe rutting hazard rating. Ratings in this hazard category indicate the potential of surface rut formation through the operation of heavy, wheeled equipment. Ratings are based on depth to the water table, rock fragments on or below the surface, the classification of the soil material based on the Unified Soil Classification System, depth to a restrictive layer, and slope. A rating of "moderate" indicates that rutting is likely and "severe" indicates that ruts form readily.

Over half of the soils within the ROI of Segment 1 North and Segment 1 South have a medium or higher soil compaction rating. Soil compaction occurs when moist or wet soil particles are pressed together, reducing pore space between them, and is primarily caused by heavy vehicular traffic or permanent structure placement. Soils are rated based on their susceptibility to compaction from the operation of ground-based equipment for planting, harvesting, and site preparation activities when soils are moist. A “medium” rating means that after the initial compaction (that is, the first equipment pass) the soil can support standard equipment with only minimal increases in soil density. A “high” rating means that the soil will continue to compact after each equipment pass.

5.9.8.2 Potential Impacts

Transmission line projects have the potential to impact soils during construction and operation of the project. Construction might require some amount of grading to provide a level surface for safe operation of construction equipment. In addition, potential topsoil and subsoil mixing might result from the excavation, stockpiling, and redistribution of soils during installation of transmission line structures.

Localized soil erosion, compaction, and topsoil and subsoil mixing could affect revegetation within temporary work areas.

5.9.8.3 Mitigation

The sample route permit (Section 5.3.8 of Appendix H) includes the following measures to mitigate impacts to soils:

> *"The Permittee shall implement those erosion prevention and sediment control practices recommended by the Minnesota Pollution Control Agency (MPCA) Construction Stormwater Program. If construction of the Transmission Facility disturbs more than one acre of land or is sited in an area designated by the MPCA as having potential for impacts to water resources, the Permittee shall obtain a National Pollutant Discharge Elimination System/State Disposal System Construction Stormwater Permit from the MPCA that provides for the development of a Stormwater Pollution Prevention Plan that describes methods to control erosion and runoff.*
>
> *The Permittee shall implement reasonable measures to minimize erosion and sedimentation during construction and shall employ perimeter sediment controls, protect exposed soil by promptly planting, seeding, using erosion control blankets and turf reinforcement mats, stabilizing slopes, protecting storm drain inlets, protecting soil stockpiles, and controlling vehicle tracking. Contours shall be graded as required so that all surfaces provide for proper drainage, blend with the natural terrain, and are left in a condition that will facilitate re-vegetation and prevent erosion. All areas disturbed during construction of the Transmission Facility shall be returned to pre-construction conditions. "*

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicant would obtain a NPDES/State Disposal System Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicle trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored in a suitable location. Disturbed areas would be promptly seeded after construction. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

5.9.9 Surface Water

The ROI for surface water is the route width. Impacts to surface waters were assessed by identifying watercourses and waterbodies and considering their proximity to the project and special designations. Segment 1 North's anticipated alignment crosses more watercourses and waterbodies than Segment 1 South but would also be double-circuited with existing transmission lines at the crossing locations. Direct impacts caused by structures placed in surface waters would be minimized to the extent practicable by spanning surface waters. Direct impacts to other resources can cause indirect impacts to surface waters. For example, construction activities near surface waters could

cause riparian vegetation disturbance and surface erosion, which can lead to runoff impacting surface waters. In addition to spanning surface water crossings, impacts to surface waters would be mitigated through implementation of the SWPPP, AIMP, and VMP.

5.9.9.1 Existing Conditions

Several federal and state laws regulate watercourses and waterbodies. The Clean Water Act (CWA) establishes the structure for regulating the discharge of materials into waters of the United States and for developing water quality standards for surface waters (U.S. Code [USC]: Chapter 33 § 1311 and 1344). The CWA could potentially regulate several types of activities and their impacts associated with the project.

Watercourses and waterbodies may be regulated under Section 10 of the Rivers and Harbors Act (USC Chapter 33 § 401) and Section 404 of the CWA (USC Chapter 33 § 328.3 and 1344). The Rivers and Harbors Act regulates activities such as excavating, dredging, and altering the course of Section 10 designated waters (USC Chapter 33 § 403). Section 404 of the CWA prohibits discharge of dredged or fill materials without a permit. It provides legal protection to more waterbodies than the Rivers and Harbors Act, namely all jurisdictional waters of the United States, including navigable waters, interstate waters, and wetlands with a significant nexus to navigable waters (USC Chapter 33 § 320). The U.S. Army Corps of Engineers (USACE) holds both Section 10 and Section 404 permitting authority.

Activities regulated under either Section 10 or Section 404 must obtain a Section 401 water quality certification to confirm that the project would comply with state water quality standards. Section 401 of the CWA is administered by the United States EPA. The CWA, however, gives the EPA the authority to delegate 401 certification to the states. In Minnesota, the EPA has delegated Section 401 certification to the Minnesota Pollution Control Agency (MPCA).

Section 303(d) of the CWA requires states 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. Waters that do not meet their designated uses because of water quality standard violations are listed as impaired. In Minnesota, the MPCA has jurisdiction over determining 303(d) waters which are described and listed as impaired.

Some watercourses and waterbodies are designated as public waters and are listed in the PWI by the state of Minnesota. The statutory definition of a public water is found in Minnesota Statute § 103G.005, Subdivision 15a (Minnesota Statute §103G.005). These water resources are under the jurisdiction of the DNR, and a DNR license to cross public waters would be required when an activity would cross, change, or diminish the course, current, or cross-section of public waters by any means, including filling, excavating, or placing materials in or on the beds of public waters. PWI watercourse crossings are unavoidable, and the applicant would be required to coordinate with the DNR to obtain licenses to cross.

Minnesota regulates trout streams according to Minnesota Statute § 6264.0050. As provided by Minnesota Rules 6135.1100, subpart 4, item B: Crossings on or under the beds of streams designated by the commissioner of natural resources as trout waters shall be avoided unless there is no feasible alternative. When unavoidable, maximum efforts shall be taken to minimize damage to trout habitat.

Minnesota designates some water resources as Outstanding Resource Value Waters because of their exceptional qualities. Minnesota Statute § 7050.0180 prohibits, or stringently controls, new or expanded discharges from either point or nonpoint sources to outstanding resource value waters.

Segment 1 is in the Minnesota River and Lower Mississippi River Basins and crosses two major watersheds, as delineated by the USGS: Middle Minnesota River (8-digit Hydrologic Unit Code (HUC) 07020007) and Cannon River (8-digit HUC 07040002). According to the Watershed Health Assessment Framework (WHAF), the mean watershed score for these two major watersheds ranges from 41 to 50 (reference (185)). Watershed scores are scaled 0 (least healthy) to 100 (best health). The mean watershed score is the average score of five separate components: hydrology, geomorphology, biology, connectivity, and water quality. At the state scale, mean watershed scores tend to decrease further downstream. Urban watershed degradation is attributed, in part, to impervious surfaces, intensity of water use, and point source pollution (reference (186)).

Map 9 shows the watercourses in the route width of Segment 1. Surface waters in the route width of Segment 1 include rivers and streams (watercourses) and lakes and ponds (waterbodies). Major watercourses within the route width of Segment 1 include, but are not limited to: Cannon River, Devil Creek, Mackenzie Creek, Whitewater Creek, and Waterville Creek; all of these watercourses are designated as public watercourses in the Public Waters Inventory (PWI) and are also classified as impaired waters (Map 9). None of the other watercourses crossed by Segment 1 are designated as Outstanding Resource Value Waters, Section 10 navigable waters (reference (187)), or trout streams.

Map 9 shows the waterbodies in the route width of Segment 1. The route width of Segment 1 includes waterbodies identified by the NHD, including Long Lake, Eagle Lake, Fish Lake, Mud Lake, Tetonka Lake, Lower Sakatah Lake, Wells Lake, Sprague Lake, Lily Lake, and several unnamed lakes. Of these lakes, none are designated as trout lakes by the DNR but most are designated as public water basins in the PWI. Exceptions include Long Lake and four unnamed lakes, which are not designated as public water basins. Four of the waterbodies, including Eagle Lake, Tetonka Lake, Lower Sakatah, and Cannon Lake, are listed as impaired waters.

The DNR Shallow Lakes Program works to protect and enhance wildlife habitat on larger lakes that are dominated by shallow water; these shallow lakes serve as important habitat to wildlife species (reference (188)); designated shallow wildlife lakes are discussed in Section 5.9.12. The DNR maps certain waterbodies as Lakes of Biological Significance based on the unique presence of aquatic plants or animals (reference (182)); Lakes of Biological Significance are discussed in Section 5.9.7.

The route width of Segment 1 includes 100-year floodplains designated by the Federal Emergency Management Administration (FEMA) (Map 9). Twelve surface waters are associated with these 100-year floodplains. The route width of Segment 1 North includes the 100-year floodplains of Cannon River, Lower Sakatah Lake, Dell Creek, and Crockers Creek. The route width of Segment 1 South includes the 100-year floodplains of an unnamed waterway, a tributary to Tetonka Lake, a tributary to White Water River, and Waterville Creek. The route width of Segment 1 North and Segment 1 South both include the 100-year floodplains of the Minnesota River and Mackenzie Creek.

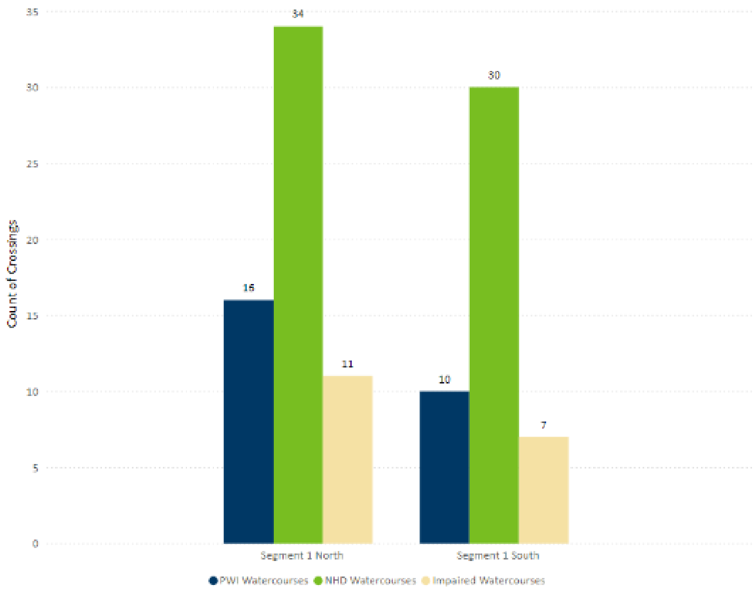
5.9.9.2 Potential Impacts

The project was designed to span watercourses, waterbodies, and floodplains to the extent practicable and to minimize the number of structures in surface water resources where these resources cannot be spanned or where crossings cannot use double-circuiting. The maximum transmission line structure span distance for watercourses, waterbodies, and floodplains is 1,000 feet. The crossing length of most of these resources is less than 1,000 feet, meaning that the project is expected to be able to span most watercourses and waterbodies, with a few exceptions for the waterbodies noted below. No structures would be placed within the surface waters that can be spanned by Segment 1 North and Segment 1 South, and no direct impacts on these watercourses and waterbodies are anticipated.

Segment 1 North has more NHD, PWI, and impaired watercourse crossings than Segment 1 South (Figure 5-10). The PWI watercourses and impaired streams crossed by the anticipated alignments for Segment 1 North and Segment 1 South include the following:

- **Public Watercourses:** Segment 1 North crosses a tributary to the Minnesota River, a tributary to Lake Washington, Cannon River, a tributary to Lower Sakatah Lake, Devil Creek, Mackenzie Creek, and a tributary to Cannon River. Segment 1 South crosses a tributary to the Minnesota River, Whitewater Creek, Waterville Creek, Mackenzie Creek, and a tributary to Cannon River.
- **Impaired Watercourses:** Segment 1 North crosses the Cannon River, Devil Creek, Mackenzie Creek, and an unnamed creek. Segment 1 South crosses Whitewater Creek, Waterville Creek, unnamed creek, and Mackenzie Creek.

Figure 5-10 Segment 1 North and Segment 1 South Watercourse Crossings

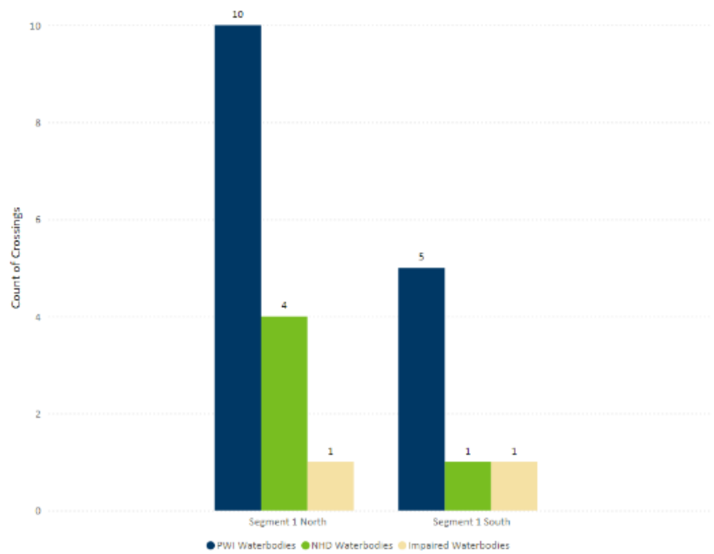


Segment 1 North has more PWI and NHD waterbody crossings than Segment 1 South but the same number of impaired waterbody crossings as Segment 1 South (Figure 5-11). The PWI and impaired waterbodies crossed by the anticipated alignments for Segment 1 North and Segment 1 South include the following:

- **Public Waterbodies:** Segment 1 North crosses Eagle Lake, Fish Lake, Long Lake, Lower Sakatah Lake, and Mud Lake. Segment 1 South crosses Eagle Lake.
- **Impaired Waterbodies:** Segment 1 North and Segment 1 South both cross Eagle Lake.

All waterbodies, except Eagle Lake and Fish Lake, have crossing lengths less than 1,000 feet and could therefore be spanned. Eagle Lake and Fish Lake, both public water basins, have crossing lengths greater than 1,000 feet; however, these two crossings would occur in areas that could be double-circuited with existing transmission lines. For Segment 1 North, all waterbody crossings would occur in areas that could be double-circuited with existing transmission lines. However, for Segment 1 South, five watercourse crossings would occur in areas that would not be double-circuited with an existing transmission line.

Figure 5-11 Segment 1 North and Segment 1 South Waterbody Crossings



Despite spanning watercourses and waterbodies, indirect impacts associated with crossing these resources could occur during construction. Removal of vegetation and soil cover could result in short-term water quality impacts due to increased turbidity. Construction impacts could also remove riparian or shoreline forest areas within the ROW that currently assist with water attenuation and decreasing erosion impacts. In addition to habitat changes, vegetation clearing could increase light penetration to watercourses and waterbodies, potentially resulting in localized increases in water temperatures and changes to aquatic communities, especially those that rely on cold water, such as trout.

Impacts to floodplains during construction would include soil disturbance and vegetation removal. Vegetation clearing within a floodplain, especially tree removal, can greatly destabilize the area, make it more prone to ongoing erosion and sediment issues, and further contribute to water quality issues. The project might require that transmission line structures be placed within FEMA-designated floodplain. Segment 1 North's anticipated alignment crosses five floodplains that exceed 1,000 feet; all of these crossings would occur where the project could be double-circuited with an existing transmission line. Segment 1 South's anticipated alignment does not include any floodplain crossings exceeding 1,000 feet.

5.9.9.3 Mitigation

The sample route permit (Section 5.3.9 of Appendix H) includes the following measures to mitigate impacts to surface water:

- Space and place structures at variable distances to span and avoid watercourses and floodplains.
- Contain soil excavated from riparian areas and not place it back into the riparian area.
- Access riparian areas using the shortest route possible in order to minimize travel and prevent unnecessary impacts.

- Do not place staging or stringing set up areas within or adjacent to water resources, as practicable.
- Assemble structures on upland areas before they are brought to the site for installation.
- Restore water resource areas disturbed by construction activities to pre-construction conditions in accordance with the requirements of applicable state and federal permits or laws and landowner agreements.
- Meet the USACE, DNR, Minnesota BWSR, and local units of government water resource requirements.

Mitigation measures are anticipated to prevent and minimize impacts to watercourses and waterbodies. The applicant would obtain a NPDES Construction Stormwater permit from the MPCA for construction of the project, which requires development of a SWPPP that identifies BMPs to be used during construction to minimize erosion and sedimentation. Per the stormwater permit, additional BMPs would be required for work near special waters which include impaired waters. Sediment barriers, such as silt fence, straw bales, and bio-logs, would be used along waterways and slopes during construction to minimize soil erosion and sedimentation. The applicant would maintain water and soil conservation practices during construction and operation of the project to protect topsoil and adjacent water resources and minimize soil erosion. If tree removal is required along waterways, trees would be cut, leaving the root systems intact to retain bank stability. Construction would be completed according to NPDES permit requirements and an approved AIMP and VMP.

Impacts would be mitigated by using BMPs. Watercourses would only be crossed by construction equipment where required to support construction activities. Crossing PWI waters would require a DNR license to cross public waters, and work near special or impaired waters would require additional BMPs as detailed in the construction stormwater permit. According to the joint certificate of need application and route permit application, the applicant would work with the DNR to confirm that all proper licenses and approvals are obtained for public water crossings. Further, the joint certificate of need application and route permit application also states that through the licensing process, the applicant would work with the DNR to determine appropriate mitigation measures for these crossings.

5.9.10 Vegetation

The ROI for vegetation is the ROW. Impacts to vegetation are primarily evaluated by examining vegetative landcover types within the ROW. Most existing vegetation is agricultural.

Potential short-term impacts, such as clearing, compacting, or otherwise disturbing vegetation, could occur during construction and maintenance activities. Potential long-term impacts on vegetation would occur where structures are located or where conversion of forested vegetation to low-growing vegetation would be required. Impacts would be localized, and unavoidable.

Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation including but not limited to implementation of the VMP and AIMP. The applicant committed to

working with state and local agencies to coordinate appropriate BMPs for noxious weeds and also committed to implementing integrated vegetation management plans associated with its existing pollinator initiative.

5.9.10.1 Existing Conditions

The DNR and the U.S. Forest Service (USFS) have developed an Ecological Classification System (ECS) for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features (reference (10)). The ECS splits the state of Minnesota into Ecological Provinces, Sections, and Subsections.

Segment 1 is within the Eastern Broadleaf Forest Province. The Eastern Broadleaf Forest Province is characterized as a transition zone between semi-arid portions of Minnesota that were historically prairie and semi-humid mixed coniferous-deciduous forests to the northeast (reference (189)). Within this province, Segment 1 North and Segment 1 South cross the Big Woods and Oak Savanna subsections.

The project crosses the Big Woods subsection. Prior to European settlement, vegetation in the Big Woods subsection consisted of oak woodlands and maple-basswood forest on the irregular ridges, with aspen, bur oak, red oak, and white oak found along the western and other margins of this subsection. At present, the Big Woods subsection is dominated by cropland and pasture, with a small percentage of upland forest and wetland also present (reference (11)).

The project crosses the Oak Savanna subsection. Prior to European Settlement, vegetation in the Oak Savanna subsection consisted of bur oak savanna, with areas of tallgrass prairie and maple-basswood forest. Bur oak savanna was found on rolling moraine ridges at the western edge of the subsection and in dissected ravines at the eastern edge. Tallgrass prairie was concentrated on gently rolling portions of the landscape, in the center of the subsection. Maple-basswood forest was found in steep, dissected ravines or where stream orientation reduced fire frequency or severity. At present, the subsection is dominated by agricultural vegetation, with urban development accelerating along the northern boundary (reference (12)).

In general, the vegetation resources across the project are dominated by agricultural vegetation and crops, including grain, soybeans, hay/haylage, sweet corn, corn for silage, green peas, corn for grain, and oats for grain (Section 5.7.1). Map 8 provides an overview of landcover types according to the National Landcover Database (NLCD) across Segment 1, and Table 5-25 summarizes the landcover types within the ROW of Segment 1 North and Segment 1 South. The NLCD is derived from Landsat imagery along with various other data sources. As such, it provides only an approximation of existing landcover types.

Natural vegetation, forested and grassy wind breaks, scattered woodlots, drainage ditches, and large grassland pastures regularly disturbed by grazing cattle are scattered throughout both Segment 1 North and Segment 1 South. Agricultural land makes up most of the landcover in the ROW of Segment 1 North (70 percent). The landcover for Segment 1 South is mostly agricultural (53 percent) and developed land

(37 percent). Based on the NLCD data, the ROW of Segment 1 North is approximately 10 percent forested, while the ROW of Segment 1 South is approximately 4 percent forested.

Developed land areas with the ROI include rural existing roadways, residential lots, and businesses concentrated around the cities of Mankato, Madison Lake, Elysian, Waterville, and Morristown.

Table 5-25 Landcover Types within the ROW of Segment 1 North and Segment 1 South

Landcover Type	Segment 1 North		Segment 1 South	
Agricultural (cultivated crops and hay/pasture)	534.9 acres	70%	458 acres	53%
Barren Land (rock/sand/clay)	0.4 acres	<1%	1.2 acres	<1%
Developed (low-high intensity; open space)	95.2 acres	12%	324.6 acres	37%
Forest (upland and wetland)	73.2 acres	10%	33.1 acres	4%
Herbaceous (upland and wetland)	58.6 acres	8%	48.1 acres	6%
Open Water	2.6 acres	<1%	1.6 acres	<1%
Shrub/Scrub (upland and wetland)	1.6 acres	<1%	0	0
Total acres	766.5 acres		866.4 acres	

5.9.10.2 Potential Impacts

Impacts to landcover associated with the project would primarily be associated with ROW clearing within rangeland and agricultural areas. Construction of the project would result in short-term impacts on existing vegetation, including localized physical disturbance and soil compaction. 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. These impacts to low growing vegetation would be temporary, having the ability to regrow after construction. Vegetation would be permanently removed where structures and foundations would be installed. Construction would also result in long-term impacts to vegetation by permanently removing high growing and forested vegetation within the ROW where present; the ROW would be maintained with low-growing vegetation during operations. The clearing of trees and tall vegetation is required for the construction, maintenance, and safe operation of the project.

Construction and maintenance activities have the potential to result in the introduction or spread of noxious weeds and other non-native species. Noxious weeds, which are regulated under Minnesota Statute 18, can be introduced to new areas through propagating material like roots or seeds transported by contaminated construction equipment. Activities that could potentially lead to the introduction of noxious weeds and other non-native species include ground disturbance that leaves soils exposed for extended periods, introduction of topsoil contaminated with weed seeds, vehicles importing weed seed, and conversion of landscape type, particularly from forested to open settings. Noxious weeds establish more quickly on disturbed soil surfaces than native vegetation and in turn displace existing native land cover without proper controls in place.

Segment 1 North's ROI includes more NLCD-mapped forested land cover than Segment 1 South. However, most of Segment 1 North could be double-circuited and the forested vegetation within the existing ROW would already be cleared and maintained. These areas of forest have generally already been fragmented. Conversion from forest to open habitats in the ROW could have impacts on native vegetation by altering environmental conditions, such as light penetration; this could alter the vegetation community adjacent to the ROW and increase the potential spread of noxious weeds and other non-native species.

5.9.10.3 Mitigation

Mitigation and minimization measures for potential impacts to vegetation resources are standard Commission route permit conditions (Sections 5.3.10, 5.3.11, 5.3.12, and 5.3.13 of Appendix H) and include the following:

- Minimize number of trees to be removed in selecting the ROW, specifically preserving to the maximum extent practicable windbreaks, shelterbelts, living snow fences, and vegetation in areas such as trail and stream crossings where vegetative screening could minimize aesthetic impacts.
- Remove tall growing species located within the transmission line ROW that endanger the safe and reliable operation of the transmission line. Leave undisturbed, to the extent possible, existing low growing species in the ROW or replant such species in ROW to blend the difference between the ROW and adjacent areas, to the extent that the low growing vegetation that will not pose a threat to the transmission line or impede construction.
- Employ BMPs to avoid the potential introduction and spread of invasive species on lands disturbed by construction activities. Develop an Invasive Species Prevention Plan and file with the Commission prior to construction.
- Take all precautions against the spread of noxious weeds during construction. Site appropriate seed certified to be free of noxious weeds should be used and to the extent possible, native seed mixes should be used.
- Restrict pesticide use to those pesticides and methods of application approved by the Minnesota Department of Agriculture, DNR, and the U.S. EPA. Selective foliage or basal application shall be used when practicable.

As summarized in the joint certificate of need application and route permit application, the applicant has committed to the following measures as the primary means to mitigate impacts to vegetation and minimize the potential for the introduction or spread of noxious weeds and invasive species:

- Limiting vehicle traffic to roads and pathways along the proposed ROW and within previously disturbed areas to the extent practicable
- Restricting equipment to narrow paths within the proposed ROW
- Spanning areas of sensitive vegetation

- Installing the line as a double circuit with an existing transmission line where possible
- Routing parallel or adjacent to existing rights-of-way, such that tree removal is minimized

The applicant committed to working with the state and counties crossed by the project to identify where noxious weeds may be present and develop appropriate BMPs to minimize impacts. The applicant would implement a vegetation management plan to mitigate impacts and restore lands impacted by construction, as provided in the applicant's route permit application. Furthermore, the applicant committed to implementing integrated vegetation management plans associated with its existing pollinator initiative, created to enhance pollinator habitat. The plans minimize chemical use by avoiding broadcast applications and employing spot treatments for control of invasive species.

5.9.11 Wetlands

The ROI for wetlands is the ROW. Impacts to wetlands were evaluated by examining wetland type, size, and potential for spanning. There are more acres of wetlands within Segment 1 North's ROI compared to Segment 1 South, however most of Segment 1 North would be constructed where there is already an existing transmission line ROW present. Less clearing within forested wetlands would be required for Segment 1 North compared to Segment 1 South.

Localized direct impacts to wetlands would include vegetation clearing, movement of soils, and construction traffic which could alter or impair wetland functions. Forested wetlands would be subject to long-term impacts given their conversion to non-forested wetlands. Wetland crossings longer than 1,000 feet might require one or more structures to be placed in the wetland, resulting in small, localized permanent wetland impacts.

Impacts can be minimized using BMPs. Wetland impacts would be regulated and could require permits. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW, moving the anticipated alignment to a least impactful alignment within the route width, or minimizing clearing required in forested wetlands by selecting a route with an existing ROW where the project could be double-circuited.

5.9.11.1 Existing Conditions

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

Minnesota also has state-level regulations focused on protecting wetlands. The Minnesota Wetland Conservation Act (WCA) (Minnesota Rules 8420) is administered by the BWSR under Minnesota Rules 8420.0100, subpart 3, 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 (1) avoid disturbing the wetland if feasible, (2) minimize wetland impacts, and (3) replace lost wetland acres, functions, and values. Certain activities are exempt from the WCA, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation.

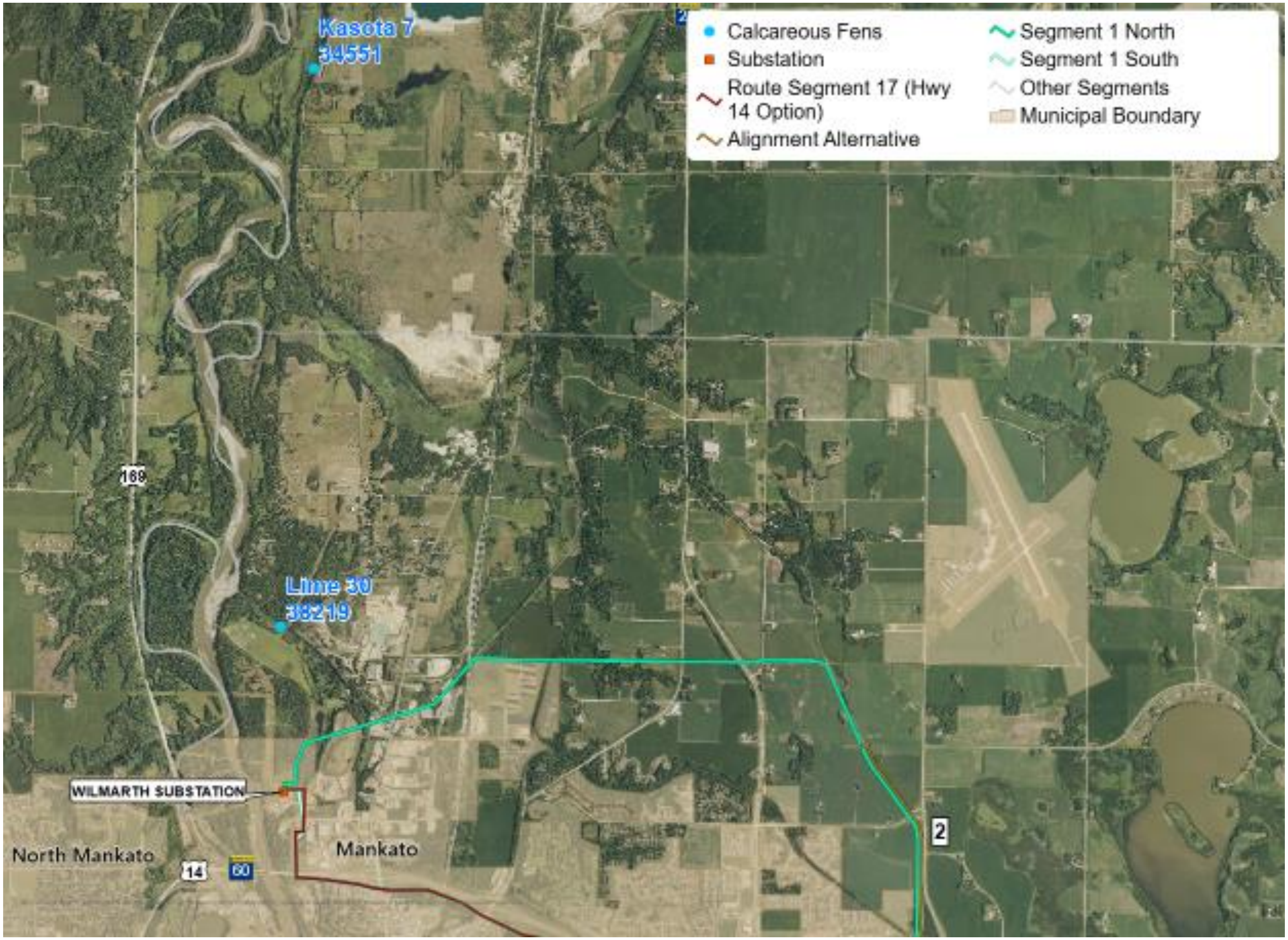
A second state-level program that offers protection to the state's waters and wetlands is the PWI program administered by the DNR (Minnesota Statute § 103G.005). The DNR regulates work below the ordinary high-water level of PWI wetlands and waters through the public waters work permit program. Examples of work activities addressed by this program include filling, excavation, bridges and culverts, dredging, structures, and other construction activities.

Wetlands are areas with hydric (wetland) soils, hydrophytic (water-loving) vegetation, and wetland hydrology (inundated or saturated much of the year). Wetlands detain floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. Wetland types vary widely due to differences in topography, soils, hydrology, vegetation, water chemistry, climate, and other factors.

Calcareous fens are rare and distinctive peat-accumulating wetlands that receive groundwater rich in calcium and other minerals. The Wetlands Conservation Act (WCA), authorized by Minnesota Statute Section 103G.223, states that calcareous fens may not be filled, drained, or otherwise degraded, wholly or partially, by any activity, except as provided for in a management plan approved by the commissioner of the DNR. The DNR regulates calcareous fens under Minnesota Rules 8420.0935.

The USFWS National Wetlands Inventory (NWI), as updated by the DNR, identifies wetland complexes and isolated wetlands within the ROI of Segment 1 North and Segment 1 South (Map 9). Wetland types in Segment 1 generally include seasonally flooded wetlands, wet meadows, shallow marshes, deep marshes, shallow open water, shrub swamps, wooded swamps, bogs, and riverine wetlands. As shown on Map 9, wetlands in the route width are mostly non-forested. PWI wetlands are present within the ROI of segment 1 North and Segment 1 South. Two calcareous fens (Lime 30 and Kasota 7 sites) are located approximately 1 mile and 4.5 miles north of the Wilmarth Substation, respectively (Figure 5-12) (reference (190)).

Figure 5-12 Location of Lime 30 and Kasota 7 Calcareous Fens



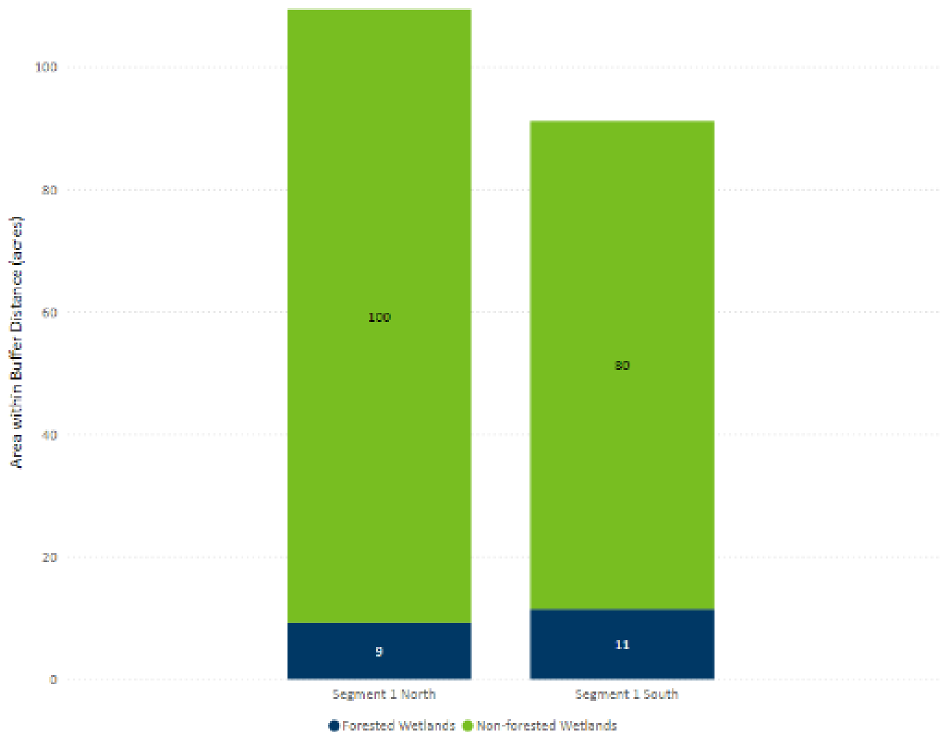
5.9.11.2 Potential Impacts

The proposed transmission line could temporarily or permanently impact wetlands if they cannot be avoided during project design. Construction of transmission line structures typically includes vegetation clearing, movement of soils, and construction traffic. These activities could alter or impair wetland functions. Even small changes in hydrology (for example, periods of inundation, changes in flow, and sedimentation) can impair wetland function. Any wetland that would receive permanent transmission line infrastructure would also be impacted long term during operation of the project due to equipment access through the wetland for maintenance.

Transmission lines cannot be safely or reliably operated with trees growing within the ROW. As such, existing trees must be removed throughout the ROW, including forested wetlands. Forested wetlands within any new transmission line ROW would likely undergo a permanent change in wetland/vegetation type. Wetlands can also be impacted by soil erosion and sediment deposition during construction. Sedimentation and ground disturbance in wetlands can make them more susceptible to the establishment of invasive plant species, such as reed canary grass, which would adversely impact wetland function by reducing vegetative biodiversity and altering wildlife habitat.

Segment 1 North’s ROI has more acres of wetland than Segment 1 South (Figure 5-13). Segment 1 North’s ROI and Segment 1 South’s ROI have a similar acreage of forested wetlands subject to wetland type conversion (Figure 5-13). Given that approximately 96 percent of Segment 1 North could be double-circuited with existing transmission lines, forested wetlands within the existing ROW have been cleared. Less clearing within forested wetlands would be required for Segment 1 North compared to Segment 1 South.

Figure 5-13 Wetlands within ROW of Segment 1 North and Segment 1 South



In most cases, wetlands can be spanned to avoid placing structures within them. However, wetland crossings longer than 1,000 feet might require one or more structures to be placed within the wetland. Segment 1 North and Segment 1 South's anticipated alignments would cross wetlands wider than 1,000 feet and could therefore require pole placement within the wetlands. In nearly all cases, these locations would occur where the project could be double-circuited and existing ROW is present. In total, Segment 1 North crosses seven wetlands/PWI basins exceeding 1,000 feet and Segment 1 South crosses six wetlands/PWI basins exceeding 1,000 feet.

Segment 1 South's anticipated alignment would cross a wetland wider than 1,000 feet where an existing transmission line is not present and where the wetland is adjacent to Waterville Creek, a public watercourse (Map 9–3).

In its Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR noted that many of the unique characteristics of calcareous fens result from the upwelling of groundwater through calcareous substrates. Because of this dependence on groundwater hydrology, calcareous fens can be affected by nearby activities or even those several miles away. Activities that affect surface water flows (e.g., stormwater flow, erosion) or activities that affect groundwater hydrology (e.g., groundwater pumping, contamination, discharge, or excavation) can impact calcareous fens.

5.9.11.3 Mitigation

Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width.

The sample route permit (Section 5.3.9 of Appendix H) includes the following measures to mitigate impacts to wetlands:

- Develop wetland impact avoidance measures and implement them during construction of the project.
- Space and place the structures at variable distances to span and avoid wetlands.
- Limit unavoidable wetland impacts as a result of the placement of structures to the immediate area around the structures.
- Construct in wetland areas during frozen ground conditions where practicable and according to permit requirements by the applicable permitting authority.
- Use wooden or composite mats to protect wetland vegetation when construction during winter is not possible.
- Contain soil excavated from the wetlands and not place it back into the wetland.
- Access wetlands using the shortest route possible in order to minimize travel through wetland areas and prevent unnecessary impacts.
- Do not place staging or stringing set up areas within or adjacent to wetlands, as practicable.
- Assemble structures on upland areas before they are brought to the site for installation.
- Restore wetland areas disturbed by construction activities to pre-construction conditions in accordance with the requirements of applicable state and federal permits or laws and landowner agreements.
- Meet the USACE, DNR, Minnesota BWSR, and local units of government wetland requirements.

In order to avoid impacting or altering the Lime 30 fen and Kasota 7 fen, the applicant could obtain a no effect concurrence decision from the DNR prior to construction, given Segment 1’s proximity within 5 miles of the fens. If the DNR determines the no effect concurrence to be required, the applicant would need to demonstrate that any temporary or permanent disturbance from any project-related activities, including dewatering (amount, timing, and duration), is avoided. In their Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR noted to ensure compliance with WCA, the applicant would be required to contact the Calcareous Fen Program Coordinator for further coordination. If, through further coordination, the DNR determines if any impacts to the fen would occur during any phase of the project, the applicant could be required to develop a Calcareous Fen Management Plan in coordination with the DNR, as specified in Minnesota Statute § 103G.223. A special condition could be added to the route permit to direct the applicant to coordinate with DNR to ensure an appropriate plan and protections are in place.

5.9.12 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width. Impacts to wildlife and wildlife habitat are assessed both by considering wildlife inhabiting the ROI as well as assessing the presence of potential habitat for wildlife within the ROI, including areas that are preserved or managed for wildlife. Potential short-term, localized impacts to wildlife could occur from displacement during construction or maintenance activities. Potential long-term impacts could occur as a result to habitat loss, conversion, or fragmentation.

Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife and associated habitat. The primary means for mitigating impacts to wildlife or associated habitat is to avoid areas known to contain high-quality habitat or which serve as migratory corridors. Use of existing rights-of-way can minimize habitat loss and fragmentation. Impacts to wildlife can also be minimized by spanning habitats and minimizing the number of structures in high-quality habitat through the use of specialty structures.

5.9.12.1 Existing Conditions

Wildlife inhabiting the ROI are typical of those found in disturbed habitats associated with agriculture and rural and suburban development. Watercourses and waterbodies and areas of natural vegetation, such as wetlands, forested areas, and open herbaceous areas, also provide habitat for wildlife in the area. Wildlife species inhabiting the ROI are generally adapted to disturbance associated with agricultural activities and human settlement. Typical species include mammals such as deer, fox, squirrels, coyote, and racoons; songbirds, such as robins and red-winged blackbirds; waterfowl, such as eagles and wood ducks; reptiles, such as snakes and turtles; amphibians, such as toads and frogs; and aquatic biota, such as fish and mussels.

The state of Minnesota is in the Mississippi Flyway of North America. The Mississippi Flyway is a bird migration route that encompasses the Great Plains of the U.S. and Canada. Migratory birds use portions of the Mississippi Flyway as resting grounds during spring and fall migration, as well as breeding and nesting grounds throughout the summer. Suitable habitat for migratory birds is present throughout Segment 1.

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

Minnesota is home to over 2,000 known native wildlife species, and over 300 of these species have been identified as Species in Greatest Conservation Need (SGCN) because they are rare, their populations are declining, or they face serious threats that can cause them to decline, and thus have populations below levels desirable to promote their long-term health and stability. Minnesota's Wildlife Action Plan 2015-2025 includes a habitat approach, which focuses on sustaining and enhancing terrestrial and aquatic habitats for SGCN in the context of the larger landscapes (reference (191)). The Wildlife Action Plan lays out the basis for the long-term vision of a Wildlife Action Network composed of terrestrial and aquatic habitat cores and ROWs to support biological diversity and ecosystem resilience with a focus on SGCN. As shown on Map 20, several Wildlife Action Network corridors are scattered throughout Segment 1 and are crossed by the ROI for Segment 1 North and Segment 1 South. The Wildlife Action Network is a metric that can be used to assess buffers and connectors of habitats representing the diversity of habitat quality, supporting SGCN. As detailed by the DNR, "Consideration should be given to projects or activities that could result in the loss, degradation or fragmentation of habitat within the Wildlife Action Network, as habitat loss was identified as a substantial contributor to SGCN population declines" (reference (191)).

Several lands that are preserved or managed for wildlife and associated habitat are scattered throughout Segment 1, including DNR Wildlife Management Areas (WMAs), DNR state game refuges, USFWS Grassland Bird Conservation Areas (GBCAs), National Audubon Society Important Bird Areas (IBAs), USFWS Waterfowl Production Areas, DNR-designated shallow wildlife lakes, and DNR AMAs; these areas are shown on Map 20.

The DNR manages over one million acres of land as WMAs to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses (reference (192)). Several WMAs intersect the ROI for Segment 1 North and/or Segment 1 South, including the Cannon River WMA, Dove Lake WMA, Earl Swain WMA, and Gilfillan Lake WMA Map 20.

DNR state game refuges are established to protect and preserve natural habitat and game populations (reference (193)). The western extents of the Segment 1 North and Segment 1 South ROIs intersect the East Minnesota River Game Refuge (Map 20–1).

The USFWS designates GBCAs priority areas for grassland protection and enhancement that are thought to provide suitable habitat for many or all priority grassland bird species in tall grass prairie. Several GBCAs intersect the ROI for Segment 1 North and Segment 1 South (Map 20).

The National Audubon Society works to identify, monitor, and protect habitat for bird species throughout the U.S., in part by designating sites as IBAs; these areas are designated when they meet certain criteria related to providing habitat for vulnerable species (reference (194)). The Upper Minnesota River Valley IBA intersects the ROI for both Segment 1 North and Segment 1 South (Map 20).

The USFWS established Waterfowl Production Areas to conserve some of the most threatened and productive migratory bird habitat in the country (reference (195)). The Preuss Waterfowl Production

Area intersects the ROI for Segment 1 North (Map 20–3). No other Waterfowl Production Areas are located within the vicinity of the project.

There are over 5,000 shallow lakes that are greater than 50 acres in size in the state of Minnesota; these shallow lakes serve as important habitat to wildlife species (reference (188)). Several shallow lakes are scattered across Segment 1. The DNR Shallow Lakes Program designates certain shallow lakes as shallow wildlife lakes; this designation allows them to protect and enhance wildlife habitat on these larger lakes (reference (196)). A DNR designated shallow wildlife lake (Eagle Lake) intersects the ROI for Segment 1 North and Segment 1 South (Map 20–1).

The DNR establishes AMAs to protect, develop, and manage lakes, rivers, streams, and adjacent wetlands and lands that are critical for fish and other aquatic life, for water quality, and for their intrinsic biological value, public fishing, or other compatible outdoor recreational uses (reference (197)). Several AMAs are located within the vicinity of Segment 1. However, as shown on Map 20–3, the only AMA to intersect the ROI in Segment 1 is the Tetonka Lake AMA, which intersects the ROI for Segment 1 North.

In addition to the lands that are preserved or managed for wildlife, there are several sensitive ecological resources, such as native plant communities, that would also provide habitat for wildlife; these resources are discussed in Section 5.9.7.1.

5.9.12.2 Potential Impacts

5.9.12.2.1 General Wildlife Impacts

Construction activities that generate noise, dust, or disturbance of habitat could result in short-term, indirect impacts on wildlife. During project construction, wildlife would generally be displaced within and adjacent to the ROW. Clearing and grading activities could also affect birds' eggs or nestlings and small mammals that might be unable to avoid equipment. Many wildlife species would likely avoid the immediate area during construction and possibly not return following construction; the distance that animals would be displaced depends on the species and the tolerance level of each animal. However, comparable habitat is available adjacent to the project.

Construction of the project could result in long-term adverse impacts on wildlife due to loss, conversion, or fragmentation of habitat, particularly areas that are preserved and/or managed for wildlife. The route widths and rights-of-way of both Segment 1 North and Segment 1 South would intersect areas preserved or managed for wildlife, as summarized in Table 5-26 and shown on Map 20.

As discussed in Section 5.4, 96 percent of Segment 1 North could be double-circuited with an existing 115 kV line and 69 percent of Segment 1 South could be double-circuited with existing 69 kV or 115 kV line. Additional areas of each segment would parallel existing road rights-of-way. In areas where Segment 1 North or Segment 1 South could be double-circuited with an existing transmission line and/or where the segments would parallel existing ROW, impacts to wildlife and associated habitat would be minimized because habitat fragmentation has already occurred in these areas.

Table 5-26 Wildlife Resources within the Route Width and ROW of Segment 1 North and Segment 1 South

Resource	Units	Segment 1 North		Segment 1 South	
		Route width	ROW	Route width	ROW
Wildlife Management Areas	Acres	64	9	55	6
Important Bird Areas	Acres	42	4	11	0
Grassland Bird Conservation Areas	Acres	2,412	364	2,459	368
Designated Shallow Wildlife Lakes	Count	1	1	1	1
Aquatic Management Areas	Count	1	1	0	0
State Game Refuge	Acres	127	17	52	5
Waterfowl Production Area	Acres	<1	0	0	0
Wildlife Action Network corridors	High or medium-high rank (acres)	101	9	52	2
	Medium rank (acres)	545	87	201	32
	Low or medium-low rank (acres)	171	25	72	10
	Total acres	816	121	325	44

The route width and ROW of Segment 1 North would intersect more acreage of WMAs and the East Minnesota River Game Refuge relative to Segment 1 South. However, where the rights-of-way of both segments would intersect WMAs and the state game refuge, they would do so in areas where they could be double-circuited with an existing transmission line.

The route widths and ROWs of both Segment 1 North and Segment 1 South would intersect GBCAs and would mostly do so in areas that could be double-circuited or in areas where existing transmission lines are present. The route widths of Segment 1 North and Segment 1 South would both intersect the Upper Minnesota River Valley IBA. Segment 1 South would minimize impacts to the IBA because its ROW does not intersect it, while the ROW of Segment 1 North intersects the southeastern edge of the IBA.

The route width of Segment 1 North would intersect less than an acre of the southeastern extent of the Preuss Waterfowl Production Area; however, its ROW does not intersect it. Segment 1 South avoids the Waterfowl Production Area.

Segment 1 North and Segment 1 South would both cross Eagle Lake, a DNR designated shallow wildlife Lake, in an area that could be double-circuited. The ROW of Segment 1 North would intersect the edge of the Tetonka Lake AMA in an area where the line could be double-circuited; Segment 1 South avoids the AMA.

The route width and ROW of both Segment 1 North and Segment 1 South would intersect several Wildlife Action Network corridors. Segment 1 North would intersect more acreage of Wildlife Action Network corridors relative to Segment 1 South. However, impacts would be minimized, as the locations where the ROW and/or anticipated alignment of either Segment 1 North or Segment 1 South intersects corridors occur in areas that could be double-circuited with an existing transmission line.

5.9.12.2.2 Avian Impacts

Potential impacts to avian species (for example, songbirds, raptors, and waterfowl) could occur due to electrocution and collision with transmission line conductors. Electrocution occurs when an arc is created by contact between a bird and energized lines or an energized line and grounded structure equipment. Electrocution occurs more frequently with larger bird species, such as hawks, because they have wider wingspans that are more likely to create contact with the conductors.

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

As discussed above, impacts to wildlife and associated habitat would be minimized by double-circuiting with existing transmission lines for 96 percent of Segment 1 North and 69 percent of Segment 1 South. However, the incidence of birds colliding with transmission lines is influenced by the number of horizontal planes in which the conductors are strung. Stringing the conductors in a single horizontal plane presents less of a barrier to birds crossing the transmission line ROW. The proposed double-circuiting for both Segment 1 North and Segment 1 South would require adding another horizontal plane to the transmission line, which could increase potential impacts to avian species.

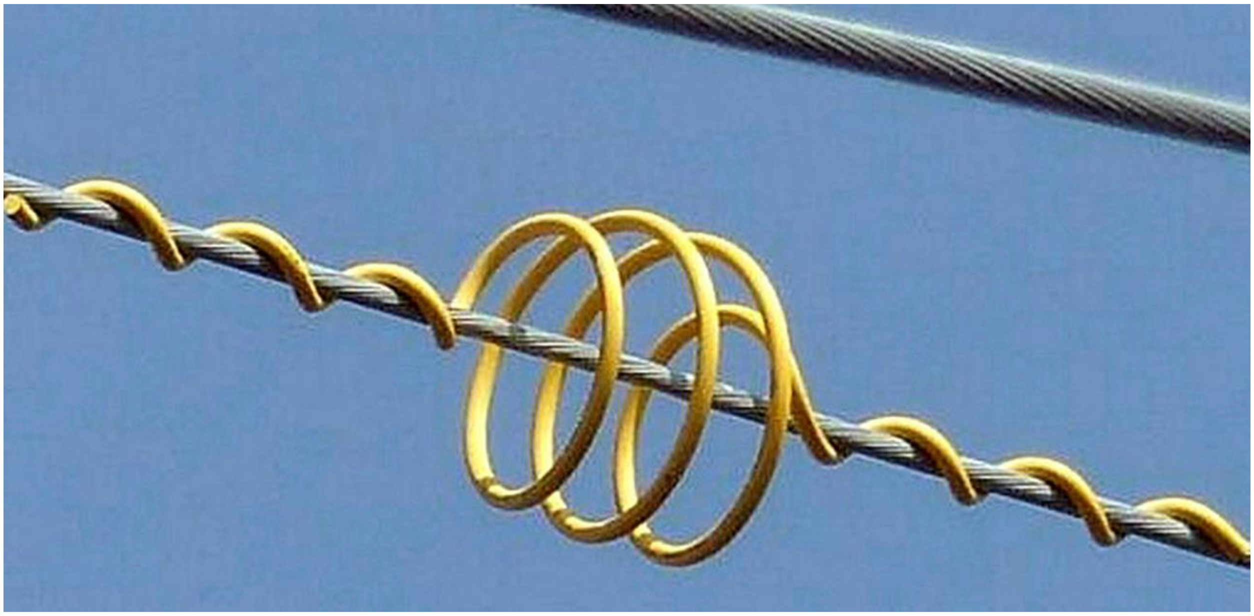
5.9.12.3 Mitigation

Potential impacts to wildlife and wildlife habitat can often be minimized or mitigated through several strategies. The primary strategy for mitigating impacts is to select route alternatives away from areas known to contain high-quality habitat or which serve as migratory corridors. Use of existing rights-of-way can minimize habitat loss and fragmentation. Impacts to wildlife can also be minimized by spanning habitats and minimizing the number of structures in high-quality habitat through the use of specialty structures.

Mitigation and minimization measures for potential impacts to avian species, including federally and/or state-protected avian species, are standard Commission route permit conditions. As noted in Appendix H, as part of the Commission’s route permit, the applicant, in cooperation with the DNR, would need to identify areas of the transmission line where bird flight diverters would be incorporated into the transmission line design to prevent large avian collisions attributed to visibility issues. A typical bird flight diverter installation is shown in Figure 5-14. In addition, standard transmission design would need to incorporate adequate spacing of conductors and grounding devices in accordance with Avian Power Line Interaction Committee standards to eliminate the risk of electrocution to raptors with larger wingspans that could simultaneously come in contact with a conductor and grounding devices.

As discussed in Section 5.9.10.3, there are several standard Commission route permit conditions to mitigate or minimization potential impacts to vegetation resources; these standard route permit conditions would also be applicable to mitigating and minimizing potential impacts to wildlife habitat.

Figure 5-14 Typical Bird Flight Diverter



As summarized in its route permit application, the applicant has committed to the following measures to minimize the potential for impacts to wildlife and wildlife habitat:

- Designing the route to avoid wildlife habitat identified to the extent possible during a constraints analysis completed during the routing process.
- Implementation of specific BMPs for protected species that would also be beneficial to wildlife in general; these are discussed in Section 5.9.7.3.
- Coordinating with the DNR and/or USFWS to identify wildlife migration pathways, particularly avian flyways crossed by the route alternatives and to identify areas where transmission lines should be marked to minimize avian interactions.

Currently, the state of Minnesota does not track locations of bald eagles or their nests, and the USFWS does not have any public data available on eagle nests. The DNR is in the process of developing a database of eagle nest locations; however, it is not currently available. The DNR suggests reporting any eagle sightings on eBird (https://ebird.org/home); these reports will ultimately become part of the DNR's eagle database.

The USFWS bald eagle management guidelines indicate that activities within 660 feet of an active nest and occur within line of sight of the nesting location might have the potential to disturb nesting bald eagles (reference (198)). Impacts to bald eagles could be minimized by conducting a visual inspection for bald eagle nests not more than two weeks prior to the start of construction, if work will occur during the active nesting period for bald eagles (January 15th – July 31st). If an active nest is observed and if construction would need to take place during the time that the nest remains active, consultation with the USFWS would need to occur to determine the appropriate next steps. Under such a circumstance, a variety of options are available, including the presence of a biological monitor to observe and determine if project activities are resulting in disturbance, a shift in project schedule to avoid the active nesting season, or a submittal for an incidental take permit that would allow work to proceed even if it is likely to result in disturbance.

As summarized in their joint certificate of need application and route permit application, the applicant has committed to continuing coordination with the USFWS regarding the 2024 revised regulations for the issuance of permits for eagle incidental take and eagle nest take (Permits for Incidental Take of Eagles and Eagle Nests, 50 Code of Federal Regulations CFR, Parts 13 and 22, 2024).

5.10 Electric System Reliability

In the joint certificate of need application and route permit application, the applicant summarized MISO's reliability analysis findings and noted that the applicant completed their own examination of system reliability improvements yielded by the project. Reliability analyses studied all NERC contingency categories (P1-P7). These analyses support the purpose and need of the project.

The purpose of the project, as also discussed in Section 4.1, is to construct an HVTL to provide additional transmission capacity to reduce congestion and to improve electric system reliability throughout the region as more renewable energy resources are added to the high-voltage transmission system. The project would provide additional transmission capacity that is needed to mitigate current capacity issues and as part of the LRTP Tranche 1 Portfolio, would address reliability violations as defined by the NERC at over 300 different sites across the Midwest. The project would increase transfer capability across the MISO Midwest subregion to allow reliability to be maintained for all hours under varying dispatch patterns driven by differences in weather conditions.

The joint certificate of need application and route permit application discussed that the existing 230 kV transmission system in eastern North Dakota and South Dakota plays a key role in transporting and delivering energy to customers in Minnesota, but the existing 230 kV system is currently at its capacity. The project, as part of LRTP Tranche 1, would provide a new 345 kV transmission line, which is designed to provide additional transmission capacity to mitigate current capacity issues on the existing 230 kV transmission system and to improve electric system reliability as more renewable energy resources are added throughout the region.

The applicant designed the project with the intent of meeting the project's electric system reliability needs. Reliability was also considered by the applicant in their alternatives analysis.

5.11 Costs that are Dependent on Design and Route

The applicant's overall project costs, as presented in the joint certificate of need application and route permit application and discussed in Section 3.5, are based on high and low-cost estimates of the project as a whole, and do not distinguish between the individual route segments and alternatives. The transmission line is expected to cost approximately $3.7 million per mile. The estimated project construction cost at the time of the application was between $524.7 million and $577.2 million. Also as discussed in Section 3.5, since the filing of the joint certificate of need application and route permit application, the applicant has updated this range of project costs to include alternatives, and the updated estimated cost is between $436.8 million and $583.8 million.

Construction cost estimates rely on the best available information at the time of the estimate. Estimates include (1) transmission line structures and materials; (2) transmission line construction and restoration; (3) transmission line and substation permitting and design; (4) transmission line ROW acquisition; and (5) substation materials, substation land acquisition, and construction. The cost estimates assume the applicant would pay prevailing wages for applicable positions during project construction.

The following variables were considered when estimating project costs:

- Unexpected weather conditions
- Environmental sensitivities resulting in the need for mitigation measures
- Poor soil conditions in areas where no data was obtained
- Transmission line outage constraints
- Potential shallow bedrock
- River crossings
- Labor shortages
- Market fluctuations in material pricing and availability
- Labor costs

These cost estimates could increase over time for any number of reasons such as, but not limited to escalation, inflation and commodity pricing, especially for these types of large-scale 345 kV transmission projects that have multi-year schedules.

5.12 Segment 1 Relative Merits

The Commission is charged with locating transmission lines in a manner that is "compatible with environmental preservation and the efficient use of resources" and that minimizes "adverse human and environmental impact(s)" while ensuring electric power reliability per Minnesota Statute § 216E.02. Minnesota Statute §216E.03, subdivision 7(b) identifies considerations that the Commission must consider when designating transmission lines routes. These considerations are further clarified and expanded by Minnesota Rule 7850.4100, which identifies the following 14 factors the Commission must consider when making a transmission line route permit decision:

A. effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services;
B. effects on public health and safety;
C. effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining;
D. effects on archaeological and historic resources;
E. effects on the natural environment, including effects on air and water quality resources and flora and fauna;
F. effects on rare and unique natural resources;
G. application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity
H. use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries;
I. use of existing large electric power generating plant sites;
J. use of existing transportation, pipeline, and electrical transmission systems or rights-of-way;
K. electrical system reliability;
L. costs of constructing, operating, and maintaining the facility which are dependent on design and route;
M. adverse human and natural environmental effects which cannot be avoided; and
N. irreversible and irretrievable commitments of resources.

These routing factors are used to conduct a relative merits analysis of Segment 1 North and Segment 1 South with the exception of some elements of resource categories that are considered to have minimal impacts that might not vary significantly and/or the routing factors are not applicable. These include:

- Impacts on human settlements (factor A)— cultural values, environmental justice, noise, property values, socioeconomics, transportation, and public services.
- Impacts on public health and safety (factor B)—EMF, implantable medical devices, stray voltage, public and worker safety, stray voltage, induced voltage, and electronic interference.
- Impacts on the natural environment (factor E) – air quality, climate, geology and topography, floodplains, groundwater, and soils.

With respect to routing factor G, it is assumed that Segment 1 North and Segment 1 South are equal with regard to maximizing energy efficiencies and accommodating expansion of transmission capacity. With respect to environmental impacts, the examination of such impacts suggested by routing factor G is included in the discussion of other routing factors and elements that more specifically address an environmental impact (for example, effects on vegetation and wildlife, routing factor E, or rare and unique natural resources, routing factor F).

Routing factor I, the use of existing large electric power generating plant sites, is not relevant to this project and is not discussed further.

Routing factors M and N— the unavoidable and irreversible impacts of the project—are discussed in Chapter 12.

A relative merits analysis was completed to compare Segment 1 North and Segment 1 South using these routing factors. The analysis uses graphics (Table 5-27) to provide a visual assessment of the relative merits for each route segment. The graphic for a specific routing factor or element is not meant to be indicative of the “best” route segment but is provided as a relative comparison to be evaluated together with all other routing factors. For routing factors where impacts are anticipated to vary, the graphic represents the magnitude of anticipated difference between these anticipated impacts and compares them across the different route options with a given region. For routing factors that express the state of Minnesota’s interest in the efficient use of resources (for example, the use and paralleling of existing rights-of-way), the graphic represents the consistency of the route alternative with these interests and compares them to each other. Table 5-28 summarizes the relative merits analysis for Segment 1.

Table 5-27 Guide to Relative Merits Analysis

Consistency with Routing Factor or Anticipated Impacts	Symbol
Segment option is consistent with the routing factor OR Impacts are anticipated to be negligible to minimal or the impact is positive	
Segment option is consistent with routing factor but less so than the other options OR Impacts are anticipated to be minimal but the potential for impacts is greater than the other options or require special permit conditions OR Impacts are anticipated to be moderate	
Route is not consistent with routing factor or consistent only in part OR Impacts might be moderate but the potential for impacts is greater than the other options or might require special permit conditions OR Impacts are anticipated to be significant	

Table 5-28 Relative Merits of Segment 1 North and Segment 1 South

Routing Factor / Resource	Segment 1 North	Segment 1 South	Summary
Factor A Human Settlement			
Aesthetics	◒	○	Aesthetic impacts are anticipated to be moderate for Segment 1 North and significant for Segment 1 South. Segment 1 North has less residences within the ROW, route width, and local vicinity (with a total of 154 residences within the local vicinity compared to 323). It also has less non-residential structures within the local vicinity. Segment 1 North and Segment 1 South would result in aesthetic impacts to areas used for recreational purposes, however both segments would almost always be double-circuited where potential impacts would occur. Segment 1 South would result in one new crossing location and associated aesthetic impacts to the Sakatah Singing Hills State Trail where its anticipated alignment crosses the trail east of Madison Lake. Segment 1 North could be double-circuited with existing transmission lines for 96% of its length and 100% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads). Segment 1 South could be double-circuited with existing transmission lines for 69% of its length and 86% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads).
Displacement	◒	○	Segment 1 South has 11 residences that could be subject to displacement; however, the applicant has indicated no residences would be displaced. Segment 1 North does not contain any residences with the ROW. Segment 1 South has 11 non-residential residential structures, and Segment 1 North has 4 non-residential structures that could be subject to displacement.
Land Use and Zoning	◒	◒	Two known areas of future development were noted during scoping and would be subject to impacts from either Segment 1 North or Segment 1 South. Impacts could be avoided and/or mitigated with alternatives (i.e., Alternative Alignment 2 [Section 5.13.3] and Route Segment 5 [Section 5.14.2]). During scoping, comments were received from city of Madison Lake expressing concern about potential impacts the project would have on future growth.
Recreation	●	◒	Recreational resources within the ROI include local parks, a publicly accessible trail system (Sakatah Singing Hills State Trail), public watercourses (including a designated state water trail and wild and scenic river), and snowmobile trails. The project also crosses a scenic byway. Intermittent impacts would occur during construction and long-term impacts would include aesthetic impacts (discussed above). Segment 1 North and Segment 1 South would both impact the aesthetic viewshed and cross the Sakatah Singing Hills State Trail; however, Segment 1 South is parallel to the trail for a greater distance (6.3 miles versus 4.2 miles) and includes a crossing where existing transmission lines are not present. The Cannon River is a state water trail and wild and scenic river and is located within the ROI of Segment 1 North, and not within the ROI of Segment 1 South. Where the anticipated alignment of Segment 1 North crosses the Cannon River, existing transmission lines are present. Impacts to the Cannon River are anticipated to be minimal.
Factor C Land-Based Economies			
Agriculture	●	●	Most land within the route width is agricultural (72% of Segment 1 North and 69% of Segment 1 South) and impacts cannot be avoided but can be mitigated. Prudent routing (e.g., ROW sharing via double-circuiting or paralleling with existing infrastructure) could help minimize impacts. Segment 1 North shares or parallels existing infrastructure (transmission lines, roads, and railroads) for 100% of its length and Segment 1 South shares or parallels existing infrastructure for 86% of its length. Overall, impacts are anticipated to be minimal.
Forestry	●	●	No notable forestry resources were identified within Segment 1 North or Segment 1 South's ROI; therefore, no impacts to forestry are anticipated as a result of Segment 1.
Mining	●	●	No active gravel pits were identified within Segment 1 North or Segment 1 South's ROI; therefore, impacts to mining are anticipated to be minimal and independent of the route segment selected.
Tourism	●	●	Known events and other opportunities for tourism are advertised in nearby incorporated towns and the activities are not located within the ROI. Recreational opportunities identified within the ROI include publicly accessible lands and waters used for outdoor activities. Impacts to the tourism-based economy are anticipated to be negligible to minimal.
Factor D Archaeological and Historic Resources			
Archaeological	●	●	Segment 1 South's ROI contains one more unevaluated site for the NRHP compared to Segment 1 North (four versus three). Segment 1 South's ROI contains more potential historic cemeteries than Segment 1 North (eight versus one). However, the exact locations of the cemeteries is unknown. Survey efforts would be completed by the applicant and would inform potential impacts; impacts could be avoided and/or mitigated.
Historic	●	●	Segment 1 North and Segment 1 South's ROI includes three previously documented NRHP-eligible historic architectural resources, and 13 historic architectural resources which are unevaluated for the NRHP. Segment 1 South's ROI includes more (20 versus 13) historic architectural resources which are unevaluated for the NRHP. Survey efforts would be completed by the applicant and would inform potential impacts; impacts could be avoided and/or mitigated.

Routing Factor / Resource	Segment 1 North	Segment 1 South	Summary
Factor E Natural Resources			
Public and Designated Lands	●	●	Public lands within the ROI include Wildlife Management Areas, an Aquatic Management Area, and a Scientific and Natural Area – all of which are owned by the DNR. Both Segment 1 North and Segment 1 South cross DNR-owned lands, all crossing locations are in locations where the project could be double-circuited with existing transmission line. The applicant would be required to coordinate with DNR. Additionally, RIM land and Forest Legacy Land is present within Segment 1 North's ROI. A PWP is present within Segment 1 South's ROI. Permanent clearing of vegetation, or the expansion of the cleared areas in cases where an existing line is already present within the conservation areas, would impact the function and intent of these areas unless they could be avoided during final design.
Surface Water	◒	◒	Segment 1 North has more watercourse and waterbody crossings than Segment 1 South but all crossings for Segment 1 North would occur in areas that could be double-circuited with existing transmission lines. For Segment 1 South, five watercourse crossings would occur in areas that would not be double-circuited with an existing transmission line. Both Segment 1 North and Segment 1 South would cross waterbodies that are greater than 1,000 feet wide (e.g., Eagle Lake) and could require placement of structures within them if they cannot be spanned.
Vegetation	●	●	Segment 1 North has more acres of forested vegetation in the ROW (73 acres) than Segment 1 South (33 acres). However, Segment 1 North would double-circuit an existing transmission line for 96 percent of its length, therefore these forested areas have generally already been fragmented from the existing ROW.
Wetlands	◒	◒	Segment 1 North has more acres of wetland in the ROW than Segment 1 South but they have a similar acreage of forested wetland in the ROW and route width. Segment 1 South's anticipated alignment includes one wetland crossings greater than 1,000 feet in length where an existing transmission line isn't already present.
Wildlife and Wildlife Habitat	◒	◒	The route width and ROW of Segment 1 North and Segment 1 South would intersect wildlife resources, with Segment 1 North intersecting more acreage of wildlife resources. Impacts would be minimized because for the most part, where the anticipated alignments cross wildlife resources, they could be double-circuited with an existing transmission line. As such, fragmentation of these habitats has already occurred.
Rare and Unique Natural Resources	◒	◒	Segment 1 North and Segment 1 South have a similar number of NHIS records of state-protected species within 1 mile and they each have two records within their ROW. Segment 1 North would intersect the Townsend Woods Scientific and Natural Area, in an area where it would double-circuited; Segment 1 South avoids this resource. The ROW of Segment 1 North intersects more acres of SBS and native plant communities than Segment 1 South; impacts to these resources would be minimized for both segments because they would intersect these resources where double circuiting would occur.
Minnesota Statute § 216E.03 - subdivision 7 (15e) (transmission lines)			
Paralleling Existing Transmission Line	●	◒	Segment 1 North could be double-circuited within existing 69 or 115 kV transmission line for 40.5 miles which is 96% of its length. Segment 1 South could be double-circuited within existing 69 or 115 kV transmission line for 32.9 miles which is 69% of its length.
Minnesota Statute § 216E.03 - Subdivision 7 (8) (roads/railroads)			
Paralleling Roads and Railroads	◒	●	Segment 1 North would parallel roads for 7.3 miles which is 17% of its length. Segment 1 South would parallel roads for 30.3 miles which is 63% of its length. Segment 1 North also parallels some existing railroad.
Factor H Paralleling Division Lines			
Paralleling existing survey lines, natural division lines, and agricultural field boundaries	●	●	Segment 1 North would follow existing division lines (field, parcel, and section lines) for 31.1 miles which is 74% of its length. Segment 1 South would follow existing division lines (field, parcel, and section lines) for 40.7 miles which is 88% of its length.
Factor J Paralleling Existing Infrastructure			
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.	●	●	Cumulatively, Segment 1 North parallels existing infrastructure (transmission lines, roads, or railroads) for 100% of its length. Cumulatively, Segment 1 South parallels existing infrastructure (transmission lines, roads, or railroads) for 86% of its length.
Factor L Costs			
Costs Dependent on Design and Route	●	●	The applicant's overall project costs, as presented in the joint certificate of need application and route permit application and discussed in Section 3.5, are based on high and low-cost estimates of the project as a whole, and do not distinguish between the individual route segments and alternatives. The application noted that the transmission line is expected to cost approximately $3.7 million per mile. Segment 1 South is 47.7 miles in length compared to Segment 1 North which is 42.1 miles in length.

5.13 Segment 1 North Alternatives

The potential alternatives to Segment 1 North include two route segments (Route Segment 9 and Route Segment 18) and two alignment alternatives (Alignment Alternative 2 and Alignment Alternative 8). The potential impacts associated with these alternatives are summarized below and compared to their Segment 1 North equivalents.

5.13.1 Route Segment 9

Route Segment 9 is southwest of the city of Faribault and east of Cannon Lake (Map 13–15). It is 0.9 miles long and would shift the route approximately 600 feet to the east, where it would then reconnect with Segment 1 North. Route Segment 9 was proposed during scoping to minimize tree clearing. The applicant indicated that if Route Segment 9 is chosen, the corresponding portion of the existing 115 kV line would be shifted to the proposed route segment route and be double-circuited with Route Segment 9 (Appendix E). Table 5-29 summarizes the differences in potential impacts of Route Segment 9 compared to its equivalent.

Table 5-29 Route Segment 9 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment 9 would not follow any existing infrastructure (transmission lines, roads, railroads). It also would not follow division lines (field, parcel, or section lines). Its equivalent would share ROW for 100 percent of its length and double-circuit with the existing 115 kV line.
Human Settlement, Aesthetics	Route Segment 9 would require a new transmission line corridor, while its equivalent could be double-circuited with an existing transmission line. The number of residences within 0 to 1,600 feet is the same for Route Segment 9 and its equivalent. Route Segment 9 would require a new transmission line corridor, however the existing transmission line ROW of its equivalent would require tree clearing resulting in aesthetic impacts.
Human Settlement, Displacement	There are no residences within the ROW of Route Segment 9 or its equivalent.
Human Settlement, Recreation	Route Segment 9 would locate the project further east of Shager Park in comparison to its equivalent. However, impacts to Shager Park are anticipated to be minimal to negligible for the equivalent given the presence of an existing transmission line and because the park is located on the opposite side of the road (Morristown Boulevard).
Land-Based Economies	Route Segment 9 would traverse more agricultural land than its equivalent and would do so while creating a new transmission line corridor diagonally through agricultural fields. The equivalent would share an existing transmission line ROW.

Resource	Summary
Natural Environment - Vegetation	Route Segment 9 would reduce impacts to forested landcover compared to its equivalent. The equivalent could be double-circuited with an existing transmission line and would require additional clearing of forested vegetation to expand the ROW. However, the ROW for the existing transmission line has already fragmented this forested area.
Natural Environment – Wildlife and Wildlife Habitat	Neither Route Segment 9 nor its equivalent would intersect areas preserved or managed for wildlife. Route Segment 9 would create a new transmission line corridor, while the equivalent would double-circuit with an existing 115 kV transmission line; both could potentially increase impacts to avian species. Route Segment 9 would traverse agricultural land, while its equivalent would require clearing some forested habitat to widen the existing ROW.

5.13.2 Route Segment 18

Route Segment 18 is approximately 1.6 miles long and would be a continuation of Route Segment 9, extending further southwest (Map 13–15). It would continue straight to connect with 230th Street West to the south, where it would then turn west to reconnect with Segment 1 North. The applicant indicated that if Route Segment 18 is chosen, the corresponding portion of the existing 115 kV line would be shifted to the proposed route segment route and be double-circuited with Route Segment 18 (Appendix E). Table 5-30 summarizes the differences in potential impacts of Route Segment 18 compared to its equivalent.

Table 5-30 Route Segment 18 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment 18 would not follow any existing infrastructure (transmission lines, roads, railroads). It would follow field, parcel, or section lines for approximately 15 percent of its length. Its equivalent would share ROW for 100 percent of its length and double-circuit with the existing 115 kV line.
Human Settlement, Aesthetics	Route Segment 18 would require a new transmission line corridor, while its equivalent could be double-circuited with an existing transmission line. Neither Route Segment 18 nor its equivalent have residences within the ROW. Route Segment 18 would have one non-residential structure in its ROW, while its equivalent would not have any. Route Segment 18 would require a new transmission line corridor, while its equivalent would take advantage of an existing transmission line corridor. Route Segment 18 would shift the existing 115 kV line between the residence and Cannon Lake, which could result in aesthetic improvement for the homeowner.
Human Settlement, Displacement	There are no residences within the ROW of Route Segment 18 or its equivalent. Route Segment 18 has one non-residential structure within the ROW, which could be displaced; no non-residential structures are in the ROW of the equivalent.

Resource	Summary
Human Settlement, Recreation	Route Segment 18 would locate the project further east of Shager Park in comparison to its equivalent. However, impacts to Shager Park are anticipated to be minimal to negligible for the equivalent given the presence of an existing transmission line and because the park is located on the opposite side of the road (Morristown Boulevard).
Land-Based Economies	Route Segment 18 would traverse more agricultural land than its equivalent and would do so while creating a new transmission line corridor diagonally through agricultural fields. The equivalent would share an existing transmission line ROW.
Archaeological and Historic Resources	Route Segment 18 contains one additional historic architectural resource within the route width: RC-WAR-00003/Warsaw Town Hall, which is unevaluated for the NRHP. Impacts to this resource would be primarily visual and noise impacts for visitors during construction, and visual alterations to the viewshed during operations. Route Segment 18 would not follow an existing ROW and would therefore alter the currently open and agricultural character of the viewshed to include visibility of the transmission line structures. Unevaluated historic architectural resource XX-ROD-00042/Trunk Highway 60 and eligible resource XX-RRD-00015/Sakatah Singing Hills State Trail are within the route width of the equivalent, but not in the Route Segment 18 route width. However, impacts to these resources would be unlikely. Neither resource would intersect the anticipated alignments, and because this portion of Segment 1 North could be double-circuited, impacts would be limited to visual and/or noise effects during construction. Considering these factors, Route Segment 18 would likely have greater impact on cultural resources than its equivalent.
Natural Environment - Vegetation	Route Segment 18 would reduce impacts to forested landcover compared to its equivalent. The equivalent could be double-circuited with an existing transmission line and would require additional clearing of forested vegetation to expand the ROW. However, the ROW for the existing transmission line has already fragmented this forested area.
Natural Environment – Wildlife and Wildlife Habitat	Neither Route Segment 18 nor its equivalent would intersect areas preserved or managed for wildlife. Route Segment 18 would create a new transmission line corridor, while the equivalent would double-circuit with an existing 115 kV transmission line; both could potentially increase impacts to avian species. Route Segment 18 would traverse agricultural land, while its equivalent would require clearing some forested habitat to widen the existing ROW.

5.13.3 Alignment Alternative 2 (AA-2)

Alignment Alternative 2 shifts the alignment of Segment 1 North to the east side of the railroad (Map 13–2 and Map 13–3). This alignment alternative would avoid a new development that has broken ground in the same location as the proposed alignment for Segment 1 North. It was proposed by the applicant during scoping. The alternative alignment would be located within the applicant-proposed route width. Impacts for Alternative Alignment 2 and its equivalent would be similar except for avoiding the development.

5.13.4 Alignment Alternative 8 (AA-8)

Alignment Alternative 8 starts east of Echo Avenue and would traverse 0.2 miles northeast where it would reconnect with Segment 1 North (Map 13–15). This alternative alignment was suggested during scoping by the landowner. In his comment letter, he notes that the existing transmission line was constructed on a hillside along a path of various elevations and directly above a creek. He also notes regular presence of deer beneath the existing powerline in the ravine. The landowner requested that if the existing ROW requires expansion, that the expanded ROW extend north versus south to avoid additional tree clearing toward the creek.

5.14 Segment 1 South Alternatives

The potential alternatives to Segment 1 South include the following six route segments: Route Segment 1, Route Segment 5, Route Segment 6, Route Segment 7, Route Segment 10, and Route Segment 11. The potential impacts associated with these alternatives are summarized below and compared to their Segment 1 South equivalents.

5.14.1 Route Segment 1

Route Segment 1 is approximately 2.8 miles long and starts south of the Eastwood Substation in Blue Earth County (Map 13–18 and Map 13–19). It traverses east along Madison Avenue until 594th Avenue where it turns north, crossing County Highway 14, until it joins Segment 1 South. This route segment was recommended during scoping to avoid impacts to a property the owner indicated was intended for commercial use. Table 5-31 summarizes the differences in potential impacts of Route Segment 1 compared to its equivalent.

Table 5-31 Route Segment 1 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment 1 and its equivalent would parallel existing transmission line or road ROW for 100 percent of their lengths. Route Segment 1 would follow an existing 69 kV transmission line for 10 percent of its length and would have potential to double-circuit with the existing 69 kV line. It would follow roads for 90 percent of its length. The equivalent would double-circuit 69 kV or 115 kV transmission lines for 46 percent of its length. The equivalent would follow roads for 89 percent of its length.
Human Settlement, Aesthetics	There are three non-residential structures within the ROW of Route Segment 1; the equivalent does not have any non-residential structures within the ROW.
Human Settlement, Displacement	Route Segment 1 would increase the number of non-residential structures impacted. Route Segment 1 would have 3 non-residential structures within the ROW, while it’s equivalent would have none. One of the non-residential structures appears to be a shed, while the other two appear to be larger storage buildings.

Resource	Summary
Human Settlement, Recreation	Route Segment 1 would remove a crossing of Sakatah Singing Hills State Trail before rejoining Segment 1 South. Its equivalent would cross or parallel the State Trail 0.75 miles before Route Segment 1 would rejoin Segment 1 South.
Archaeological and Historic Resources	Route Segment 1 contains one additional archaeological site in the route width: 21BE0301/Megley Schoolhouse, which is not eligible for listing on the NRHP. Therefore, there would be no difference in impacts to known cultural resources between Route Segment 1 and its equivalent.
Natural Environment – Geology, Topography, and Groundwater	Route Segment 1 contains one sealed domestic well (MWI #402873) within ROW, while its equivalent would avoid MWI wells within ROW.
Natural Environment – Wildlife and Wildlife Habitat	Impacts to avian species could be higher for Route Segment 1 because it would require a new transmission line corridor in an area where one is not currently present.
Cost	Route Segment 1 is estimated to cost $3.0 million more.[8]

5.14.2 Route Segment 5

Route Segment 5 is approximately 1.3 miles long and is located near Walnut Avenue and East Street in the city of Madison Lake (Map 13–21). This proposed route segment extends east from Segment 1 South at the northeast side of the city. It would extend along the south side of an existing railroad to the west side of 626th Avenue then continue south to rejoin Segment 1 South. The applicant proposed Route Segment 5 during scoping[9] in response to MnDOT's comment letter noting construction of a new commercial store planned along Walnut Avenue that will require extension of East Street and installation of turn lanes and sidewalks. [10] The planned development is described in Section 5.5.5. Table 5-32 summarizes the differences in potential impacts of Route Segment 5 compared to its equivalent.

[8] Northern States Power Company, dba Xcel Energy: TESTIMONY-- T. Wendland Direct Testimony and Schedules, Docket No. 20253-216973-01

[9] Docket No. 20248-209829-01 [NORTHERN STATES POWER COMPANY, DBA XCEL ENERGYRESPONSE TO EIS SCOPING COMMENTS, 08/28/2024]

[10] Docket. No. 20248-209198-01 [MnDOT Comments, 08/01/2024]

Table 5-32 Route Segment 5 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment 5 would follow road ROW for 35 percent of its length but would not follow any existing transmission line ROW. The equivalent would follow existing transmission line and road rights-of-way for 73 percent of its length and would double-circuit an existing 69 kV transmission line for 69 percent of its length.
Human Settlement, Aesthetics	Route Segment 5 would have one residence and one non-residential structure within 500 feet, while its equivalent would have 19 residences and 11 non-residential structures within 500 feet. Route Segment 5 would follow Sakatah Singing Hills Trail, until turning south at 626th Avenue. While paralleling the trail, there is forested vegetated buffer between the project and the trail. The trail and buffer would not be within the ROW. The equivalent would double-circuit an existing 69 kV line along State Highway 60 (Walnut Avenue). Although impacts would be reduced by double-circuiting an existing transmission line, the ROW would need to be expanded, and the height of structures would increase.
Human Settlement, Land Use and Zoning	Route Segment 5 was proposed to avoid a planned commercial development on the Route Segment 5 Equivalent. The equivalent has plans laid out by the city of Madison Lake for a new commercial store along Walnut Ave that requires the extension of East Street and installation of turn lanes and sidewalks. Route Segment 5 would cross land that is zoned for commercial development; however, there are currently no development plans in that area. Route Segment 5 and its equivalent would both impact potential future growth areas for the city of Madison Lake.
Human Settlement, Recreation	Route Segment 5 would run parallel to Sakatah Singing Hills Trail. Although there would be a row of trees between the trail and the ROW, it is possible that transmission line structures would be visible from the trail.
Human Settlement, Transportation and Public Services	Route Segment 5 would reduce impacts to MN Highway 60 and the proposed expansion of East Street to accommodate a commercial development.
Land-Based Economies	Route Segment 5 would go through more agricultural land than its equivalent.
Archaeological and Historic Resources	Route Segment 5 contains one additional historic architecture resource within the route width: BE-JAM-00007/Wisconsin, Minnesota & Pacific Railway/Chicago Great Western Railway/Chicago & North Western Culvert, which is unevaluated for the NRHP. However, this resource does not intersect the anticipated alignment and would not be affected by project construction. The culvert is along the Sakatah Singing Hills State Trail, which is bordered by stands of trees for this length of trail. Both Route Segment 5 and its equivalent contain eligible resource XX-RRD-00015/Sakatah Singing Hills State Trail, which is bordered by stands or trees, and unevaluated resource XX-ROD-00042 (State Highway 60) in their route widths. The equivalent may also contain the historic Calvary Cemetery, mapped at the PLS Forty level, in the route width. The impacts on known cultural resources for either option would likely be similar, although the equivalent route width may have a slightly greater probability of containing burials related to Calvary Cemetery.
Natural Environment – Wildlife and Wildlife Habitat	The equivalent of Route Segment 5 would double-circuit or parallel an existing 69 kV transmission line for more than half of its length. Route Segment 5 would require construction of a new transmission line corridor for its entire length; as such, impacts to avian species could be higher with Route Segment 5 relative to its equivalent.

5.14.3 Route Segment 6

Route Segment 6 is approximately 3.6 miles long and would follow the Sakatah Singing Hills State Trail (Map 13–26 and Map 13–27). Route Segment 6 would start at the intersection of 516th Street and the Sakatah Singing Hills State Trail and continue east where it would rejoin Segment 1 South near State Highway 60. This route segment is intended to utilize the existing Sakatah Singing Hills State Trail corridor to reduce additional land use conversion, and to move the line away from multiple residences along Highway 60. Table 5-33 summarizes the differences in potential impacts of Route Segment 6 compared to its equivalent.

Table 5-33 Route Segment 6 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment 6 would not follow existing infrastructure (transmission lines, roads, railroads) for any portion of its length. Its equivalent would double-circuit existing transmission lines for 85 percent and follow road ROW for 80 percent of its length. Route Segment 6 would follow field, parcel, and section lines for 31 percent of its length.
Human Settlement, Aesthetics	Route Segment 6 would have less residences within 500 feet than its equivalent (3 residences versus 21). It would not follow existing transmission line for any portion of its length. The equivalent could be double-circuited for almost its entire length with an existing 69 kV transmission line. Despite double-circuiting, aesthetic impacts would occur due to expanding the ROW and increasing the height of structures. Route Segment 6 would reduce aesthetic impacts to residences, but if structures are visible, it could potentially increase aesthetic impacts on Sakatah Singing Hills State Trail.
Human Settlement, Displacement	Route Segment 6 has one residence within 75 feet of the anticipated alignment, while its equivalent has two. As noted in Section 5.5.3.2, the applicant indicated no displacement of residences would occur and the alignment would be shifted as needed to avoid displacement. It is noted that if the applicant were to shift the alignment to avoid displacement of this residence, the modified alignment could potentially be required to cross the Sakatah Singing Hills State Trail. Route Segment 6 has two non-residential structures within the ROW, while its equivalent does not have any non-residential structures in the ROW. One of the Route Segment 6 non-residential structures appears to be a shed, while the other one appears to be a larger storage building.
Human Settlement, Transportation and Public Services	Route Segment 6 would reduce impacts to State Highway 60. Outside of this it would not reduce impacts to transportation and public services in comparison to its equivalent.
Land-Based Economies	Route Segment 6 would impact more agricultural land than its equivalent.
Archaeological and Historic Resources	Route Segment 6 contains seven additional historic architecture resources that are not within its equivalent's route width, all of which are eligible for listing on the NRHP. These resources are all located along the Sakatah Singing Hills Trail, which runs parallel to Route Segment 6, approximately 70 feet north of the anticipated alignment. Route Segment 6 would not be double-circuited or parallel an existing transmission line and therefore may have greater impact on known cultural resources if these eligible resources or the character of the environment, feeling or setting of these resources, were to be altered by the project.

Resource	Summary
Natural Environment - Vegetation	Route Segment 6 would cross slightly more agricultural land, significantly less developed land and double the amount of forested land in comparison to its equivalent. Route Segment 6 would have more impact to vegetation.
Natural Environment – Wildlife and Wildlife Habitat	Route Segment 6 and its equivalent would intersect GBCAs for the majority of their lengths. Both Route Segment 6 and its equivalent would traverse a landscape that has already been fragmented by agriculture and road and/or transmission line corridors. The Route Segment 6 equivalent double-circuits or parallels transmission line corridor for the majority of its length. Route Segment 6 follows field, parcel, or section lines for its entire length but does not parallel any existing transmission line or road ROW; as such, Route Segment 6 could have more impacts on avian species relative to its equivalent.
Rare and Unique Natural Resources	Blanding's turtles have been documented within the ROW of Route Segment 6 and its equivalent. The route width of the Route Segment 6 equivalent would intersect the edge of a Lake of Biological Significance (Lily Lake; ranked outstanding), native plant communities, and an SBS (ranked moderate); none of these sensitive resources intersect the ROW of the Segment 6 equivalent.
Cost	Route Segment 6 is estimated to cost $2.6 million more.[11]

5.14.4 Route Segment 7

Route Segment 7 would be located south of the city of Morristown. It extends north from 260th Street West for approximately a half mile before turning east for approximately 1.5 miles where it rejoins Segment 1 South at Garfield Avenue (Map 13–30 and Map 13–31). The applicant proposed Route Segment 7 during scoping in response to an individual who noted during a scoping meeting that they had begun construction of a new home along 260th Street. Table 5-34 summarizes the differences in potential impacts of Route Segment 7 compared to its equivalent.

Table 5-34 Route Segment 7 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment 7 would not follow any existing infrastructure and would instead follow field, parcel, and section lines for the entirety of its length. Its equivalent would parallel road ROW for its entire length.
Human Settlement, Aesthetics	Route Segment 7 would cross agricultural fields instead following road ROW to reduce the number of residences and non-residential structures within 500 feet from 6 residential structures and 42 non-residential structures within 500 feet for the equivalent to zero for Route Segment 7. Neither Route Segment 7 nor its equivalent would double-circuit existing transmission lines, so new transmission line would be built for either. Route Segment 7 would reduce aesthetic impacts to residents.

[11] Northern States Power Company, dba Xcel Energy: TESTIMONY-- T. Wendland Direct Testimony and Schedules, Docket No. 20253-216973-01

Resource	Summary
Human Settlement, Displacement	Route Segment 7 does not have any residences or non-residential structures within its ROW. Its equivalent would have 2 non-residential structures within its ROW. The non-residential structures are associated with agricultural activities.
Human Settlement, Transportation and Public Services	Route Segment 7 would reduce impacts to 260th Street West.
Land-Based Economies	Route Segment 7 would increase impacts to agriculture in comparison to its equivalent.
Natural Environment – Geology, Topography, and Groundwater	The equivalent of Route Segment 7 contains one active domestic well (MWI #529964) within ROW, while Route Segment 7 would avoid MWI wells within ROW.
Natural Environment - Vegetation	Route Segment 7 would go through more agricultural land (36 acres) in comparison to its equivalent (19 acres). Although not reflected in the NLCD data, both Route Segment 7 and its equivalent would impact forested vegetation. Both Route Segment 7 and its equivalent would require tree clearing around a stream crossing; the equivalent could also require tree removal serving as windrows for farmsteads.
Natural Environment – Wildlife and Wildlife Habitat	Route Segment 7 would intersect a GBCA for all of its length and its equivalent would intersect a GBCA for the majority of its length. Both Route Segment 7 and its equivalent would traverse a landscape that has already been fragmented by agriculture. The equivalent of Route Segment 7 would parallel road rights-of-way for its entire length, while Route Segment 7 would not parallel any existing rights-of-way for any of its length. Potential impacts to wildlife could be more significant for Route Segment 7 given that it does not follow any existing infrastructure ROW.

5.14.5 Route Segment 10

Route Segment 10 is 2.9 miles long and would start around 0.5 miles north of 250th Street West and traverse east to Interstate 35, where it would run north and connect with Segment 2 North (Map 13–33). In comparison to Route Segment 11, it starts further north but overlaps Route Segment 11 in part along Interstate 35. The route segment would avoid potential impacts to existing residences and structures. Table 5-35 summarizes the differences in potential impacts of Route Segment 10 compared to its equivalent.

Table 5-35 Route Segment 10 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment 10 would follow existing infrastructure (transmission lines and railroads) for 73 percent of its length. The equivalent would follow existing infrastructure (transmission lines and roads) for 96 percent of its length and would double-circuit an existing 69 kV transmission line for 96 percent of its length.
Human Settlement, Aesthetics	Route Segment 10 would reduce impacts to residences and non-residential structures in the route width. Route Segment 10 would have 3 residences and 3 non-residential structures within 500 feet. Its equivalent would have 12 residences within 500 feet, one of which is in the ROW, and 40 non-residential structures within 500 feet. Route Segment 10 would double circuit an existing 69 kV line for a portion of the route through agricultural fields, before turning north to parallel a railroad and Interstate 35. Its equivalent would double-circuit an existing 69 kV line for the majority of its entire length but would increase aesthetic impacts due to taller structures and a wider ROW needed for the project.
Human Settlement, Displacement	Route Segment 10 would have no residences or non-residential structures within its ROW. Its equivalent would have one residence and no non-residential structures within the ROW. As noted in Section 5.5.3.2, the applicant indicated no displacement of residences would occur and the alignment would be shifted as needed to avoid displacement.
Human Settlement, Transportation and Public Services	Route Segment 10 parallel Appleton Avenue for a shorter distance compared to its equivalent.
Land-Based Economies	Route Segment 10 would have more impacts on agriculture than its equivalent.
Natural Environment – Wildlife and Wildlife Habitat	The route width and ROW of Route Segment 10 would intersect the edge of a GBCA, while its equivalent would avoid the GBCA.
Cost	Route Segment 10 is estimated to cost $6.9 million less.[12]

5.14.6 Route Segment 11

Route Segment 11 is approximately 3.6 miles long and would start at 245th Street West and continue east to Interstate 35 (Map 13–16 and Map 13–33), where it would follow Interstate 35 to the north and connect with Segment 2 North. In comparison to Route Segment 10, it starts further south but overlaps Route Segment 10 in part along Interstate 35. The route segment would avoid potential impacts to existing residences and structures. Table 5-36 summarizes the differences in potential impacts of Route Segment 11 compared to its equivalent.

[12] Northern States Power Company, dba Xcel Energy: TESTIMONY-- T. Wendland Direct Testimony and Schedules, Docket No. 20253-216973-01

Table 5-36 Route Segment 11 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment 11 would follow existing infrastructure (transmission lines, roads, and railroads) for transmission line for 99 percent of its length. Its equivalent would follow existing infrastructure (transmission line and roads0 for 97 percent of its length and would double-circuit an existing 69 kV transmission line for 97 percent of its length.
Human Settlement, Aesthetics	Route Segment 11 would reduce impacts to residences and non-residential structures in the area. Route Segment 11 would have 5 residences and 14 non-residential structures within 500 feet. Its equivalent would have 12 residences within 500 feet, one of which is in the ROW, and 49 non-residential structures within 500 feet. Route Segment 11 would continue along 250th St W before turning north to parallel a railroad and Interstate 35. Its equivalent would double-circuit an existing 69 kV line for almost its entire length but would increase aesthetic impacts to residences due to taller structures and a wider ROW needed for the project.
Human Settlement, Displacement	Route Segment 11 would have no residences or non-residential structures within its ROW. The Route Segment 11 Equivalent would have one residence and no non-residential structures within the ROW.
Human Settlement, Transportation and Public Services	Route Segment 11 would parallel Appleton Avenue for a shorter distance compared to its equivalent. Route Segment 11 would parallel 250th Street East whereas its equivalent would not.
Land-Based Economies	The use of Route Segment 11 would have more impacts on agriculture than its equivalent.
Natural Environment – Wildlife and Wildlife Habitat	The route width and ROW of Route Segment 11 would intersect the edge of a GBCA, while its equivalent would avoid the GBCA.
Cost	Route Segment 11 is estimated to cost $6.2 million less.[13]

[13] Northern States Power Company, dba Xcel Energy: TESTIMONY-- T. Wendland Direct Testimony and Schedules, Docket No. 20253-216973-01

6 Segment 2, West Faribault to Pine Island (North Rochester Substation) - Affected Environment, Potential Impacts and Mitigation

This chapter provides an overview of the human and environmental resources that could be affected by Segment 2 and its alternatives (Section 3.1.2 – Segment 2, Faribault (West Faribault Substation) to Pine Island (North Rochester Substation)). It discusses potential impacts relative to the construction and operation of the project on these resources. It also discusses ways to avoid, minimize, and mitigate these impacts.

Segment 2 would be a new 345 kV transmission line that would run from a point near the West Faribault Substation, southwest of the city of Faribault to the North Rochester Substation, just north of the city of Pine Island. The applicant proposed two potential options for Segment 2: Segment 2 North (41.2 miles) and Segment 2 South (33.6 miles) (Map 1). No route segments or alignment alternatives were proposed during scoping for Segment 2. The applicant included Connector 2G in the joint certificate of need application and route permit application. This is incorporated into the East of Faribault to west of North Rochester Study Area (Connector 2G) as described in Section 3.1.2.3. Connector 2G connects Segment 2 North and Segment 2 South in Rice County and presents options for connecting north and south options from just east of Faribault to west of North Rochester; these options and the opportunities they could present for minimizing or avoiding impacts are discussed in Section 6.13.

6.1 Terms and Concepts

Understanding proposed and alternative route impacts involves contextualizing their duration, size, intensity, and location. This form of contextual information serves as the basis for assessing the overall project impacts on resources. To provide appropriate context, the following terms and concepts are used to describe and analyze potential impacts:

- Duration – Impacts vary in length of time. Short-term impacts are generally associated with construction but might extend into the early operational phase of the project. Long-term impacts are associated with the operation of the project. Permanent impacts extend beyond project decommissioning and reclamation.
- Size – Impacts vary in size. To the extent possible, potential impacts are described quantitatively, for example, the number of impacted acres or the percentage of affected individuals in a population.
- Uniqueness – Resources are different. Common resources occur frequently, while uncommon resources are not ordinarily encountered.
- Location – Impacts are location-dependent. For example, common resources in one location might be uncommon in another.

The context of an impact – in combination with its anticipated on-the-ground effect – is used to determine an impact intensity level, which can range from highly beneficial to highly harmful.

Impact intensity levels are described using qualitative descriptors, which are explained below. These terms are not intended as value judgments, but rather a means to confirm common understanding among readers and to compare potential impacts between route alternatives.

- **Negligible** impacts do not alter an existing resource condition or function and are generally not noticeable to an average observer. These short-term impacts affect common resources.
- **Minimal** impacts do not considerably alter an existing resource condition or function. Minimal impacts might, for some resources and at some locations, be noticeable to an average observer. These impacts generally affect common resources over the short- or long-term.
- **Moderate** impacts alter an existing resource condition or function and are generally noticeable to the average observer. Impacts might be spread out over a large area, making them difficult to observe, but can be estimated by modeling. Moderate impacts might be long-term or permanent to common resources, but generally short- to long-term to uncommon resources.
- **Significant** impacts alter an existing resource condition or function to the extent that the resource is impaired or cannot function as intended (highly harmful). Significant impacts are likely noticeable or predictable to the average observer. Impacts might be spread out over a large area, making them difficult to observe, but can be estimated by modeling. Significant impacts can be of any duration and affect common or uncommon resources.

Also discussed are opportunities to mitigate potential impacts through mitigation. Mitigation means:

- Avoiding impacts altogether by not undertaking a certain project or parts of a project;
- Minimizing impacts by limiting the degree of magnitude of a project;
- Rectifying impacts by repairing, rehabilitating, re-creating, or restoring the affected environment;
- Reducing or eliminating impacts over time by preservation and maintenance operations during the life of the project;
- Compensating for impacts by replacing or providing substitute resources or environments; or
- Reducing or avoiding impacts by implementing pollution prevention measures.

Some impacts can be avoided or minimized; some might be unavoidable but can be minimized; others might be unavoidable and unable to be minimized but can be rectified (corrected). The level at which an impact can be mitigated might change the impact intensity level.

When referring to construction practices or mitigation measures, this EIS uses the convention of describing these as actions by the applicant, even if the action would be carried out by the applicant's contractor.

6.2 Regions of Influence

Potential impacts on human and environmental resources are analyzed within specific geographic areas called regions of influence (ROI). The ROI is the geographic area where the project might exert some influence and is used as the basis for assessing potential impacts. ROIs vary by resource and potential impact (Table 6-1). As necessary, the EIS discusses potential impacts and mitigation measures beyond the identified ROI to provide appropriate context. Direct impacts within the ROI might cause indirect impacts outside the ROI.

This EIS uses the following ROIs:

- **Right-of-Way –** the ROW for the 345 kV transmission line is 150-feet-wide (75 feet on each side of the anticipated alignment). In some locations, ROW may already exist but could require expansion as described in Section 3.3.2.
- **Route Width –** the route width varies but is most commonly 1,000-feet wide (500 feet on each side of the anticipated alignment). Locations where the route width varies are described in Section 3.3.1 Route Width.
- **Local vicinity –** within 1,600 feet of the anticipated alignment (in other words - a 3,200-foot-wide buffer area distributed equally on either side of the anticipated alignment)
- **Project area –** within one mile of the anticipated alignment (in other words - a two-mile-wide buffer distributed equally on either side of the anticipated alignment)
- **Two-county area** – term used to collectively describe the two counties in which the project is located (including Goodhue and Rice counties).

Table 6-1 Regions of Influence

Resource Type	Resource Element	Region of Influence
Human settlement	Aesthetics	Local vicinity
	Cultural values	Two-county area
	Displacement	ROW
	Environmental justice	Census Tracts within the route width
	Land use and zoning	ROW
	Noise	Local vicinity
	Property values	Local vicinity
	Recreation	Route width
	Socioeconomics	Two-county area
	Transportation and Public Services	Roadways/rail - Local vicinity/Route Width Public utilities - ROW Emergency Services – Two-county area Airports – 3.78 miles
Human health and safety	Electromagnetic fields	ROW
	Implantable medical devices	ROW
	Public and worker safety	ROW
	Stray voltage	ROW
	Induced voltage	ROW
	Electronic interference	ROW
Land-based economies	Agriculture	Route width
	Forestry	Route width
	Mining	Route width
	Tourism	Local vicinity
Archaeological and historic resources	Archaeological and historic resources	Route width
Natural environment	Air quality	Project area
	Climate	Project area
	Geology and topography	Route width
	Greenhouse Gases	ROW
	Groundwater	ROW
	Public and designated lands	ROW
	Rare and unique natural resources	Project area for protected species; route width for sensitive ecological resources
	Soils	ROW
	Surface water	Route width
	Vegetation	ROW
	Wetlands	ROW
	Wildlife and Wildlife Habitat	Route width

6.3 Environmental Setting

Segment 2's project area is dominated by rural and agricultural land use with concentrated areas of development on the west end of Segment 2 near Faribault and on the east end of Segment 2 near Pine Island (Map 21). Both Segment 2 North and Segment 2 South cross the Straight River and the North Fork of the Zumbro River (Map 22). The Nielsen Memorial Preserve is located between Segment 2 North and Segment 2 South (Map 23-2).

The DNR and the USFWS have developed an ECS for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features (reference (10)). Under this classification system, Segment 2 is in the Eastern Broadleaf Forest Province (Map 24). This section is further divided into subsections including the Oak Savanna and Rochester Plateau subsections. These subsections are used below to classify the environmental setting of the project.

The Oak Savanna Subsection is primarily characterized by rolling plains of loess-mantled ridges over sandstone and carbonate bedrock and till. The boundaries are characterized by end moraines to the west and land dominated by hardwood forests to the east. Topography is gently rolling throughout the subsection, with steeply sloped Stagnation moraines in the southwest. Glacial drift is generally less than 100 feet thick, with a maximum thickness of about 200 feet. Soils within this subsection are a combination of Alfisols and Mollisols and include Aquolls, Udolls, Udalfs, and Aqualfs. Pre-settlement, bur oak savanna was the primary vegetation; at present, most of the area is farmed (reference (12)).

The Rochester Plateau Subsection is primarily characterized by level to gently rolling older till plains, overlying dolomite, limestone, and sandstone. The boundaries are characterized by end moraines to the west, and by an area of transition between a level to rolling plateau and dissected landscapes to the east. Topography is controlled by underlying glacial till along the western edge. As glacial till thins to the east, topography is largely bedrock controlled. Depth of drift over bedrock varies from 100 to 200 feet in the west to 10 to 100 feet in the east with bedrock exposures common. Loess thickness is variable, ranging from 30 feet thick on broad ridgetops, to less than a foot on valley walls. The predominant soils are Udalfs, with localized Aquents along the floodplains and major rivers. Pre-settlement tallgrass prairie and bur oak savanna were the primary vegetation; at present, most of the area is farmed (reference (199)).

Segment 2 North and Segment 2 South are in Rice and Goodhue Counties. Major communities nearest to Segment 2 include Faribault to the west, Kenyon, Bombay, Wanamingo, Zumbrota, and Pine Island to the east (Map 2). Existing transmission lines are prevalent throughout (Map 25). Segment 2 North and Segment 2 South are generally bound by Interstate 35 to the west and U.S. Highway 52 to the east, with U.S Highway 60 traversing Segment 2 from west to east (Map 25). County and township roads are also present within the route widths.

6.4 Use or Paralleling of Existing Rights-of-Way

When the Commission makes a final decision about the route permit and per Minnesota Statute § 216E.03, subpart 7(e), it must make specific findings that it has considered locating a route for a new HVTL along an existing HVTL route or parallel to existing highway ROW, and, to the extent these are not used, the Commission must state the reason(s).

When considering a new HVTL along an existing HVTL route, there is a difference in potential impacts between using ROW for double-circuiting and paralleling existing ROW. Both would present opportunities for combining new ROW with existing ROWs which minimizes fragmentation of the landscape and can minimize human and environmental impacts (e.g., aesthetic and agricultural impacts). Use of existing ROW for double-circuiting would involve either:

- Expanding the existing ROW and replacing existing transmission line structures (for existing lines of a smaller voltage than 345 kV) with new structures capable of double-circuiting the new 345 kV line, or
- Using the existing ROW and placing the new 345 kV line on the existing double-circuit capable poles (for existing 345 kV lines which already have existing double-circuit capable poles present).

Segment 2 North and Segment 2 South offer partial opportunity to double-circuit with an existing 345 kV line (Table 6-2). Outside of this, Segment 2 would involve replacing the existing transmission line structures (Section 3.2.1) and expanding the ROW (Section 3.3.2) for the existing 69 kV and 161 kV lines to accommodate the project's 345 kV line. Opportunities for use or paralleling existing ROW for double-circuiting are summarized in Table 6-2.

Table 6-2 Segment 2 North and Segment 2 South Opportunities for Double-Circuiting

	Unit	Segment 2 North	Segment 2 South
Total Segment Length	Miles	41.2	38.1
Double-circuit with existing 69 kV line	Miles (percent)	21.2 (52)	0.0 (0)
Double-circuit with existing 161 kV line	Miles (percent)	0.0 (0)	3.1 (8)
Double-circuit with existing 345 kV line	Miles (percent)	7.2 (17)	2.6 (7)
Total opportunity for double-circuiting	Miles (percent)	28.4 (69)	5.7 (15)
Parallels existing transmission line (i.e., not double-circuited but parallel and adjacent to)	Miles (percent)	0.0 (0)	0.0 (0)
Double-circuiting or paralleling existing transmission lines (total)	Miles (percent)	28.4 (69)	5.7 (15)

Paralleling existing ROW would involve installing the new 345 kV line parallel and adjacent to existing transmission lines or transportation, pipeline, and electrical transmission systems or rights-of-way. As described in Section 3.3.2, the total width of the new ROW required could be reduced from 150-feet where some of the ROW would overlap with existing ROW. Opportunities for paralleling existing ROW, including highway rights-of-way, are further discussed in Section 6.5.1.

6.5 Human Settlements

6.5.1 Aesthetics

The ROI for aesthetics is the local vicinity. Transmission lines alter a viewshed. Because aesthetic impacts are subjective, the potential impacts can vary widely and be unique to each person. Impacts are largely assessed by reviewing the number of nearby residences and opportunities for double-circuiting with an existing transmission line and/or ROW paralleling. Where double-circuiting occurs within Segment 2, existing transmission line structures would be replaced with larger structures and the ROW would be extended. Determining the relative scenic value or visual importance in any given area is subjective and depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question.

Aesthetic impacts can be minimized by selecting routes that are located away from homes, schools, businesses, and other places where people congregate (for example, parks or other recreation areas). Aesthetic impacts can also be minimized by following existing transmission line ROW where elements of the built environment already define the viewshed and the addition of an additional transmission line would have an incremental impact. Following other infrastructure, such as roads and railroads, would also be expected to reduce potential impacts but not to the same extent.

6.5.1.1 Existing Conditions

The aesthetic and visual resources of a landscape are defined as the existing natural and built features which affect the visual quality and character of an area. A landscape's character is largely influenced by topography, vegetation, water resources, existing development, and infrastructure. Determining the relative scenic value or visual importance in any given area depends, in large part, on the individual viewer, or community of viewers, whose perceptions are shaped by their values and experiential connection to the viewing area, as well as their physical relationship to the view, including distance to structures, perspective, and duration of the view.

Viewer sensitivity is understood as an individual's interest or concern for the quality of a viewshed and varies depending upon the activity viewers are engaged in, their values and expectations related to the viewshed, and their level of concern for potential changes to the viewshed. High viewer sensitivity is generally associated with individuals engaged in recreational activities; traveling to scenic sites for pleasure and to or from recreational, protected, natural, cultural, or historic areas; or experiencing viewsheds from resorts, roadside pull-outs, or residences. Residents have a higher sensitivity to potential aesthetic impacts than temporary observers. Low viewer sensitivity is generally associated with individuals commuting, working, or passing through an area.

For the purpose of this document, it is assumed that landscapes which are, for the average person, harmonious in form and use are generally perceived as having greater aesthetic value. Infrastructure which is not harmonious with a landscape or affects existing landscape features reflects a change in the aesthetic view that for some, or many, could negatively affect a viewer's perception and expectation of the area. Assessing visual quality reflects the difference between the landscape change and the individual or communal reaction to that change. As noted above, individual or communal perspectives are complex and affected by individual or shared values and experiences with the land. As such, some viewers could perceive the project setting as having high visual quality while others might perceive the area to have less visual quality. Perceived aesthetics can carry more weight when they are tied to a specific feature, like residential properties, scenic byways, or historic/archaeological/natural features. This is a key reason among those that prefer to co-locate new infrastructure among the built environment (utility ROWs, road, railways, pipelines).

The topography of Segment 2 is characterized by gently rolling till plains until reaching the eastern edge of the state, where loess mantled ridges and bluffs are dissected by river valleys. Segment 2 North is primarily agricultural (65.5 percent), with a smaller amount of area that is developed (26.6 percent), and small pockets that are less than 10 percent of the total landcover each that are forested, herbaceous, and open water. Segment 2 South is also primarily agricultural (81.5 percent), with small pockets that are less than 10 percent of the total landcover each that are developed, forested, herbaceous, and open water.

There are several municipalities near the project in Segment 2 (Map 26). Both Segment 2 North and Segment 2 South start at the southern end of the city of Faribault, before traveling through mostly rural residential and agricultural areas until ending just north of Pine Island. Segment 2 North goes through one municipality on its route, the City of Wanamingo. Segment 2 South does not go through any other cities before reaching the end of the segment. Areas within city limits are characterized by a higher concentration of industrial, municipal, and commercial features, power lines and electrical substations, residential buildings, streets, and sidewalks. There are also other recreational features that influence the visual character and enjoyment of these areas, like parks and trails. There are no wind or solar farms in the local vicinity of Segment 2.

Portions of Segment 2's route width contain existing utility infrastructure, including electric transmission and distribution lines (Map 25). The existing transmission structures within Segment 2's ROI generally range in height from 45 to 175 feet, depending on the size of the existing line.

- Where existing transmission lines are 69 kV, the structures are typically 45 to 70 feet tall.
- Where existing transmission lines are 161 kV, the structures are typically 75 to 140 feet tall.
- Where existing transmission lines are 345 kV, the structures are typically 85 to 175 feet.

Certain landscape areas have higher aesthetic value due to their scenic qualities. These areas could include scenic byways, recreation areas, and river crossings. There are no scenic byways or wild, scenic, and recreational rivers In Segment 2. The segments cross the Straight River, a state water trail, east of Faribault (Map 23).

6.5.1.2 Potential Impacts

The project's HVTL structures and conductors would create aesthetic impacts. The ROI for aesthetic impacts is the local vicinity. The new 345 kV transmission line structures would range in height from 85 to 175 feet. Aesthetic impacts would also include clearing existing woody vegetation and creating a new fragmented landscape and/or expanding the fragmented landscape with the expansion of the existing ROW. The degree of impacts depends in large part on opportunities to share or parallel existing ROW and the magnitude of viewer sensitivity.

Paralleling and/or sharing other types of existing ROW would have an incremental impact relative to existing horizontal elements, such as existing transmission lines, highways and county roads, and/or railroads (collectively referred to as "existing infrastructure"). In some cases, portions of a route segment could parallel ROW with more than one of these existing features at the same time (e.g., be sharing or paralleling transmission line and be paralleling road ROW). Map 4 illustrates where ROW paralleling occurs and shows existing infrastructure. Where subparts parallel more than one existing type of infrastructure, precedence is given to showing where the alternative could be double-circuited or paralleling an existing transmission line over showing it paralleling existing road ROW.

As shown in Table 6-3, Segment 2 North would primarily follow existing infrastructure (80 percent of its length). Segment 2 South follows less infrastructure compared to Segment 2 North. Segment 2 North and Segment 2 South are similar in their total length that do not parallel any existing infrastructure or division lines (3.0 miles and 4.0 miles, respectively).

Table 6-3 Segment 2 North and Segment 2 South, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

	Segment 2 North (41.2 mi total)		Segment 2 South (38.1 mi total)	
Double-circuited with existing transmission lines	28.4 mi	69%	5.7 mi	15%
Follows existing roads	24.8 mi	60%	5.4 mi	14%
Follows existing railroads	0.0 mi	0%	1.1 mi	3%
Follows existing infrastructure (transmission lines, roads, and railroads)	32.9 mi	80%	10.1 mi	27%
Follows division lines (field, parcel, and section lines)	37.4 mi	91%	29.4 mi	77%
Total ROW paralleling [1]	38.2 mi	93%	29.8 mi	78%
Total length that does not follow existing infrastructure or division lines	3.0 mi	7%	4.0 mi	10%

[1] Total ROW paralleling represents the total length of the segment that either parallels existing infrastructure (transmission lines, roads, and railroads) *or* follows division lines (field, parcel, and section lines). Some parts of a segment fall into both categories but are not double-counted in this total.

For the majority of Segment 2 North where the HVTL could be double-circuited (Map 4), aesthetic impacts would be diminished because the existing transmission lines are already part of the aesthetics of the area. Aesthetic impacts would include removal of existing structures and installation of the larger structures (Section 3.2.1). The increased structure height (typically 85 to 175 feet) for the new structures could be 130 feet taller than the existing structures (ranging from 45 to 95 feet, Section 6.5.1.1). Where Segment 2 North and Segment 2 South could be double-circuited with an existing 345 kV line, existing structures would be used (Table 6-2). In some cases, existing structures are wood and would be replaced with steel structures. Impacts for double-circuited areas would also include vegetation clearing to accommodate the expansion of the ROW width (Section 3.3.2 Right of Way). In some cases, the aesthetic impacts could be shifted from one side of a road to another. For example, if the existing transmission line is on the north side of the road and the final alignment for the project is on the south side of the road – aesthetic impacts would be shifted.

In addition to opportunities to share or parallel existing ROW, the degree of aesthetic impacts would also be dependent on the magnitude of viewer sensitivity and exposure. Visual impacts are expected to be minimal for those with low viewer sensitivity, such as people traveling to and from work. For those with high viewer sensitivity, for example, neighboring landowners or recreationalists, visual impacts are anticipated to be moderate to significant. Viewer exposure refers to variables associated with observing a viewshed, and can include the number of viewers, frequency and duration of views, and view location. Viewer exposure would typically be highest for views experienced by high numbers of people, frequently, and for long periods. To the extent these impacts can be quantified depends on the presence of several on-the-ground factors linked to the concepts of viewer quality, sensitivity, and exposure. These factors include:

- Proximity to residences, schools, churches, etc., where relatively more observers are present to experience aesthetic impacts;
- Views valued by the public at large, for example, scenic overlooks or scenic byways; or
- Locations where people recreate or otherwise enjoy leisure activities.

Appendix G details human settlement features in the local vicinity of the route segments. The proximity of residential structures (homes, daycares, and nursing homes) and non-residential structures (for example, agricultural buildings and sheds) to route segments at various distances is shown in Figure 6-1 and Table 6-4, respectively. Segment 2 North has more residences within the local vicinity (201) compared to Segment 2 South's local vicinity (67). Segment 2 North has 1 residence within the ROW, while Segment 2 South has none. Segment 2 North would have more non-residential structures within its vicinity (480) than Segment 2 South (168) and would have one more non-residential structure within its ROW (3) than Segment 2 South (2).

Figure 6-1 Segment 2 North and Segment 2 South, Proximity of Residential Structures

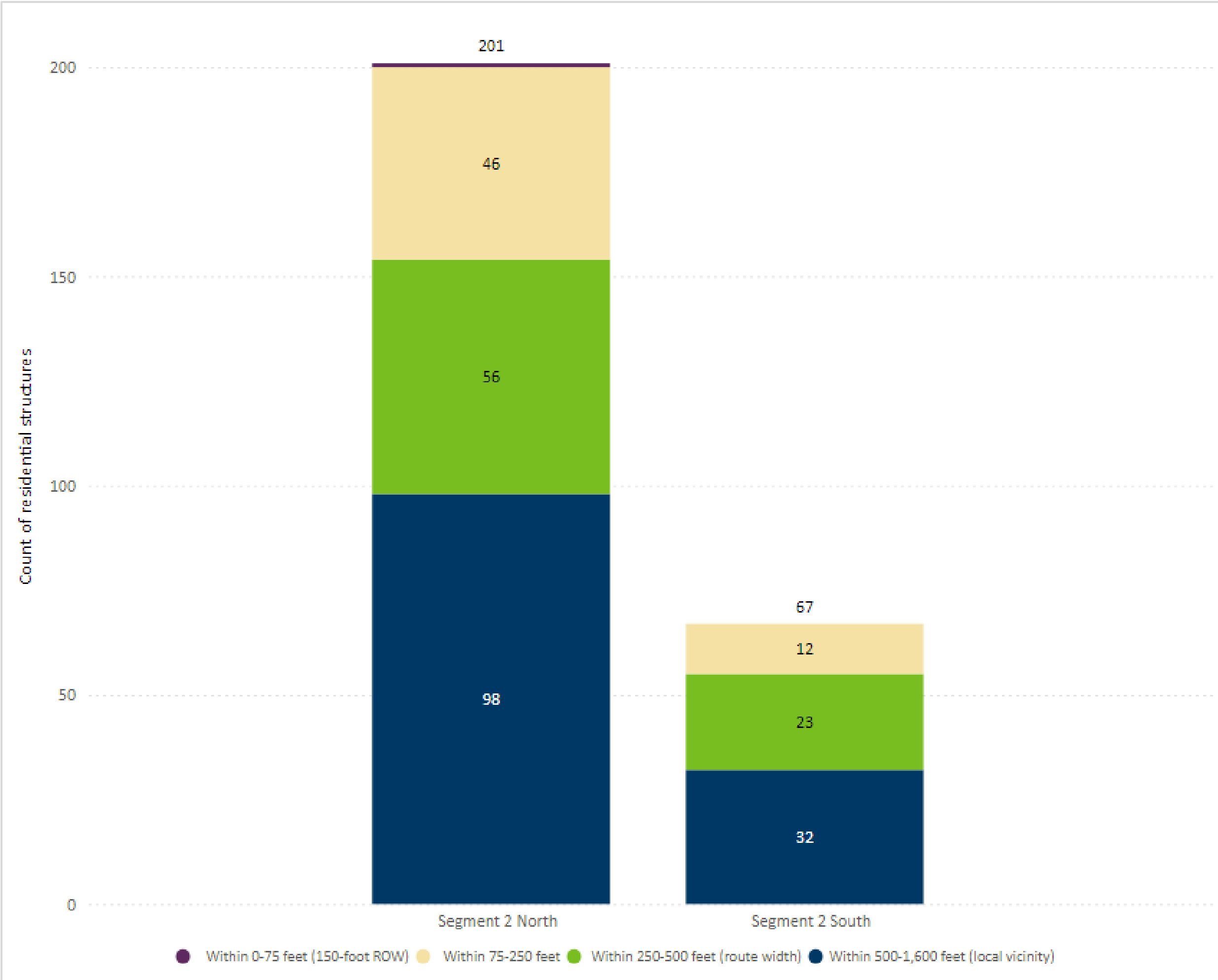


Table 6-4 Segment 2 North and Segment 2 South, Proximity of Non-Residential Structures

	Segment 2 North	Segment 2 South
Within 0-75 feet (150-ft ROW)	3	2
Within 75-250 feet	78	12
Within 250-500 feet (route width)	251	23
Within 500-1,600 feet (local vicinity)	148	32

Recreational resources are also considered in the aesthetic impacts analysis in that they might include certain landscapes with higher aesthetic value due to their scenic qualities and could also have the potential for higher viewer sensitivity, especially if people are expected to congregate in recreational areas. Recreationalists subject to potential impacts in Segment 2's ROI would include travelers on the Straight River (Section 6.4.8). Both Segment 2 North and Segment 2 South would introduce new crossings of the Straight River. In other words, there is no existing infrastructure already present at the watercourse crossings.

6.5.1.3 Mitigation

The primary strategy for minimizing aesthetic impacts is prudent routing – that is, choosing routes where an HVTL is most harmonious with the landscape. This could include:

- Maximizing ROW sharing and/or paralleling with existing linear rights-of-way (for example, transmission lines, roadways, and railroads) to minimize incremental aesthetic impacts.
- Minimizing the magnitude of viewer exposure (for example, locating the transmission line away from residences or areas where people congregate).
- Avoiding routing through areas with high-quality, distinctive viewsheds.
- Crossing rivers and streams using the shortest distance possible (that is, perpendicular to the waterbody).
- Reducing structure heights to minimize impacts within scenic areas.
- Using structures and structure designs that minimize impacts.

In the joint certificate of need application and route permit application, the applicant committed to minimizing aesthetic impacts by avoiding removal of trees where possible, spanning natural areas when feasible, and by using existing infrastructure and roadway or transmission facility rights-of-way to the maximum practicable extent.

The sample route permit (Section 5.3.7 of Appendix H) contains the following mitigation related to aesthetics:

- “The Permittee shall consider input pertaining to visual impacts from landowners or land management agencies prior to final location of structures, rights-of-way, and other areas with the potential for visual disturbance.”
- “The Permittee shall use care to preserve the natural landscape, minimize tree removal and prevent any unnecessary destruction of the natural surroundings in the vicinity of the Transmission Facility during construction and maintenance.”
- “The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads.”
- “The Permittee shall place structures at a distance, consistent with sound engineering principles and system reliability criteria, from intersecting roads, highways, or trail crossings.”

Other minimization and mitigation measures could include:

- Placing structures to take advantage of existing natural screening to reduce the view of the line from nearby residences and roadways.

- Including specific conditions in individual easement agreements with landowners along the route (for example, requiring new plantings or landscaping).
- Using the protections of Minnesota Statute § 216E.12, subdivision 4 (commonly known as the "Buy the Farm" statute), where available, to move residents away from potential aesthetic impacts.

6.5.2 Cultural Values

The ROI for cultural values is the project area. Impacts associated with rural character and sense of place are expected to be dependent on the individual. These impacts would be localized, short- and long-term, but might diminish over time. Impacts to community unity are not anticipated to occur. Impacts are minimal and unavoidable.

6.5.2.1 Existing Conditions

Cultural values are those community beliefs and attitudes which provide a framework for community unity and animate community actions. Cultural values can be informed by history and heritage, local resources, economy, local and community events, and common experiences. The project traverses land that has been home to a variety of persons and cultures over time.

The project area was populated primarily by Dakota and Ojibwe tribes in the early to mid-1800s. Most lands in the local vicinity of the project were ceded to the U.S. government during the 1851 treaty. Existing conditions are discussed for both the pre-contact period (prior to European settlement of the project area) and the post-contact period.

6.5.2.1.1 Tribal and Indigenous Peoples History within ROI

Segment 2 is within the Bdewakantunwan (those born of the waters) (Mdewakanton) Band of Eastern Dakota's, also commonly referred to as the Minnesota Sioux, ancestral lands. The Dakota people lived on the lands in this area long before European settlers arrived. The 1851 Treaty of Mendota and the Treaty of Traverse des Sioux of 1851 stripped the Dakota of these ancestral lands. The foundation of the Prairie Island reservation began forming in 1880 when 120 acres of land was purchased for the Dakota people who stayed in Minnesota by the Secretary of the Interior. In 1936 Prairie Island adopted its Constitution and By-laws, becoming recognized by the federal government as a Tribe and establishing the Prairie Island Reservation.

The Treaty of Traverse des Sioux in 1851, between the Sioux-Sisseton and Wahpeton bands of the Dakota and the U.S. government, ceded much of the southeastern portion of the Minnesota territory. The Sisseton and Wahpeton bands of Dakota were in areas that had been overhunted and depleted of animals. While many of the Sisseton and Wahpeton Dakota leaders had concerns and did not support the treaties, a consensus was eventually reached that they believed would help supplement their struggling hunting and gathering economy (reference (13)). The land cession treaty offered annuity payments and a way to get through the hard times. When signed, the treaty ceded 24 million acres for $1,665,000. A reservation including an area of land ten miles wide was retained on each side of the

Minnesota River for the tribal members (reference (14)). The U.S. government kept more than 80 percent of the money, leaving the Dakota to receive the interest on the amount, at five percent for 50 years (reference (15)). The Dakota Leaders also signed the "Traders Papers," which unfairly siphoned substantial funds from the treaty to pay alleged Dakota debts to settler fur traders (reference (13)).

After the Treaty of Traverse de Sioux was signed by the upper bands of the Dakota, the treaty delegation traveled to lower bands of the Dakota. The Treaty of Mendota was also signed in 1851, between the Mdewakanton and Wahpekute bands of Dakota. The Mdewakanton and Wahpekute were not as in need for foods and goods to support their tribes at the time as the upper bands were. The Leaders asked that annuity from the Treaty of 1837 be paid before further discussion and attempted to change the boundaries of the proposed reservation. Under this treaty the bands were to receive annual annuities on $1,410,000 (reference (16)). The bands were given one year to move to the same reservation land along the Minnesota River outlined above in the Treaty with the Sioux-Sisseton and Wahpeton Bands (reference (14)).

6.5.2.1.2 Tribal and Indigenous Peoples within Present Day ROI

There are currently 11 federally recognized American Indian Tribes with reservations in Minnesota. Minnesota tribes are sovereign nations that operate their own natural resource departments that reflect their commitment to environmental preservation for future generations. Various restoration projects have been aimed at revitalizing bison, lake trout, sturgeon, and plant populations. Traditional ecological knowledge emphasizes that caring for the land means it will care for you in return. This belief is deeply rooted in the spiritual and cultural importance of flora and fauna, as well as sacred burial sites. Plants such as wild rice, cedar, sage, sweetgrass, and tobacco, are considered sacred and used for ceremonial purposes and their healing properties (reference (17)).

According to the United States Department of Housing and Urban Development Tribal Directory Assessment Tool (reference (18)), Tribes with historic cultural interest or ancestral ties in Segment 2 include the following:

- Apache Tribe of Oklahoma
- Cheyenne and Arapaho Tribes, Oklahoma
- Flandreau Santee Sioux Tribe of South Dakota
- Lower Sioux Indian Community in the state of Minnesota
- Menominee Indian Tribe of Wisconsin
- Prairie Island Indian Community in the state of Minnesota
- Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
- Grand Portage Band of the Minnesota Chippewa Tribe
- Iowa Tribe of Kansas and Nebraska
- Sisseton-Wahpeton Oyate of the Lake Traverse Reservation, South Dakota
- Spirit Lake Tribe, North Dakota
- Santee Sioux Nation, Nebraska
- Upper Sioux Community, Minnesota

Within the present-day ROI, the federally recognized Prairie Island Indian Community (PIIC) has an established reservation located within Goodhue County. The PIIC core values are bdewakantuŋwaŋ (those born of the water), woksape (wisdom), wowaȟbada (peace or calm), waciŋic'iya (self-dependence), akhidečheča (equality), wowacaŋtohnake (generosity), and oahe (foundation). It consists of approximately 534 acres of original reservation land, 2,774 acres of other trust land close to the existing reservation, and more than 1,700 acres of additional off-reservation properties that are not currently in federal trust. Within the reservation land the Prairie Island Edwin Buck Jr. Memorial Buffalo Project has restored nearly 200 buffalo to the pastures of Prairie Island (reference (200)). Preserving culture and historical treasures is a top priority for the PIIC, and in turn Goodhue County is home to the largest concentration of untouched burial mounds in the state. Their partnership with the Minnesota State University, Mankato developed and is implementing a burial mound protection plan to preserve these sites (reference (20)). There are several Wacipi (the Dakota word for powwow) held throughout the year, with the largest celebration being held during the summer.

6.5.2.1.3 County Conditions within ROI

Today, Segment 2 goes through Rice County and Goodhue County in the southeastern region of Minnesota. Southeastern Minnesota is known for its vast landscapes and wooded bluffs along the Mississippi Corridor (reference (20)). It is a health care and agricultural powerhouse, where advanced manufacturing is a strong industry (reference(21)). Segment 2 is primarily in a rural setting with two cities, Faribault and Wanamingo, along the routes.

Rice County is around 50 miles south of the Twin Cities metropolitan area and encompasses an area of 516 square miles. The county remains a blend of agriculture and industry. The largest cities in the county are Northfield and Faribault. Northfield's main business is education, with college students making up a large percentage of the population. Northfield is also known for the notorious Jesse James attempted robbery of the First National Bank. One of the largest cities in the county is Faribault, where Segment 2 North and Segment 2 South would begin. Faribault is known for the Faribault Woolen Mill and is home to the Rice County Fair which brings the community together to celebrate agriculture, local talent, and family fun (reference (32)).

Goodhue County is a largely rural county with some industrious small river and mill towns. Landscapes feature agricultural areas and scenic natural features of the Mississippi River Valley. Goodhue County has many outdoor recreational opportunities with its many parks and trails. They also have a large County Fair and the Cannon Valley Fair. The county is on the ancestral homeland of the Mdewakanton Dakota Oyote and the current day Prairie Island Indian Community (PIIC) reservation is located south of Hastings and north of Red Wing, along the Mississippi corridor (reference (201)). Segment 2 North and Segment 2 South travel west through Goodhue County, ending north of the city of Pine Island.

There are numerous natural amenities, including lakes, rivers, and public lands, that attract local and regional recreational users within and near the project area (discussed further in 6.5.8 and 6.9.6). These areas provide a variety of outdoor recreational opportunities, like fishing, hunting, boating, hiking, and snowmobiling which also contribute to the identity of area residents.

6.5.2.2 Potential Impacts

Construction, operation, and maintenance of Segment 2 is not anticipated to conflict with cultural values in the ROI. The area throughout Segment 2 is generally rural, with several more populated municipal areas within one mile. There are no lakes that have shown historical wild rice growth within Segment 2, so no impacts to wild rice harvesting or production are anticipated. The project would not interfere with hunting or fishing in the area.

Transmission line and substation projects have the potential to impact community and regional events during construction, primarily due to the presence of equipment and supplies on local roadways and potential temporary road closures or detours. Impacts would be minor and temporary if they occur.

Segment 2 North and Segment 2 South would have similar potential impacts in regard to cultural values. Impacts associated with rural character and sense of place are expected to depend on the individual. For some residents, constructing the project might change their perception of the area’s character, thus potentially eroding their sense of place. This tension between infrastructure projects and rural character creates real tradeoffs. For those residents who place high value on rural character and a sense of place, impacts are anticipated to be moderate. These impacts would be localized, short- and long-term, but might diminish over time depending on the individual.

6.5.2.3 Mitigation

There are no conditions included in the sample route permit that directly mitigate impacts to cultural values, sense of place, or community unity. Impacts could be minimized by sharing or paralleling existing ROW as it would minimize new routes across the landscape.

Impacts are unavoidable, and the applicant would continue to coordinate with potentially affected parties if further mitigation is requested.

6.5.3 Displacement

The ROI for displacement is the anticipated ROW. Displacement occurs when a residence or building is required to be removed for construction of the project. Residential buildings within the ROI could require removal, whereas non-residential buildings could more likely stay within the ROI if the activities taking place in these buildings are compatible with the safe operation of the line.

Potential displacement impacts are assessed by identification of buildings within the ROW which is based on the anticipated alignment. If buildings are located within the ROW, they could be subject to displacement depending upon site-specific considerations and coordination with the applicant. The applicant noted in the joint certificate of need application and route permit application that “displacement of residential properties is not anticipated” if any of the applicant-proposed segments are selected by the Commission.

6.5.3.1 Existing Conditions

Displacement is the removal of a residence or building to facilitate the operation of a transmission line. For electrical safety code and maintenance reasons, utilities generally do not allow residences or other buildings within the ROW of a transmission line. Any residences or other buildings within a proposed ROW have the potential to be removed or displaced. Displacements are relatively rare and more likely to occur in highly populated areas where avoiding all residences and businesses is not feasible.

The ROI for displacement is the ROW. There are no daycares, hospitals, schools, churches, or nursing homes within the ROW of Segment 2. Segment 2 North would have one residence within the ROW, while in Segment 2 South there would be no residences within the ROW. The residential structure within the ROW on Segment 2 North is just outside the city limits of Wanamingo. It is at the southwest corner of the intersection of MN Highway 60 and MN Highway 57.

There would be three non-residential structures (for example, agricultural outbuildings or animal production structures) within the ROI of Segment 2 North, and two non-residential structures within the ROI of Segment 2 South. All non-residential structures appeared to be agricultural, storage, or shed type buildings.

6.5.3.2 Potential Impacts

Segment 2 North's ROW includes one residence. The applicant indicated in the joint certificate of need application and route permit application, and in Appendix E that displacement of residential structures would not occur. The applicant noted in Appendix E that if a residence is identified within the permitted route and within the required transmission line ROW, Xcel Energy would revise the alignment to avoid such impact and avoid displacement.

Non-residential structures within the ROW could be displaced by the project. Though the general rule is that buildings are not allowed within the ROW of the transmission line, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line. This is determined on a case-by-case basis.

6.5.3.3 Mitigation

The sample route permit (Section 5.3.7 of Appendix H) does not have specific statements on displacement. In the aesthetic requirements it states: "The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads."

In the safety codes and design requirements it states: "The Permittee shall design the transmission line and associated facilities to meet or exceed all relevant local and state codes, the National Electric Safety Code, and NERC requirements. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, strength of materials, clearances over roadways, ROW widths, and permit requirements."

Displacement of residential and non-residential structures can be avoided by adjusting the placement of transmission line structures, using specialty structures, increasing structure height, or by modifying the ROW location or width. The applicant would work with landowners on a case-by-case basis to address potential displacement. The applicant might need to conduct a site-specific analysis to determine if the building would need to be displaced. Building owners would be compensated by the applicant for any buildings that are displaced.

6.5.4 Environmental Justice

The ROI for environmental justice (EJ) includes the census tracts that intersect the route width. Potential EJ impacts are assessed by first identifying if any census tracts meet a definition of an EJ area per its socioeconomical information. Second, census tracts meeting an EJ definition are reviewed to consider if those residents might be disproportionally affected. The project would not result in disproportionate adverse impacts to the EJ areas of concern within the ROI. Therefore, impacts are anticipated to be minimal.

6.5.4.1 Existing Conditions

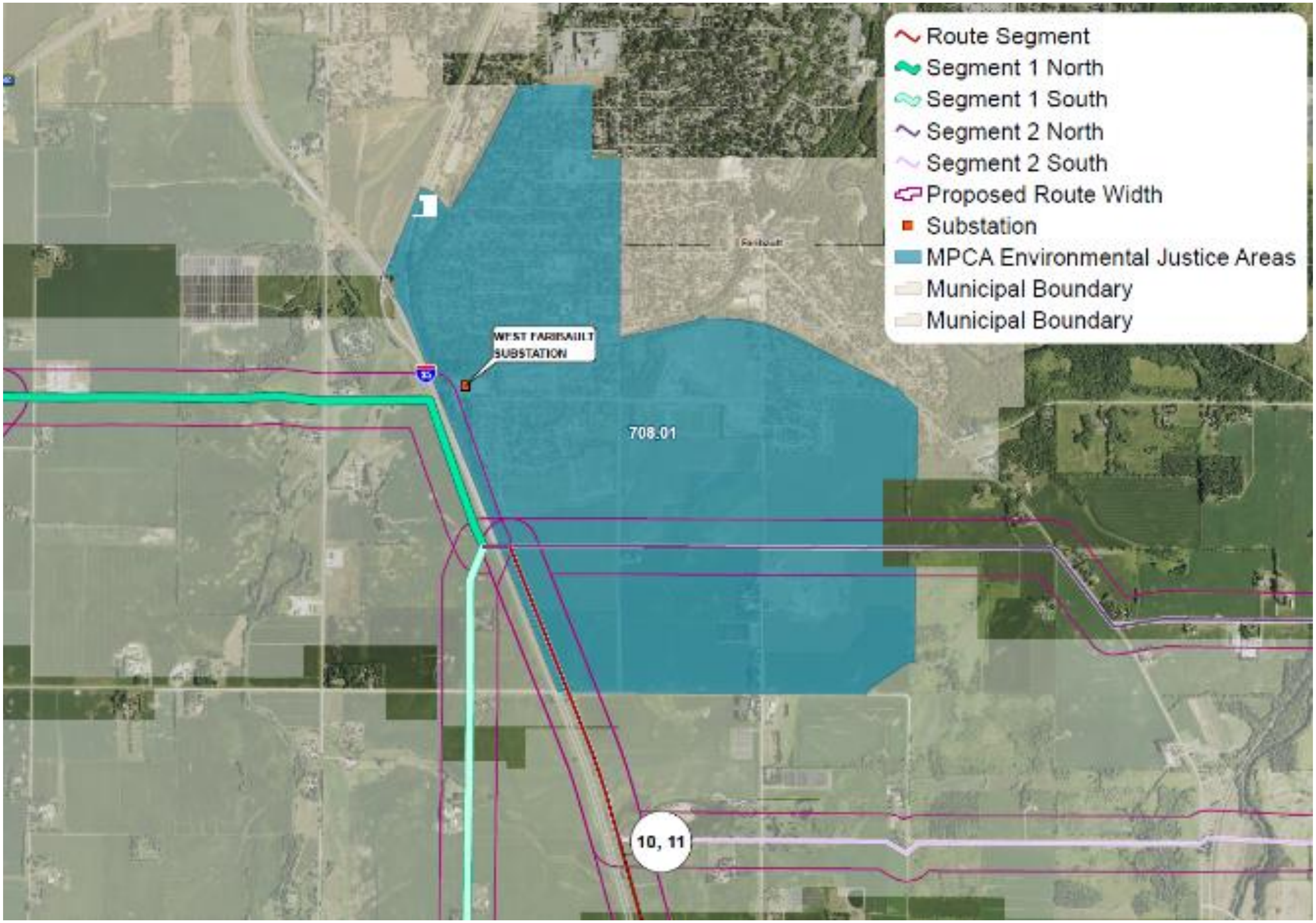
6.5.4.1.1 Minnesota Pollution Control Agency Areas of Concern Analysis

The MPCA's EJ Proximity Analysis tool is an online mapping tool that uses census data to identify areas for meaningful community engagement and additional evaluation for disproportionate effects from pollution (reference (35)). The tool identifies EJ areas of concern using the following four criteria, which align with the definition of an environmental justice area in Minnesota Statutes § 216B.1691, subdivision 1(e):

1. 40 percent or more of the area's total population is nonwhite
2. 35 percent or more of households in the area have an income that is at or below 200 percent of the federal poverty level
3. 40 percent or more of the area's residents over the age of five have limited English proficiency
4. The area is located within Indian country, as defined in United States Code, title 18, section 1151

Using the above criteria, Census Tract 708.01 (Figure 6-2) in Rice County was identified as an EJ area of concern within the ROI because around 41.5 percent of the population identifies as a person of color. Census Tract 708.01 is crossed by Segment 2 North and Segment 2 South. There are no census tracts within the ROI with federally recognized Tribal lands.

Figure 6-2 Census Tract 708.01 EJ Area of Concern



6.5.4.2 Potential Impacts

Disproportionate impacts to census tract 708.1 would not be anticipated. Segment 2 North could be double-circuited with an existing 161 kV line where the anticipated alignment occurs within census tract 708.1. Segment 2 South's ROI intersects the census tract, but the anticipated alignment is outside of the tract. Generally, there is already existing transmission line infrastructure in the area.

6.5.4.3 Mitigation

As described in Section 2.4.2, several public meetings have been held in the counties the project crosses. There are upcoming meetings scheduled to occur throughout the process. The applicant initiated an outreach campaign in 2023 to Tribal contacts and federal, state, and local agencies through in-person meetings and project notification letters. The applicant met with tribal government contacts and state and local agencies as part of the outreach program for the project.

Meetings that were held near the EJ areas of concern included a scoping meeting held on July 9th, 2024, in Faribault, which is within census tract 708.1.

No EJ impacts are anticipated; therefore, no additional mitigation is proposed at this time.

6.5.5 Land Use and Zoning

The ROI for land use and zoning is the ROW. If a route permit is issued, it would supersede and preempt zoning restrictions, building, or land use rules. However, to assess human settlement impacts, potential land use and zoning impacts are addressed by evaluating the project against local land use and zoning ordinances. Impacts to planning and zoning are anticipated to be minimal and can be avoided through selection of alternatives.

6.5.5.1 Existing Conditions

Minnesota authorizes counties and cities to create their own zoning ordinances to implement and work in conjunction with their comprehensive plans. Zoning is a method to regulate the way land is used and create patterns in the way they are used. Zoning is a regulatory device used by local governments to geographically restrict or promote certain types of land uses. Minnesota Statutes provide local governments with zoning authority to promote public health and general welfare.

This project is subject to Minnesota's Power Plant Siting Act (Minnesota Statute § 216E.10). Under this Statute, the route permit issued for a transmission line "shall be the sole site or route approval required to be obtained by the utility. Such permit shall supersede and preempt zoning restrictions, building or land use rules, regulations or ordinances promulgated by regional, county, local and special purpose government." Therefore, the applicant is not required to seek permits or variances from local governments to comply with applicable zoning codes. Nonetheless, impacts to local zoning can clearly impact human settlements, and the Commission considers impacts to human settlements as a factor in selecting transmission line routes.

Publicly available zoning information was reviewed for each county and municipality crossed by the route alternatives. Segment 2 has two counties within its ROI, including Rice and Goodhue. Map 27 shows the zoning district data that was gathered for the project.

6.5.5.1.1 Rice County Plan and Ordinances Analyses

The Rice County 2040 Comprehensive Plan was adopted in 2021. Its vision statement is a long-range, big picture portrayal of its desired future: "As Rice County grows and evolves into the future, we will support and encourage orderly growth and a diverse economy that will continue to create jobs and a high quality of life for our citizens. We will aspire to maintain the small town feel of our cities and preserve our agricultural heritage" (reference (49)). The Rice County Zoning Ordinance was last amended in January of 2024. The zoning districts in the county include agricultural, urban reserve, rural residential, village mixed-use, village planned unit development, highway commercial, limited industrial, rural industrial, shoreland, shoreland planned unit developments, urban reserve-industrial, and wild & scenic river (reference(50)).

The city of Faribault's Comprehensive Plan states the vision states that as a community, they "embrace the future and plan for positive change through our commitment to innovation and excellence, making Faribault an outstanding place to live, work, grow, invest, and visit" (reference (202)). The Unified Zoning Code details the residential, commercial, industrial, special, and overlay districts. Special districts include the agriculture-open space district and transitional urban development district. The overlay districts include floodplain management, heritage preservation, airport, shoreland management, and planned unit development districts (reference (203)). Segment 2 North would go through the agriculture/open space and residential districts. Segment 2 North and Segment 2 South starting points are around 22,000 feet away from the Faribault Municipal Airport property (Section 6.5.10.4).

6.5.5.1.2 Goodhue County Plan Analysis

The Goodhue County 2016-2040 Comprehensive Plan provides general guidelines to help manage growth and land use changes, and to promote sound management of the land and water resources within the County (reference (204)). The county's shared vision includes planning for stability and modest growth, being aware of continued conversion of agricultural land to rural housing and environmental challenges associated with intense land uses and water resources. The Goodhue County Zoning Ordinance includes provisions for the following zoning districts: agricultural, agricultural protection, urban fringe, suburban residence, mixed-use hamlet, business industry, wild and scenic river, commercial recreational, floodplains, parks and trails, and conservation subdivision (reference (205)). The project travels primarily through the agricultural protection zoning district. Segment 2 North borders urban fringe districts by Kenyon and Wanamingo, and Segment 2 North and Segment 2 South both end within an urban fringe district north of Pine Island.

6.5.5.2 Potential Impacts

Transmission line and substation projects have the potential to be incompatible with existing land use patterns, local zoning requirements, and the future land use planning of local governments.

Construction and operation of the project is not expected to have significant impact on land use within the counties crossed by the route alternatives.

Existing land uses along the HVTL would experience short-term impacts during the period of construction. When transmission line construction is complete, project workspaces would be restored as described in Section 3.4.5. Land uses which are consistent with the safe and reliable operation of the project would be allowed to continue as before.

Within the ROI the project predominantly crosses areas zoned as agricultural in both Rice County (around 83 percent) and Goodhue County (around 99 percent). Transmission lines and substations are typically either permitted or conditional uses in areas zoned as agricultural, and transmission lines and substations currently exist in some of these areas. In places where the project crosses sensitive environmental features, such as larger perennial watercourses, shoreland and floodplain districts or overlays are crossed as well.

The project passes through scenic river, shoreland, and floodplain management districts throughout the counties. Minnesota Statute § 103F defines protection of water resources, including floodplain management, wild and scenic rivers, and shoreland areas, and describes limitations on uses and locations of structures in those areas. These limitations are established through special land use provisions to maintain and restore the natural beauty and attractiveness of shoreland and to provide environmental protection for the water resources. These overlay districts were established to protect and enhance shoreland and floodplain areas by establishing additional restrictions and requirements for development and use of these resources. Currently, construction details for the project and exact locations of structures and associated facilities are not known. The project would be designed to span waterbodies and floodplains where practicable and to minimize the number of structures in surface water resources where these resources cannot be spanned. Furthermore, no impacts to the overall function of watersheds are expected. Any impacts that might occur from installation of structure foundations would be minimal and localized. The placement of transmission line structures in floodplains is not anticipated to alter the flood storage capacity of the floodplain based on the minimal size of individual transmission line structures.

A few smaller pockets of commercial and industrial zoning areas are crossed by the project, in particular where the project routes near municipalities. Transmission lines and substations are typically either permitted as conditional use in areas zoned as industrial or commercial because these facilities are similar to other infrastructure in industrial and commercial areas.

Based on review of the zoning information for the counties crossed by each route alternative, the likelihood of future residential, commercial, or industrial development within the route alternatives is generally low. Segment 2 North would go through the urban reserve district in Rice County, just outside of the city limits of Faribault. The purpose of this district is to implement urban growth zones where municipal infrastructure is likely to expand by reserving large tracts for future development. It supports and encourages orderly growth and development as guided by the Rice County Comprehensive Plan (reference (50)). In Goodhue County, Segment 2 North would go through the urban fringe district outside of the city of Kenyon and the city of Wanamingo. The purpose of the urban fringe district is to provide for urban expansion in close proximity to existing incorporated urban centers within Goodhue County. This is done by conserving land for farming and other open space land uses for a period of time until urban services become available (reference (205)). Elsewhere, the project is not anticipated to be inconsistent with authorized uses within the affected zoning districts crossed by any route alternative or be incompatible with future land use planning goals of local governments.

6.5.5.3 Mitigation

The sample route permit does not include mitigation measures specific to land use and zoning. Section 1.1 of Appendix H states: "Pursuant to Minn. Stat. § 216E.10, this route permit shall be the sole route approval required for construction of the transmission facilities and this route permit shall supersede and preempt all zoning, building, or land use rules, regulations, or ordinances promulgated by regional, county, local and special purpose governments."

Project impacts to zoning and to current and future land uses can be mitigated by selecting route alternatives that are compatible, to the extent possible, with community zoning and land-use plans. Land-use impacts can be mitigated by minimizing aesthetic impacts of the project, to the extent that zoning and land-use plans address aesthetics (for example, landscaping). Land-use impacts can also be mitigated by using existing ROW to the maximum extent possible. The proposed transmission line is generally compatible with local planning and zoning ordinances. Impacts to planning and zoning are anticipated to be negligible.

6.5.6 Noise

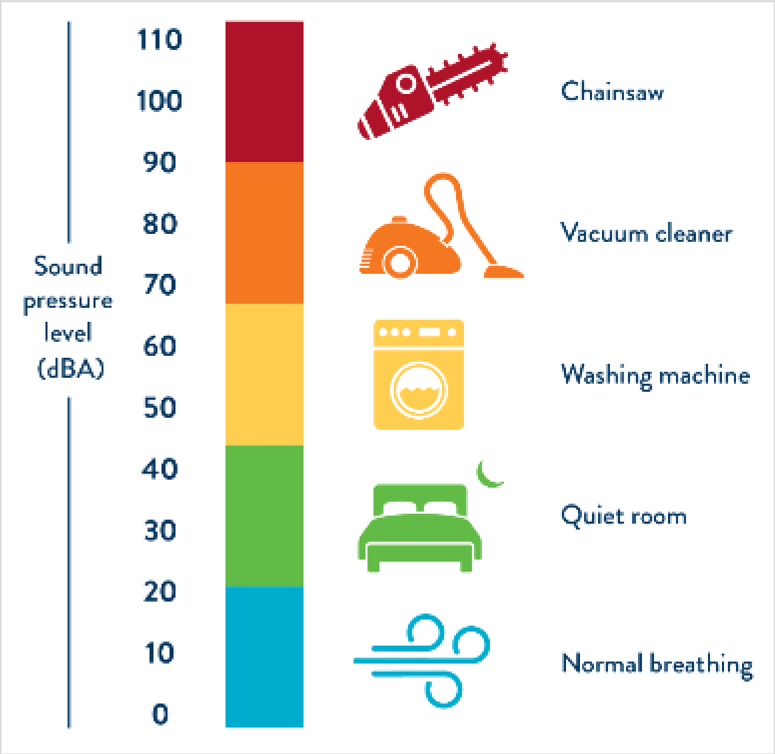
The ROI for noise is the local vicinity. Short-term noise impacts would occur during construction. Impacts would be minimal, and the applicant would be required to comply with state noise standards. Noise impacts during operation would be negligible except for perceptible noise impacts, particularly during periods of foggy, damp, or light rain conditions. Operation of the project would meet state noise standards. Impacts would be minimized by selecting the route with the fewest receptors nearby; receptors are quantified as part of the aesthetics assessment.

Noises from the project are associated with construction and operation. Noise created by construction activities is anticipated to be minimal for all route alternatives. Construction activity would occur during a specified time during the day, and only at a specific portion of the project for a few days to weeks at a time over the course of 24 to 27 months. Impacts are expected to be compliant with state noise standards.

6.5.6.1 Existing Conditions

Noise levels are measured in units of decibel (dB) on a logarithmic scale and can be used to compare a wide range of sound intensities. Human hearing is not equally sensitive to all frequencies of sound, so certain frequencies are given more weight. The A-weighted decibel scale (dBA) scale accounts for the sensitivity of the human ear. It puts more weight on the range of frequencies that the average human ear perceives, and less weight on those we don't, like higher or lower frequencies. An increase of 10 dBA sounds twice as loud, due to the way that the logarithmic scale functions in compressing the measurements associated with sounds (reference (52)). Figure 5-4 illustrates common noise levels at various levels of the dBA scale.

Figure 6-3 Common Activity Noise Levels



The MPCA has the authority to adopt noise standards pursuant to Minnesota Statute § 116.07, subpart 2. The adopted noise standards are set forth in Minnesota Rule 7030, which sets noise limits for different land uses (Table 6-5). These land uses are grouped by NAC and are separated between the daytime and nighttime noise limits. Residences are classified as NAC -- 1 and have the lowest noise limits of the four NACs. A complete list of all land use designations assigned to the NAC categories is available at Minnesota Rule 7030.0050. All project noises must comply with the MPCA noise standards (Table 6-5). The noise standards specify the maximum allowable noise volumes that may not be exceeded for more than 10 percent of any hour (L_{10}) and 50 percent of any hour (L_{50}) (reference (52)).

Table 6-5 Minnesota Noise Standards

	Daytime Limit (dBA)	Daytime Limit (dBA)	Nighttime Limit (dBA)	Nighttime Limit (dBA)
	L_{10}	L_{50}	L_{10}	L_{50}
NAC – 1: Residential and Other Sensitive Uses	65	60	55	50
NAC – 2: Non-Residential Uses (typical Commercial)	70	65	70	65
NAC – 3: Non-Residential Uses (typical Industrial, Agricultural)	80	75	80	75
NAC – 4: Undeveloped Uses	NA	NA	NA	NA

Source: reference (1)

The project is primarily in rural areas, with some portions in more developed areas. Background noise has the potential to be higher in the more populated areas of the project. Rural areas without significant noise might be in the 30 to 40 dBA range, while noise could be in the 40 to 50 dBA range in more developed portions of the project (reference (53)). Portions of the route parallel existing highways which may further elevate near-field noise levels depending on traffic load. The primary noise receptors within the project area are residences and farmsteads, which are classified as NAC – 1.

For most of the project, ambient noise levels are in the range of 30 to 50 dBA, with temporary, higher noise levels associated with wind, vehicular traffic, and the use of gas-powered equipment (for example, tractors or chainsaws). Community noise levels are usually closely related to the intensity of human activity. Noise levels are generally considered low when below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. In rural areas, noise levels can be below 35 dBA. In small towns or wooded and lightly used residential areas, noise levels are more likely to range from 40 to 50 dBA. Levels around 75 dBA are more common in busy urban areas, and levels up to 85 dBA occur near major freeways and airports.

6.5.6.2 Potential Impacts

6.5.6.2.1 Construction Noise

During project construction, temporary, localized noise from heavy equipment and increased vehicle traffic is expected to occur along the ROW during daytime hours during implementation of the project. HVTL 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. Substation noise would be localized and present at a particular location from start to end. Major noise-producing activities are associated with clearing and grading, material delivery, augering foundation holes, setting structures, and stringing conductors.

Noise associated with heavy equipment can range between 80 and 90 dBA when operating at full power 50 feet from the source (reference (206). Heavy equipment generally runs at full power up to 50 percent of the time. Point source sounds decrease six dBA at each doubling of distance (reference (52));

therefore, a 90 dBA sound at 50 feet is perceived as a 72 dBA sound at 400 feet and a 60 dBA sound at 1,600 feet.

Construction noise could reach levels above the state thresholds for short intervals at select times and locations. Any periods of sufficient duration to exceed the MPCA daytime noise limits would be temporary in nature and no exceedances of the MPCA nighttime noise limits are expected for the project. Construction noise could temporarily affect residences, schools, businesses, libraries, parks, recreational areas, and related public spaces that are close to the ROW. An exceedance of noise standards need not occur for a negative impact to occur. For example, interference with conversational speech typically begins at about 60 dBA (reference (55)). A 70 dBA sound interferes with telephone conversations, and an 80 dBA sound interferes with normal conversation. Distinct noise impacts during construction are anticipated to be minimal to moderate depending on proximity to receptors, the activity occurring, and equipment being used. Construction noise impacts will be temporary, localized, and intermittent.

6.5.6.2.2 Transmission Line Noise

Noise from transmission lines (electrical conductors) is due to small electrical discharges which ionize surrounding air molecules. The level of noise from these discharges depends on conductor conditions, voltage levels, and the weather conditions. Noise emissions are greatest during heavy rain events when the conductors are consistently wet. However, during heavy rains, the background noise level is usually greater than the noise from the transmission line. As a result, audible noise is typically not noticeable during heavy rains. In foggy, damp, or light rain conditions, transmission lines might produce audible noise higher than background levels. During dry weather, noise from transmission lines is a perceptible hum and sporadic crackling sound. The noise modeling for the proposed transmission line indicates that the noise generated by the project will not exceed the most stringent MPCA noise standards of NAC-1 at the edge of the ROW. Therefore, no mitigation is proposed.

6.5.6.2.3 Substation Noise

Transformers and switchgear operation are the common noises associated with a substation. Noise emissions from this equipment have a tonal character that often sounds like a hum or a buzz that corresponds to the frequency of the alternating current (AC). Transformers produce a consistent humming sound, resulting from magnetic forces within the transformer core. This sound does not vary with transformer load. Switchgear produces short-term noises during activation of circuit breakers; these activations are infrequent. The applicant indicates that the substations will be designed such that noise levels would be compliant with Minnesota noise standards at the substation boundary. Accordingly, substation noise levels are anticipated to be within Minnesota noise standards (that is, < 50 dBA and NAC-1) at the nearest receptor(s).

6.5.6.3 Mitigation

The sample route permit (Section 5.3.6 of Appendix H) contains the following mitigation related to noise: “The Permittee shall comply with noise standards established under Minnesota Rules 7030.0010 to 7030.0080. The Permittee shall limit construction and maintenance activities to daytime working hours to the extent practicable."

Sound control devices on vehicles and equipment, for example, mufflers; conducting construction activities during daylight hours, and, to the greatest extent possible, during normal business hours; and running vehicles and equipment only when necessary are common ways to mitigate noise impacts. Impacts to state noise standards can be mitigated by timing restrictions if needed. During operation, permittees are required to adhere to noise standards. No additional mitigation is proposed.

6.5.7 Property Values

The ROI for property values is the local vicinity. Property values are impacted by many interconnected factors. If effects do occur due to transmission lines and substations, research has shown these effects to be almost always less than 10 percent. Impacts are anticipated to be minimal. However, it is acknowledged that every landowner has a unique relationship and sense of value associated with their property and impacts. Impacts of the project would be minimized by selecting the route with the fewest residences nearby; residences are quantified as part of the aesthetics assessment.

6.5.7.1 Existing Conditions

The ROI for property values is the local vicinity. Residences located within the local vicinity of Segment 2 are summarized in the aesthetics impact analysis (Section 6.5.1). Map 28 includes residence locations within the route width of the route alternatives; they are also shown in Map 26. For a general sense of the number of residences within the ROI, Segment 2 North has more than 200 residences within the ROI (Figure 6-1) and Segment 2 South has more than 60 residences within the ROI (Figure 6-1).

6.5.7.2 Potential Impacts

Potential impacts of overhead transmission lines on property values are generally connected to three main factors. First, how the transmission line affects the viewshed and aesthetics of a property. Second, the real or perceived risks that buyers have of EMF. Third, the effects to agricultural production on properties that are used for farming operations. The aforementioned factors are only some of the many interconnecting factors that affect property values. Because of this, it is difficult to measure how much and the numerous ways that transmission lines and property values are correlated.

A variety of methodologies have been used to research the relationship between transmission lines and property values. Some general conclusions can be drawn from this body of literature. This discussion highlights relevant outcomes of property value research with additional detail provided in Appendix I.

Research does not support a clear cause-and-effect relationship between property values and proximity to transmission lines, but has revealed trends that are generally applicable to properties near transmission lines:

- When negative impacts on property values occur, the potential reduction in value is in the range of one to 10 percent.

- Property value impacts decrease with distance from the line; thus, impacts are usually greater on smaller properties than on larger ones.
- Negative impacts 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 greater effect on sale price than the presence of a transmission line.
- The value of agricultural property decreases when transmission line structures interfere with farming operations.

Every landowner has a unique relationship and sense of value associated with their property. Thus, a landowner's assessment of potential impacts to their property's value is often a deeply personal comparison of the property "before" and "after" a proposed project is constructed. These judgments, however, do not necessarily influence the market value of a property. Rather, appraisers assess a property's value by looking at the property "after" a project is constructed. Moreover, potential market participants likely see the property independent of the changes brought about by a project; therefore, they do not take the "before" and "after" into account the same way a current landowner might.

6.5.7.3 Mitigation

The sample route permit does not include any specificity around mitigation required for property values.

The applicant would be responsible for any construction-related damages and for returning affected property to its original condition, which would help maintain property value. As discussed in Section 3.3.2, for properties crossed by the ROW, the applicant would develop a fair market value offer and once ROW is acquired, would contact the landowner to discuss any special considerations that might be needed (for example, for fences, crops, or livestock). Impacts could also be mitigated by using the protections offered through Minnesota Statute § 216E.12 (commonly known as the "Buy the Farm" statute), where available, to move away from potential property value impacts.

6.5.8 Recreation

The ROI for recreation is the route width. Impacts to recreation are assessed through identification of recreational resources within the ROI and reviewing their use and proximity to the anticipated alignment in comparison to other features that are a part of the natural or built environment. Recreational resources that are present include public watercourses (including a designated state water trail), snowmobile trails, and a private golf course. Intermittent and localized indirect impacts could occur during construction (for example – increased noise levels); long-term impacts during operation could occur in the form of aesthetic impacts (Section 6.5.1). Given that direct long-term effects are predominantly related to aesthetics, the indirect long-term repercussions on recreation are anticipated to be subjective, meaning that responses vary based on individual perspectives and experiences.

6.5.8.1 Existing Conditions

Recreation within Segment 2's ROI consists primarily of outdoor recreational opportunities including picnicking, hiking, cross-country skiing, biking, bird watching, fishing, hunting, canoeing/kayaking, and snowmobiling. Publicly accessible recreational areas within the ROI are summarized in Table 6-6, shown in Map 23, and further discussed below. Additional recreational resources that are near Segment 2 but outside of the ROI include: Fall's Creek Park and Nielsen Memorial Preserve (Map 23-1 and Map 23-2). Publicly accessible lands that may be used for recreational purposes but also serve to provide wildlife habitat are discussed further in Section 6.9.12. Within Segment 2 North and Segment 2 South's ROI, this includes one WMA.

Table 6-6 Recreational Resources within the ROI

Recreational Resource Type	Recreational Resource	Unit	Segment 2 North	Segment 2 South
State Water Trails	Straight River	crossing count	1	1
		linear feet	1,055	1,116
Snowmobile Trails	Faribo-Sno-Go Trails	miles	2.6	0.2
	Goodhue County Trails	miles	5.4	1.2
	Total snowmobile trails	miles	8.0	1.4
Golf Course	Straight River Golf Course	crossing count	0	1

Watercourses provide opportunities for recreation throughout the project area. Some watercourses hold special designations, such as state water trails and national or state wild and scenic rivers. State water trails are miles of waters publicized for canoeing, kayaking, and camping (reference (60)). The Straight River is designated as a state water trail. It is located east of the West Faribault Substation. Segment 2 North and Segment 2 South both cross the Straight River once (Map 23-1). There are no existing transmission lines at either crossing.

Several snowmobile trails are located within the ROI (Table 6-6; Map 23). The trails are maintained by the Faribo Sno-Go Club and Zumbrota Covered Bridge Riders.

One private recreational facility, the Straight River Golf Course, is within the ROI of Segment 2 South. The anticipated alignment of Segment 2 South crosses through the golf course (Map 23-1).

6.5.8.2 Potential Impacts

Effects on recreation due to construction of the project are anticipated to be minimal and temporary in nature, lasting only for the duration of construction and are anticipated to include short-term disturbances, such as increased noise and dust, as well as visual impacts. Construction activities also could, depending on the timing, affect nearby hunting or wildlife viewing opportunities in public spaces by temporarily displacing wildlife. Wildlife, however, is expected to return to the area once construction has been completed.

Once constructed, the project would result in modified viewsheds or new visual impacts caused by new built features introduced to the landscape which could change the aesthetic of a recreational destination in a way that changes the experience or reduces visitor use. Because direct long-term impacts are primarily aesthetic in nature, indirect long-term impacts to recreation are expected to be subjective and unique to the individual. These unavoidable impacts might affect unique resources. Potential impacts can be minimized through prudent routing. Visual impacts are discussed in Section 6.5.1. While visual impacts would occur, the project is not anticipated to impede recreational activities, such as snowmobiling, golfing, canoeing, hunting, or fishing.

The physical structures of Segment 2 South that would cross through to the Straight River Golf Course would impact the functional use of the golf course resulting in a permanent impact. Aesthetic and functional impacts could decrease the recreational value of the golf course.

6.5.8.3 Mitigation

Impacts to recreation can be mitigated by prudent routing and/or selecting route alternatives that avoid resources used for recreational purposes. The applicant would be required to coordinate with the Straight River Golf Course should Segment 2 South be selected.

6.5.9 Socioeconomics

The ROI for socioeconomics is the two-county area. Impacts are qualitatively assessed based on the influx of workers during construction activities. Economic factors related to construction and operation of the project are anticipated to be short-term and positive, but minimal. Positive impacts come from increased expenditures at local businesses during construction, the potential for some materials to be purchased locally, and the use of local labor.

6.5.9.1 Existing Conditions

Segment 2 is in southeastern Minnesota. Labor force and unemployment data was used from the 2019-2023 American Community Survey, 5-Year Estimates from the US Census Bureau and the Minnesota Department of Employment and Economic Development. Table 6-7 shows the compiled population and economic data on Minnesota and the counties that Segment 2 North and Segment 2 South intersect. These include Rice and Goodhue Counties.

Table 6-7 Population, Income, and Employment

	Minnesota	Rice County	Goodhue County
Population	5,024,279	47,844	67,389
Population Density (population/sq. miles)	71.7	92.7	86.4
Labor Force Participation (%)	68.7	64.9	61.6
Labor Force	4,537,247	25,038	35,272
Labor Force Unemployment Rate (%)	4.0	2.3	3.0
Per Capita Income	44,947	42,254	38,276
Median Household Income	84,313	82,749	82,792

The population of Goodhue County is slightly larger than Rice County. At the county level, change in population between the 2010 and 2020 census ranged from a growth rate of 2.9 percent in Goodhue County to 4.6 percent in Rice County (references (207); (208)). The labor force unemployment rate in Segment 2 is slightly larger in Goodhue County (3.0 percent) than in Rice County (2.3 percent). At the county level, change in population between the 2010 and 2020 census ranged from a growth rate of 2.9 percent in Goodhue County to 4.6 percent in Rice County (references (207); (208)). The labor force unemployment rate in Segment 2 is slightly larger in Goodhue County (3.0 percent) than in Rice County (2.3 percent). Rice County's unemployment rate is below, while Goodhue County's unemployment rate is above the state of Minnesota (2.7 percent). Per capita income between counties is very similar, with only a 4,000-dollar difference, while the median household income is almost identical. The population of Goodhue County is slightly larger than Rice County.

According to the 2018-2022 American Community Survey, 5-Year Estimates from the US Census Bureau, both county's largest industry in terms of employment is "educational services, health care and social assistance." "Manufacturing" is the second largest industry in terms of employment in both counties, further showing the emphasis on the expansive healthcare and manufacturing industries in the southeastern portion of Minnesota.

6.5.9.2 Potential Impacts

Potential socioeconomic impacts would be short-term due to the time frame of construction (2-3 years). An influx of construction jobs and personnel, delivery of construction material, temporary housing, and other purchases from local businesses will occur during that time. Slight increases in retail sales in the project area are expected. These would include purchases of lodging, food, fuel, construction materials, and other merchandise. No long-term impacts are expected in transmission line and substation projects.

Construction of the transmission line would employ approximately 50-100 workers over the 2-3 years of the project, per the route permit application. The applicant committed in the route permit application to pay prevailing wages for applicable construction jobs. Local construction crew expenditures would result in temporary, positive impacts on local economies.

Workers would likely be commuting to the area instead of relocating to the project area. Construction workers traveling to the area might find temporary housing over the span of the project, but this might move with construction along the project area. The construction and operation of the project is not anticipated to create or remove jobs over the long-term or result in the permanent relocation of individuals to the area.

6.5.9.3 Mitigation

Adverse impacts are not expected; therefore, mitigation is not proposed.

6.5.10 Transportation and Public Services

The ROI for transportation and public services varies. For roadways and rail, the ROI is the local vicinity. For public utilities, the ROI is the ROW. For emergency services, the ROI is the two-county area. For airports, the ROI is within 3.78 miles. Impacts are expected to primarily be related to construction activities and would be short-term and minimal. Negative impacts, such as traffic delays, should be negligible. Long-term impacts to public services are also anticipated to be minimal. Impacts are unavoidable but can be minimized and mitigated.

6.5.10.1 Roadways and Railways Existing Conditions

In addition to numerous other county, city, and township roads, Segment 2 is located adjacent to or crosses the below-listed US highways and MN highways.

- Interstate 35, which Segment 2 North and Segment 2 South both cross once.
- Segment 2 North is parallel to it for 0.5 miles.
- Segment 2 South is parallel to it for 1.1 miles.
- MN Highway 56, which Segment 2 North and Segment 2 South both cross once.
- MN Highway 57, which Segment 2 North and Segment 2 South both cross once.
- MN Highway 60, which Segment 2 North crosses 16 times and is parallel to it for 11 miles.

Segment 2 North would cross the Owatonna subdivision of the DME railroad and the Albert Lea subdivision of the Union Pacific (UP) railroad (Map 25).

6.5.10.2 Public Utilities Existing Conditions

Electric utilities near the project are provided by numerous entities (reference (64)), including:

- Northern States Power Company
- Dakota Electric Association
- Benco Electric Cooperative
- Minnesota Valley Electric Cooperative
- Steele Waseca Cooperative Electric

- Goodhue County Coop Elec Assn
- Lake City Public Works
- Kenyon Municipal Utilities

Natural gas service in the project area is provided by Invenergy and Minnesota Municipal Power Agency. Segment 2 North crosses three separate interstate Northern Natural Gas Co. pipelines and Segment 2 South crosses two interstate Northern Natural Gas Co. pipelines.

Potable water in Segment 2 is largely supplied by local wells. Near urban areas, primarily within municipalities, water mains and other public utilities are provided. Rice and Goodhue Counties have septic programs that conduct inspection services, issue permits, and oversee installation and maintenance of private septic systems and wells in Segment 2. Public works and utility departments design, construct, and maintain sanitary sewers, streets and sidewalks, storm sewers, and water mains.

6.5.10.3 Emergency Services Existing Conditions

Emergency services in Segment 2's ROI are provided by local law enforcement and emergency response entities, fire departments, and ambulance services of various counties and communities. Sheriffs' offices and municipal police departments provide regional law enforcement to Rice and Goodhue counties and their respective cities in Segment 2 of Faribault, Kenyon, Zumbrota, and Wanamingo. Fire departments would provide emergency fire response services in Segment 2. Fire services are provided by city and community fire departments in Faribault. Kenyon, Zumbrota, and Wanamingo have volunteer fire departments. Ambulance districts provide emergency medical response services throughout Segment 2. Emergency medical response is available from local hospitals. Emergency services within the ROI are provided by:

- Faribault Police
- Rice County Sheriff's Office
- Kenyon Police Department
- Zumbrota Police Department
- Faribault Fire Department
- Kenyon Volunteer Fire Department
- Wanamingo Fire and Rescue
- Zumbrota Volunteer Fire Department
- Faribault Clinic – Northfield Hospital & Clinics
- Allina Health – Faribault Clinic, Medical Center, and Emergency Department
- District One Hospital
- Olmsted Medical Center – Wanamingo

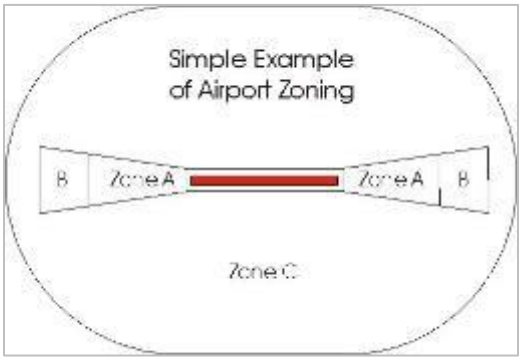
6.5.10.4 Airports Existing Conditions

Transmission line structures and conductors can conflict with the safe operation of an airport if they are located within applicable safety zones. Airports are defined by the state and the Federal Aviation Administration (FAA) as areas of land or water that are used or intended to be used for the landing and takeoff of aircraft, and includes the surrounding area used or intended to be used for airport buildings and facilities (14 C.F.R. Part 1, § 1.1 and Minnesota Rules 8800.0100, subpart 3). Different classes of airports have different safety zones depending on several characteristics, including runway dimensions, classes of aircraft they can accommodate, and navigation and communication systems (reference (65)). These factors determine the necessary take-off and landing glide slopes, which in turn determine the setback distance of transmission line structures.

The FAA and MnDOT have each established development guidelines on the proximity of tall structures to public-use airports. Transmission lines near public airports are limited by FAA height restrictions, which prohibit transmission line structures above a certain height, depending on the distance from the specific airport. Federal Aviation Regulation (FAR) Part 77 and Minnesota Rules 8800.1200 establish guidelines on heights for any structures that could endanger aircraft, which includes either structures exceeding 200 ft AGL or the airport elevation, whichever is greater. These guidelines impose stricter regulations for structures within a maximum distance of 20,000 ft (3.78 miles) of a public use or military airport. Regulatory obstruction standards only apply to those airports that are available for public use and are listed in the FAA airport directory. Per Minnesota Rules 8800.2400, private airstrips and personal use airstrips cannot be used in commercial transportation or by the public and are not subject to FAA regulatory obstruction standards.

In addition, MnDOT has established separate zoning areas around airports as shown in Figure 6-4. The most restrictive safety zones are safety zone A, which does not allow any buildings, temporary structures, places of public assembly, or transmission lines, and safety zone B, which does not allow places of public or semi-public assembly such as churches, hospitals, or schools. Permitted land uses in both zones include agricultural uses, cemeteries, and parking lots. Safety zone C, the horizontal airspace obstruction zone, encompasses all land enclosed within the perimeter of the imaginary horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs of specified radii (5,000 to 10,000 feet) from the center of each end of the primary surface of each runway, and which is not included in zone A or zone B. As with FAA regulations and per Minnesota Rules 8800.2400 subpart 1, MnDOT zoning requirements only apply to public airports and are recommended for private airports (reference (66)).

Figure 6-4 MnDOT Example of Airport Zoning



Source: reference (67))

There are no public airports within 20,000 feet of Segment 2; Segment 2 North and Segment 2 South starting points are around 22,000 feet away from the Faribault Municipal Airport property. The Faribault Municipal Airport is at an elevation of 1,051 ft ASL at its lowest and 1,060 ft ASL at its highest. This airport has two airstrips, 37 private hangars, and 25 city-owned T-hangars that accommodate single-engine planes, multi-engine planes, helicopters, and gliders.

In addition to public airports, Minnesota Rules 8800.1200 also establishes height restrictions applicable to public heliports in subpart 6. There is one heliport (Heliport ID MN59) at the District One Hospital in the city of Faribault, located within the ROI. This heliport is located 9,821 feet from Segment 2 North and 15,048 feet from Segment 2 South. The project ROW would be outside where structures may be considered general obstructions.

6.5.10.5 Potential Impacts

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

Construction could cause moderate, localized impacts to roadways that would be short-term in nature. Construction activities occasionally cause lanes or roadways to be closed. These closures would only last for the duration of the construction activity in a given area. Construction equipment and delivery vehicles would increase traffic along roadways throughout project construction, with effects lasting from a few minutes to a few hours, depending upon the complexity and duration of the construction activities. Drivers could experience increased travel times as a result. Construction vehicles could temporarily block or alter public access to streets and businesses. Lane closures and traffic management might pose safety concerns to workers and the public as active traffic and workers move throughout the construction space. Additionally, construction along roadways can increase dust as grading occurs, which can obscure road lines or vision.

Vehicles and equipment that would be used for construction of the transmission line (for example, overhead line cranes, concrete trucks, construction equipment, and material delivery trucks) are generally heavy load vehicles and can cause more damage to road surfaces. Oversized/overweight load permits must be obtained from MnDOT and county road authorities when size and/or weight limits would be exceeded.

During operation, severe weather, including high winds, ice, snowstorms, and tornadoes, could result in structure damage. If structures and lines fall over or otherwise reach the ground, they would create safety hazards on any roadways located within the designed fall distance of an overhead transmission line parallel to existing roadways. Snow and ice accumulation and high winds could make the transmission line more susceptible to failure or collapse.

The applicant indicated that its design standards would meet or surpass NESC requirements for the safe design and operation of transmission lines. These standards include designing transmission lines to withstand severe winds from summer storms and the combination of ice and strong winds from winter weather.

Potential impacts to railways would be limited to short-term construction impacts and would be coordinated directly with the railroad operator. Impacts of stringing HVTL lines and maintenance of structures can include delays and safety concerns as trains are temporarily rerouted or crossings are postponed. Safety measures would be implemented during active construction around railroads. Construction workers would maintain regular contact with railroad personnel as electrical conductor stringing occurs over spanned rail lines to ensure appropriate safety standards are maintained throughout construction and operation. Negligible impacts during operation would be anticipated to railroads.

Potential impacts to the electrical grid and other utilities during construction are anticipated to be short-term, intermittent, and localized. In some areas, the project could cross over existing transmission lines, follow existing transmission line ROW or cross or parallel electric distribution lines. An overarching project objective is to provide additional transmission capacity to reduce congestion and to improve electric system reliability throughout the region as more renewable energy resources are added to the high-voltage transmission system. Project operations would, therefore, have long-term beneficial impacts by providing additional transmission line capacity in the project area.

The project crosses pipeline ROWs in several locations in Segment 2. Potential pipeline impacts are expected to be avoided and mitigated by coordinating with the appropriate pipeline companies. The applicant indicated that they would use the Gopher State One-Call system to locate and mark underground utilities prior to ground disturbing activities. Transmission lines have the ability to cause AC interference on pipelines. Engineering analysis and induction study can be done to determine the extent of possible impacts and determine if co-location is feasible and reasonable.

The project is not anticipated to impact emergency services. Construction and operation of the project is not expected to impact heliports operating from hospitals. Temporary road closures required during construction would be coordinated with local jurisdictions to provide for safe access of police, fire, and other emergency service vehicles. Accidents that might occur during construction would be handled through local emergency services. Given the limited number of construction workers involved in the project and the low probability of a construction-related accident, the existing emergency services should have sufficient capacity to respond to emergencies. During operation, emergency services providers could receive 911 phone calls in the event of a fallen transmission line structure.

Potential airport impacts, as they exist today, are anticipated to be minimal as there are mitigation measures that can be employed to avoid these impacts, such as routing away from the airport, the use of appropriate height structures to avoid impact to glide or approach slopes, and structure marking or lighting. Potential impacts to public airports would occur if the project is of a certain height and located within close proximity thereby limiting the potential for safe operations, including aircraft takeoff and landing. Potential impacts to public airports would be determined in relation to safety zones and through adherence to FAA design criteria and recommended setbacks. Height restrictions would apply if/when the airport's airstrips are within 3.78 miles. No impacts are anticipated to Faribault Municipal Airport as the airstrip is more than 3.78 miles away from the nearest potential transmission line structure in Segment 2 North and Segment 2 South (also discussed in Section 6.5.10.4).

6.5.10.6 Mitigation

The sample route permit (Sections 5.3.4 and 5.3.14 of Appendix H) contains the following mitigation related to transportation:

> *"The Permittee shall cooperate with county and city road authorities to develop appropriate signage and traffic management during construction."*
>
> *"The Permittee shall keep records of compliance with this section and provide them upon the request of Commerce or Commission staff."*
>
> *"The Permittee shall advise the appropriate governing bodies having jurisdiction over all state, county, city, or township roads that will be used during the construction phase of the Transmission Facility. Where practical, existing roadways shall be used for all activities associated with construction of the Transmission Facility. Oversize or overweight loads associated with the Transmission Facility shall not be hauled across public roads without required permits and approvals."*
>
> *"The Permittee shall promptly repair private roads or lanes damaged when moving equipment or when accessing construction workspace, unless otherwise negotiated with the affected landowner."*

The applicant committed to attempt to avoid or limit roadway closures to the maximum extent practicable and using conductor safety guides over roads or utilize helicopters for stringing activities where possible. The applicant also noted impacts to traffic would be mitigated by limiting construction traffic to the project right-of-way and existing access points to the maximum extent feasible and minimizing impacts related to dust by proper use of BMPs (e.g., soil matting, wetting) to reduce the potential for dust. The applicant also committed to utilizing appropriate safety measures such as use of safety signage, installation of temporary barrier structures, and employing spotters during clearing or stringing activities. Finally, the applicant would meet with MnDOT, county highway departments, township road supervisors, and/or city road personnel to address any issues that occur during roadway construction.

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to public services and utilities: “During Transmission Facility construction, the Permittee shall minimize any disruption to public services or public utilities. To the extent disruptions to public services or public utilities occur these shall be temporary, and the Permittee shall restore service promptly. Where any impacts to utilities have the potential to occur the Permittee would work with both landowners and local entities to determine the most appropriate mitigation measures if not already considered as part of this route permit.”

In the joint certificate of need application and route permit application, the applicant committed to ongoing coordination with MnDOT, local and county road authorities, railroad companies, and the FAA.

MnDOT and rail operator design guidelines would need to be met for any utility occupation of road and railroad ROW and a permit from MnDOT would be required to use any state highway ROWs. MnDOT has a formal policy and procedures for accommodating utilities within or as near as feasible to highway ROWs. The applicant would continue to work with MnDOT and as noted in Section 2.7.3, has completed ENMs and will be required to complete a constructability report. Additionally, the applicant has committed to coordinating with county and township road departments to minimize impacts on local roads and highways.

Where the project crosses pipeline ROWs, mitigation might be required. If induction mitigation is necessary, the pipeline company would have to approve the mitigation being installed and the applicant would be responsible for the added project costs.

The applicant committed to coordinating with local emergency services to ensure that emergency access to areas near construction activities is maintained.

6.6 Human Health and Safety

The ROI for electric and magnetic fields (EMF) is the ROW. Impacts to human health from possible exposure to EMFs are not anticipated. The HVTL would be constructed to maintain proper safety clearances. EMF associated with the project are below Commission permit requirements, and state and international guidelines. Potential impacts would be long-term and localized. These unavoidable impacts would be of a small size and can be mitigated. Impacts would be minimized by appropriate placement and adhering to electric field standards for transmission lines.

6.6.1 Electric and Magnetic Fields (EMF)

The ROI for electric and magnetic fields (EMF) is the ROW. Impacts to human health from possible exposure to EMFs are not anticipated. The HVTL would be constructed to maintain proper safety clearances. EMF associated with the project are below Commission permit requirements, and state and international guidelines. Potential impacts would be long-term and localized. These unavoidable impacts would be of a small size and can be mitigated. Impacts would be minimized by appropriate placement and adhering to electric field standards for transmission lines.

6.6.1.1 Existing Conditions

The term "EMF" is typically used to refer to electric and magnetic fields that are coupled together. EMF is associated with natural sources such as lightning and sunlight. EMFs are also invisible lines of force that surround electrical devices (for example, power lines, electrical wiring, and electrical equipment) which are produced through the generation, transmission, and use of electric power (reference (70)). However, for lower EMF frequencies associated with power lines, electric and magnetic fields are relatively decoupled. Generally, electric fields are dependent on the voltage of a transmission line and magnetic fields are dependent on the current carried by a transmission line.

Electric fields are the result of electric charge, or voltage, on a conductor. Using a garden hose as an analogy, voltage is equivalent to the pressure of the water moving through the hose. The intensity of an electric field is related to the magnitude of the voltage on the conductor and is measured in kV per meter (kV/m). Magnetic fields are created and increase from the strength of the flow of current through wires or electrical devices. Using the same analogy, current is equivalent to the amount of water moving through the garden hose. The intensity of a magnetic field is related to the magnitude of the current flow through the conductor and is measured in units of Gauss (G) or milliGauss (mG).

Because the EMF associated with a transmission line is proportional to the amount of electrical current passing through the power line, it will decrease as distance from the line increases (reference (71)). This means that the strength of EMF that reaches a house adjacent to a transmission line ROW will be significantly weaker than it would be directly under the transmission line. Electric fields are easily shielded by conducting objects, such as trees and buildings, further shielding electric fields.

Magnetic fields, unlike electric fields, are not shielded or weakened by materials that conduct electricity (for example, trees, buildings, and human skin). Rather, they pass through most materials. Both magnetic and electric fields decrease rapidly with increased distance from the source. Electric and magnetic fields are invisible, just like radio, television, and cellular phone signals, all of which are part of the electromagnetic spectrum (reference (70)).

Electric and magnetic fields are found anywhere there are energized, current-carrying conductors, such as near transmission lines, local distribution lines, substation transformers, household electrical wiring, and common household appliances. The frequency from transmission lines is considered "non-ionizing, low-level radiation which is generally perceived as harmless to humans" (reference (70)). Table 6-8 illustrates the typical ranges of electric and magnetic fields of frequently and commonly used appliances that would be in a home (reference (70)).

Table 6-8 Electric and Magnetic Field Ranges for Common Household Appliances

Electric Field [1]		Magnetic Field [2]			
Appliance	kV/m	Appliance	mG		
	1 foot		1 inch	1 foot	3 feet
Stereo	0.18	Circular saw	2,100 to 10,000	9 to 210	0.2 to 10
Iron	0.12	Drill	4,000 to 8,000	22 to 31	0.8 to 2
Refrigerator	0.12	Microwave	750 to 2,000	40 to 80	3 to 8
Mixer	0.10	Blender	200 to 1,200	5.2 to 17	0.3 to 1.1
Toaster	0.08	Toaster	70 to 150	0.6 to 7	< 0.1 to 0.11
Hair Dryer	0.08	Hair dryer	60 to 200	< 0.1 to 1.5	< 0.1
Television	0.06	Television	25 to 500	0.4 to 20	< 0.1 to 1.5
Vacuum	0.05	Coffee maker	15 to 250	0.9 to 1.2	< 0.1

[1] German Federal Office for Radiation Safety
[2] Long Island Power Institute

Research on whether exposure to magnetic fields causes biological responses and health effects has been performed since the 1970s. The U.S. National Institute of Environmental Health Sciences and the World Health Organization's research does not support a relationship or association between exposure to electric power EMF and adverse health effects. The U.S. National Institute of Environmental Health Science evaluated numerous epidemiologic studies and comprehensive reviews of scientific literature regarding association of cancers with living near power lines, with magnetic fields in the home, and with exposure of parents to high levels of magnetic fields in the workplace. They concluded that "no consistent evidence for an association between any source of non-ionizing EMF and cancer has been found" (reference (72)).

Minnesota, Wisconsin, and California have performed literature reviews and research examining EMF. In 2002, Minnesota formed an Interagency Working Group to evaluate EMF research and develop public health policy recommendations for any potential problems arising from EMF effects associated with high-voltage transmission lines. The Working Group included staff from a number of state agencies and published its findings in a White Paper titled *EMF Policy and Mitigation Options*. Their research found that some epidemiological studies have shown no statistically significant association between exposure to EMF or health effects, and some have shown a weak association. Studies have not been able to establish a biological mechanism for how magnetic fields could cause cancer (reference (73)).

There is no federal standard for transmission line electric fields. The Commission has imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground (reference (74)). The Commission has not adopted a magnetic field standard for transmission lines. Appendix J provides detailed background on EMF health impact research.

6.6.1.2 Potential Impacts

The magnitude of the voltage on a transmission line is near-constant and ideally within plus or minus five percent of the designed voltage. Because of this, the magnitude of the electric field will also be near constant regardless of the power flowing down the line. The maximum electric field associated with the project and measured at one meter (3.28 feet) above the ground, is calculated to be 6.9 kV/m. The strength of electric fields diminishes rapidly as the distance from the conductor increases. The maximum electric field values are provided in Table 6-9 and the corresponding case number is shown in Figure 6-5.

The projected magnetic fields are provided in Table 6-10 and the corresponding case number is shown in Figure 6-5. Because magnetic fields are dependent on the current flowing on the line, calculations were based on two typical system conditions that are likely to occur during the project’s first year in service. The two scenarios are system peak energy demand and system average energy demand.

The projected magnetic fields are provided in Table 6-10 and the corresponding case number is shown in Figure 6-5. Because magnetic fields are dependent on the current flowing on the line, calculations were based on two typical system conditions that are likely to occur during the project’s first year in service. The two scenarios are system peak energy demand and system average energy demand.

Table 6-9 Electric Field Calculations

Structure Type	Circuits Present	Case	Maximum within ROW
Single Pole, Davit Arm, 345 kV Single Circuit	Wilmarth – North Rochester 345 kV	Case 1	6.2 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild	Wilmarth – North Rochester 345 kV & Line 832 115 kV	Case 2	2 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild	Wilmarth – North Rochester 345 kV & Line 706, 707, or 708 69 kV	Case 3a, Case 3b, Case 3c	1.5 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit	Wilmarth – North Rochester 345 kV / Line 964 345 kV	Case 4	6.4 kV/m
Single Pole, Tangent/Dav it Arm, 345 kV Double Circuit	Wilmarth – North Rochester 345 kV & Line 964 345 kV	Case 5	5.2 kV/m
Single Pole, Tangent/Dav it Arm, 345 kV Double Circuit with 69 kV Underbuild	Wilmarth – North Rochester 345 kV , Line 964 345 kV & Line 739 69 kV	Case 6	1.2 kV/m
Single Pole, Davit, 161/69 kV Double Circuit	North Rochester – Chester 161 kV & Peoples Line 69 kV	Case 7	1.5 kV/m
Single Pole, Tangent, 345 kV Double Circuit	North Rochester – Tremval 345 kV, Line 965 345 kV	Case 8	6.3 kV/m
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 9	1.3 kV/m
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit	North Rochester – Chester 161 kV & Line 979 345 kV	Case 10a	6.9 kV/m
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit	North Rochester – Chester 161 kV / Line 965 345 kV, North Rochester – River 345 kV	Case 10b	6.2 kV/m
Single Pole, Davit, 161 kV Single Circuit	North Rochester – Chester 161 kV	Case 11	2.7 kV/m
Single Pole, Tangent, 345 kV Double Circuit Single Circuit	Wilmarth – North Rochester 345 kV	Case 12	6.2 kV/m
Single Pole, Tangent, 345 kV Double Circuit	Wilmarth – North Rochester 345 kV, Line 979 345 kV	Case 13	4.9 kV/m
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit	North Rochester –Chester 161 kV, Line 5310 161 kV / Wilmarth – North Rochester 345 kV, Line 979 345 kV	Case 14	5.0 kV/m

Figure 6-5 Segment 2, EMF Nodes

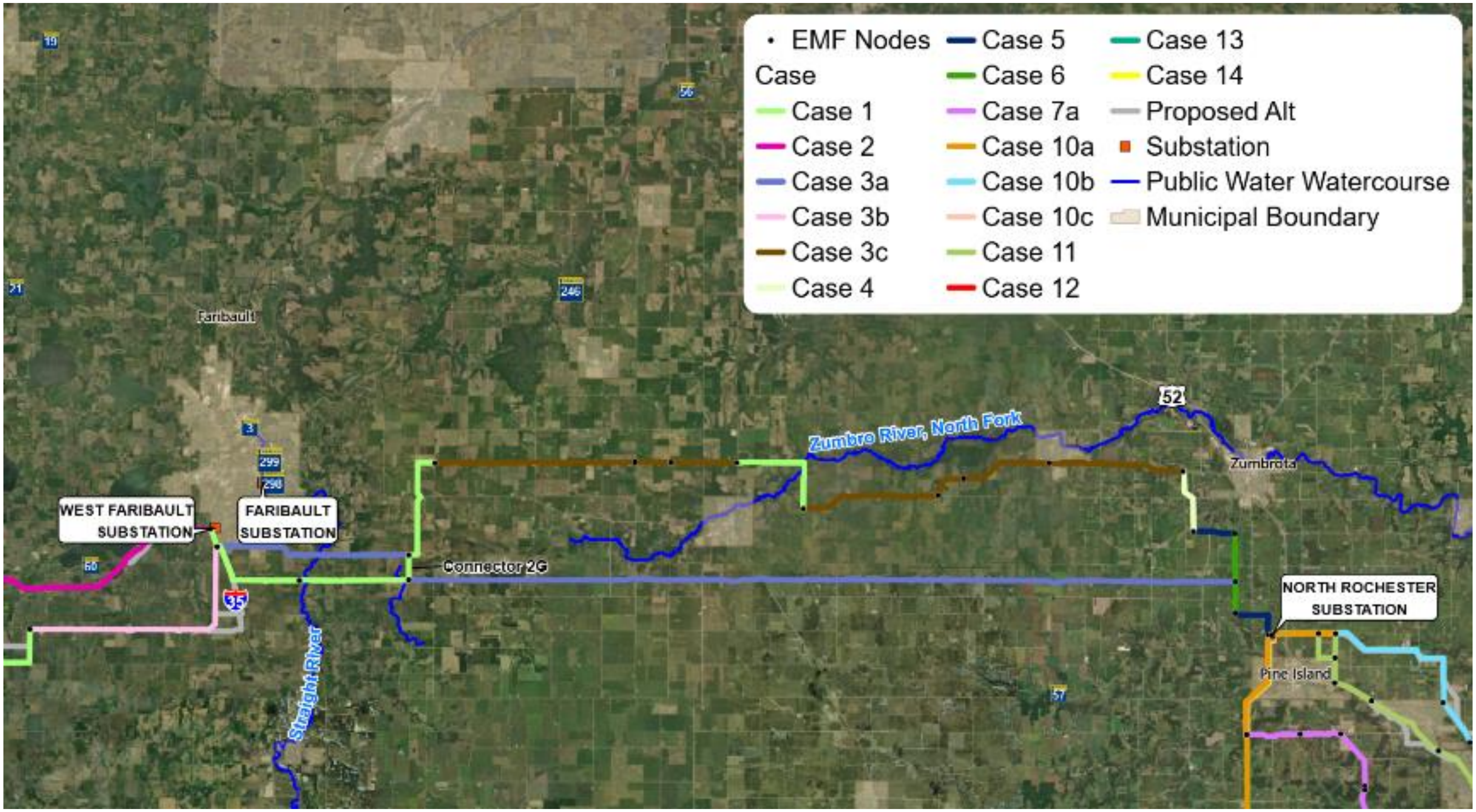


Table 6-10 Calculated Magnetic Flux density (mG)

Structure Type	Circuits Present	Case	Maximum within ROW (mG)
Single Pole, Davit Arm, 345 kV Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV	Case 1	77
Single Pole, Davit Arm, 345 kV Single Circuit (Max Loading)		Case 1	167
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 832 115 kV	Case 2	65
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild (Max Loading)		Case 2	114
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 708 69 kV	Case 3a	55
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3a	96
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 707 69 kV	Case 3b	27
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3b	59
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 706 69 kV	Case 3c	31
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3c	62
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV /Line 964 345 kV	Case 4	78
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit (Max Loading)		Case 4	246
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit (Average Loading)	Wilmarth – North Rochester 345 kV & Line 964 345 kV	Case 5	74
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit (Max Loading)		Case 5	224
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV , Line 964 345 kV & Line 739 69 kV	Case 6	19
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit with 69 kV Underbuild (Max Loading)		Case 6	59

Structure Type	Circuits Present	Case	Maximum within ROW (mG)
Single Pole, Davit, 161/69 kV Double Circuit (Average Loading)	North Rochester – Chester 161 kV & Peoples Line 69 kV	Case 7	5 mG
Single Pole, Davit, 161/69 kV Double Circuit (Max Loading)			21 mG
Single Pole, Tangent, 345 kV Double Circuit with 69 kV Underbuild (Average Loading)	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 8	105 mG
Single Pole, Tangent, 345 kV Double Circuit with 69 kV Underbuild (Max Loading)			190 mG
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild (Average Loading)	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 9	23 mG
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild (Max Loading)			41 mG
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit (Average Loading)	North Rochester – Chester 161 kV & Line 979 345 kV	Case 10a	150 mG
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit (Max Loading)			400 mG
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit (Average Loading)	North Rochester – Chester 161 kV / Line 965 345kV, North Rochester – River 345 kV	Case 10b	111 mG
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit (Max Loading)	North Rochester – Chester 161 kV / Line 965 345kV, North Rochester – River 345 kV		205 mG
Single Pole, Davit, 161 kV Single Circuit (Average Loading)	North Rochester – Chester 161 kV	Case 11	8 mG
Single Pole, Davit, 161 kV Single Circuit (Max Loading)	North Rochester – Chester 161 kV		27 mG
Single Pole, Tangent, 345 kV Double Circuit Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV	Case 12	76 mG
Single Pole, Tangent, 345 kV Double Circuit Single Circuit (Max Loading)			164 mG
Single Pole, Tangent, 345 kV Double Circuit (Average Loading)	Wilmarth – North Rochester 345 kV, Line 979 345 kV	Case 13	85 mG
Single Pole, Tangent, 345 kV Double Circuit (Max Loading)			222 mG
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Average Loading)	North Rochester –Chester 161 kV, Line 5310 161 kV / Wilmarth –North Rochester 345 kV, Line 979 345 kV	Case 14	85 mG
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Max Loading)			222 mG

System peak energy demand represents the current flow on the line during the peak hour of system-wide energy demand. Peak demand is 1,200 amps on both conductors. Whereas system average energy demand represents the current flow on the line during a non-peak time, average demand is 560 amps on both conductors. For both scenarios, the magnetic field values were calculated at a point where the conductor is closest to the ground. Like electric fields, magnetic field levels decrease rapidly as the distance from the centerline increases. In addition, because the magnetic field produced by the transmission lines is dependent on the current flow, the actual magnetic fields when the project is placed in service would vary as the current flow on the line changes throughout the day.

6.6.1.3 Mitigation

The sample route permit (Section 5.4.2 of Appendix H) states: "The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms."

Mitigation of magnetic field strength would be achieved by increasing distance from the HVTL to the receptor. The Commission has, however, 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.

6.6.2 Implantable Medical Devices

The ROI for implantable medical devices is the ROW. Potential impacts associated with the project are anticipated to be negligible. If impacts occur, they can be mitigated. Impacts would be minimized by appropriate grounding and adherence to electric field standards for transmission lines.

6.6.2.1 Existing Conditions

Implantable medical devices, such as an implantable cardioverter defibrillator (ICD) or a pacemaker, are battery-powered devices that help keep a person's heartbeat in a regular rhythm. These devices are implanted into the heart tissue and can deliver electrical shocks to correct the heart's rhythm to prevent sudden cardiac issues and help people at risk for recurrent, sustained ventricular tachycardia or ventricular fibrillation (reference (75)). Instances of interference attributed to EMF are recognized, commonly referred to as electromagnetic interference (EMI). EMF exposure produced by transmission lines generally does not affect implantable devices.

Electromechanical implantable medical devices, such as cardiac pacemakers, ICDs, neurostimulators, and insulin pumps could be subject to interference from EMF, which could mistakenly trigger a device or inhibit it from responding appropriately (reference (76)). While EMI can result in either inappropriate triggering or inhibition of a device from responding properly, only a small percentage of these occurrences are caused by external EMI. Electrical interference at levels above 1.5 kV/m have the potential to interfere with modern, bipolar pacemaker behavior, but some models have been unaffected at as high as 20 kV/m (reference (77)). There is the potential for interference at lower levels, as differing manufacturers vary in susceptibility to EMI (reference (78)). During the peak hour of system-wide energy demand, the maximum electric field within the ROW was calculated to be 6.9 kV/m.

Workers who have cardiac pacemakers have separate guidelines for EMF exposure. The American Conference of Governmental Industrial Hygienists (ACGIH) recommended magnetic and electric field exposure limits for workers who have ICDs are 1 G and 1 kV/m, respectively (reference (79)). While ICD's vary and questions and concerns should be directed to the specific manufacturer, ICD manufacturers' recommended threshold for modulated magnetic fields is 1 G (reference (76)). One gauss is five to 10 times greater than the magnetic field likely to be produced by a high-voltage transmission line (references (76); (80)). During the peak hour of system-wide energy demand, the maximum magnetic field was calculated to be 0.246 G.

It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line, inducing a voltage on the object. Induced voltage is further discussed in Section 6.6.5.

6.6.2.2 Potential Impacts

While EMI can result in either inappropriate triggering or inhibition of a device from responding properly, only a small percentage of these occurrences are caused by external EMI. The project is under ACGIH and ICD manufacturers' recommended threshold for magnetic fields. Additionally, shocks from induced voltage from transmission lines are considered more of a nuisance than a danger. Impacts of induced voltage are further discussed in Section 6.6.5.

In the event ICDs are impacted by EMF, it generally results in a temporary asynchronous pacing (reference (76)). Therefore, health impacts or permanent impacts on implantable medical devices could be possible.

6.6.2.3 Mitigation

The sample route permit (Section 5.4.1 of Appendix H) contains the following mitigation related to grounding, electric field, and electronic interference:

> *"The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the National Electric Safety Code. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."*

"The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms."

Electric and magnetic field strength is mitigated by increasing the distance from the transmission line and structures. Workers with ICDs should consult with their doctors directly with concerns about work in electrical or magnetic environments (references (81); (82)). Medical devices will return to normal operation when the person moves away from the source of the EMF (reference (76)). Transmission lines will not be energized during construction; therefore, construction workers would not be at risk of EMF or magnetic field exposure. The project would be designed in accordance with applicable NESC standard and to keep electric fields below the 8 kV/m standard set by the Commission. Individuals are expected to follow the recommendations of their medical provider.

6.6.3 Public and Worker Safety

The ROI for public and worker safety is the ROW. Any construction project has potential risks, which can include potential injury from falls, equipment and vehicle use, and electrical accidents. Risks for the public involve electrocution. Potential impacts are anticipated to be minimal, short- and long-term, and can be mitigated. Impacts would be minimized by appropriate adherence to relevant local and state codes, the NESC, and NERC requirements.

6.6.3.1 Existing Conditions

The most recent data from the Bureau of Labor Statistics for injuries and illnesses was used to find the recent number of injuries and illnesses for Power and Communication Line and Related Structures Construction (North American Industry Classification System Code No. 237130). From 2021 to 2022 there were a total of 4,520 nonfatal occupational injuries and illnesses, with around four percent of them being classified as traumatic. From 2021 to 2022 there were 18 fatal injuries, 10 fatal transportation incidents (roadway accident or being struck by a vehicle), and four fatal incidents from coming into contact with an object or equipment (being hit, crushed, caught, struck, etc. by an object or equipment) associated with Power and Communication Line and Related Structures Construction (reference (83)).

6.6.3.2 Potential Impacts

As with any construction project, there are construction-related risks. These could include potential injury from falls, equipment and vehicle use, and electrical accidents. There is potential for construction to disturb existing environmental hazards.

Electrocution is a risk that could occur with direct contact to lines. Between 2011 and 2015, power-line installers in the U.S. had 32 deaths related to electrocution, a rate of 29.7 deaths per 100,000 full-time workers (reference (84)). It could also happen when working near power lines, like when using heavy equipment. Electrocution could occur when there is electrical contact between an object on the ground and an energized conductor, but this situation is most likely with distribution lines (reference (76)).

Any accidents that might occur during construction of the project would be handled through local emergency services. Existing emergency services should have sufficient capacity to respond to any emergencies.

6.6.3.3 Mitigation

The sample route permit (Section 5.5.1 of Appendix H) contains the following mitigation related to safety: "The Permittee shall design the transmission line and associated facilities to meet or exceed all relevant local and state codes, the National Electric Safety Code, and NERC requirements. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, strength of materials, clearances over roadways, ROW widths, and permit requirements."

Proper safeguards would be implemented for construction and operation of the transmission line. The project would be designed to meet or exceed local, state, and the applicant's standards regarding clearance to the ground, clearance to crossing utilities, strength of materials, and ROW distances.

The project must comply with the NESC.89 and Occupational Safety and Health Administration standards (reference (85)). Construction crews and contract crews would also comply with local, state, and NESC standards for installation and construction practices. The applicant would use their established safety procedures, as well as industry safety procedures, during and after installation of the transmission line, including appropriate signage during construction.

6.6.4 Stray Voltage

The ROI for stray voltage is the ROW. Potential impacts to residences and farming operations from stray voltage are not anticipated. Transmission lines do not produce stray voltage during normal operation, as they are not directly connected to businesses, residences, or farms. The project would be constructed to NESC standards, and therefore, impacts are anticipated to be minimal. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

6.6.4.1 Existing Conditions

"Stray voltage" is a condition that can potentially occur on a property or on the electric service entrances to structures from distribution lines connected to these structures. The term generally describes a voltage between two objects where no voltage difference should exist. The source of stray voltage is a voltage that is developed on the grounded neutral wiring network of a building and/or the electric power distribution system. Stray voltage is not created by transmission lines, as they do not directly connect to businesses or residences (reference (86)).

Where utility distributions systems are grounded, a small amount of current will flow through the earth at those points. This is called neutral-to-earth voltage (NEV), which is voltage that is associated with distribution lines and electrical wiring within buildings and other structures (reference (87)). Electrical systems that deliver power to end-users and electrical systems within the end-user's business, home, farm, or other buildings are grounded to the earth for safety and reliability reasons. Stray voltage could arise from neutral currents flowing through the earth via ground rods, pipes, or other conducting objects, from faulty wiring or faulty grounding of conducting objects in a facility. Thus, stray voltage could exist at any business, house, or farm which uses electricity, independent of whether there is a transmission line nearby. Site-specific mitigation measures are required to address potential stray voltage impacts.

Stray voltage is a natural phenomenon that can be found at low levels between two contact points at any property where electricity is grounded; it is measured between two points that livestock can simultaneously touch (reference (87)). Stray voltage and its effects on farms have been studied for nearly 30 years. Numerous studies have found that though it is likely to exist on farms, it is rarely strong enough to affect the behavior or production of dairy cattle (reference (88)). The Commission issued a report in 1998 supporting the conclusion that no credible scientific evidence has been found to show that currents in the earth or associated electrical parameters, such as voltages, magnetic fields, and electric currents, are causes of poor health and mild production in dairy herds (references (88)).

6.6.4.2 Potential Impacts

Stray voltage is, generally, an issue associated with electrical distribution lines and electrical service at a residence or on a farm. Under normal operating conditions, transmission lines do not create stray voltage as they do not directly connect to businesses, residences, or farms. The project would not directly connect to businesses or residences in the area and would not change local electrical service. Accordingly, impacts due to stray voltage are anticipated to be negligible.

Transmission lines, however, can induce voltage on a distribution circuit that is parallel and immediately under the transmission line. This is discussed in Section 6.6.5.

6.6.4.3 Mitigation

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to grounding, electric field, and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between the ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the NESC. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

The sample route permit (Section 5.4.2 of Appendix H) contains the following mitigation related to electric fields: "The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms." The applicant has committed to work with landowners that have any issues with stray voltage following construction of the project.

6.6.5 Induced Voltage

The ROI for induced voltage is the ROW. It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line. This could induce a voltage on the object. Smaller conductive objects near the line could cause a nuisance shock to a person, but it is not a potential safety hazard. Metal buildings within the ROW might require grounding. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

6.6.5.1 Existing Conditions

It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line. Conductive objects include vehicles, including tractors and automobiles, in part because tires are made electrically conductive to eliminate static discharge building up when moving (reference (89)). This might induce a voltage on the object; the magnitude of the voltage depends on several factors, such as the size, shape, and orientation of the object along the ROW. Smaller conductive objects near the transmission line that are insulated or semi-insulated from the ground could cause a nuisance shock to a person from a small current passing through the person's body to the ground. If there were insulated pipelines, electric fences, telecommunication lines, or other conductive objects such as tractors or automobiles with greater lengths and sizes, induced voltage from a transmission line could produce a larger shock. This larger shock has not been found to be a health safety hazard (reference (90)). Similar to stray voltage, transmission lines could cause additional current on distribution lines where they parallel. If the distribution lines are not properly wired or grounded, induced voltage could be created.

6.6.5.2 Potential Impacts

Shocks from induced voltage from transmission lines are considered more of a nuisance than a danger. The transmission line would follow NESC standards, which require the steady-state (continuous) current between the earth and an insulated object located near a transmission line to be below 5 milliamps (mA). A shock at 5 mA is considered unpleasant, not dangerous, and allows for a person to still release the energized object that they are holding that is causing the shock (reference (91)). In addition, the Commission imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground. The standard is designed to prevent serious hazards from shocks when touching large objects parked under AC transmission lines of 500 kV or greater (reference (73)). In the Brookings County to Hampton 345 kV transmission line project (Commission docket number TL-08-1474), the ALJ and Commission determined that Minnesota's current electric field exposure standard of 8 kV/m is adequately protective of human health and safety (references (92); (93)).

6.6.5.3 Mitigation

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to grounding, electric field, and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the NESC. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

The applicant committed to meeting electrical performance standards. Appropriate measures would be taken to prevent induced voltage problems when the project parallels or crosses objects. Metal buildings might have unique issues due to induction concerns. For example, conductive buildings near power lines of 200 kV or greater must be properly grounded. Any person with questions about a new or existing metal structure can contact the applicant for further information about proper grounding requirements.

6.6.6 Electronic Interference

The ROI for electronic interference is the ROW. Transmission lines do not generally cause interference. If electronic interference does occur, in most cases it can be mitigated by either increasing the distance or adjusting the placement of the device to the transmission line or other transmission line structure. If ongoing interference due to a transmission line does occur, the applicant would be required to take feasible actions to restore electronic reception to pre-project quality. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

6.6.6.1 Existing Conditions

Electronic Interference refers to the disturbance of electrical circuits or equipment caused by electromagnetic radiation emitted from external sources, in this case, high-voltage transmission lines. Transmission lines generate EMFs depending on the distance from sources and the type of line configuration. The EMFs decrease as the distance increases from the conductors (reference (94)).

There are a number of FM and AM radio broadcasting stations that operate or can be heard within the project area, such as KYSM (103.5) FM, KJLY (104.5) FM, KBGY (107.5) FM, KMSU (89.7) FM, KNGA (90.5) FM, KRUE (92.1) FM, KATO (93.1) FM, KCHK (95.5) FM, KQCL (95.9) FM, K250CD (KDHL-AM) (97.9) FM, KEEZ (99.1) FM, KDHL (920) AM, KFOW (1170) AM, KFSP (1230) AM, KTOE (1420) AM.

There are also many television channels that broadcast throughout the project area. These channels are received from cable, satellite providers, and/or digital antennas.

Wireless internet and cellular phones use frequencies in the 900 MHz ultra-high frequency (UHF) range—a range for which impacts from corona-generated noise are anticipated to be negligible.

Global positioning systems (GPS) is used in daily life, aviation, vehicle navigation, surveying, aerial drones, and agricultural activities. GPS works by sending radio-frequency signals from a network of satellites to the receiver. Because of this, buildings, trees, and other physical structures have the potential to interfere with a GPS signal. GPS provides locational information for navigation between endpoints, as well as geographic orientation for farm and other equipment. GPS is used throughout the project area.

The Continuously Operating Reference Station (CORS) Network is a cooperative effort between MnDOT, other state agencies and institutions, counties, cities, and private enterprises, with the goal of providing Global Navigation Satellite System (GNSS) corrections statewide. Using signals from all available GNSS satellites and receivers at over 140 known positions, MnCORS is able to continuously provide survey-grade positioning corrections via the internet. Users with Real-Time Kinematic (RTK) capable equipment can receive real-time corrections to their geospatial positions, yielding a more accurate horizontal and vertical measurement.

6.6.6.2 Potential Impacts

No impacts to electronic devices are anticipated. No GPS impacts are expected from the construction or operation of the project. Research evaluating the potential for interference in the use of GPS satellite-based microwave signals under or near power line conductors indicates it is unlikely that there would be electronic interference while using GPS (reference (95)). Interference would be more likely near a transmission line structure and unlikely under a transmission line (reference (96)) due to shadow effects.

Electronic interference from HVTLs can impact electronic communications like radios, television, and microwave communications in three ways: corona noise, shadowing effect, and gap discharge.

Corona “noise” primarily occurs in the radio frequency range of amplitude modulated (AM) signals. This generated noise typically occurs underneath a transmission line. It dissipates rapidly as the distance increases from the transmission line. FM radio receivers usually do not pick up interference from transmission lines because corona-generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (reference (97)). In most cases, the strength of the radio or television broadcast signal within a broadcaster’s primary coverage area is great enough to prevent interference. Additionally, due to the higher frequencies of television broadcast signals (54 MHz and above), a transmission line seldom causes reception problems within a station’s primary coverage area. Anticipated electric fields are below levels expected to produce significant levels of corona.

Shadowing effect comes from physically blocking communication signals. This primarily can impact two-way mobile radio communications and television signals. Digital and satellite television transmissions are more likely to be affected by shadowing generated by nearby towers. Interference could occur if the device was located immediately adjacent to a tower structure, blocking its signal.

While television interference is rare, it can happen when a structure is aligned between a receiver and a weak, distant signal. Telecommunication towers can be susceptible to the shadowing effect.

Gap discharge interference is the most noticed form of power line interference with radio and television signals, and typically the most easily fixed. Gap discharges are usually caused by hardware defects or abnormalities on a transmission or distribution line, causing small gaps to develop between mechanically connected metal parts. As sparks discharge across a gap, they create the potential for electrical noise, which, in addition to audible noise, can cause interference with radio and television signals. The degree of interference depends on the quality and strength of the transmitted communication signal, the quality of the receiving antenna system, and the distance between the receiver and the power line. Because gap discharges are a hardware issue, they can be repaired relatively quickly once the issue has been identified.

6.6.6.3 Mitigation

The sample route permit (Section 5.4.3 of Appendix H) contains the following mitigation related to electronic interference: "If interference with radio or television, satellite, wireless internet, GPS-based agriculture navigation systems or other communication devices is caused by the presence or operation of the Transmission Facility, the Permittee shall take whatever action is necessary to restore or provide reception equivalent to reception levels in the immediate area just prior to the construction of the Transmission Facility. The Permittee shall keep records of compliance with this section and provide them upon the request of Commerce or Commission staff."

The applicant committed to taking feasible action to restore electronic reception to pre-project quality in the case of electronic interference. Interference could be due to line-of-sight obstruction (shadowing) in select areas but could be mitigated by either increasing the distance or adjusting the placement of transmission line structures and electronic antennas. For example, if interference occurs for an AM radio station within a station's primary coverage area where good reception existed before the project was built, reception can be regained by adjusting or moving the receiving antenna system. This is unlikely to occur to AM radio frequency, except for immediately under a transmission line, and interference would dissipate rapidly with increasing distance from the line.

6.7 Land-Based Economies

The ROI for land-based economies is the route width except for tourism which is in the local vicinity. The ROI for recreation is more localized (the route width) as potential impacts to the tourism economy would be experienced at a broader scale. The short and long-term impacts of land-based economies are assessed for agriculture, forestry, mining, and tourism.

Constructing and operating the project could potentially affect land-based economies in the project area. Transmission lines are a physical, long-term presence on the landscape which could prevent or otherwise limit use of land for other purposes. The primary land-based economic activity in the project area is agriculture. Other potential economic activities connected to land usage in the project

area include forestry, mining, and tourism. The primary means of mitigating impacts to land-based economies is prudent routing (that is, by choosing route alternatives that avoid such economies).

6.7.1 Agriculture

Agriculture is the predominant land-use within the ROI, and when structures are placed within an agricultural field, they would interfere with farming operations. Potential impacts are assessed through consideration of total agricultural land use, presence of prime farmlands, and agricultural practices. The footprint of the transmission line structures is land that can no longer be used for agricultural production and could adversely impact farms based on a variety of other factors. Impacts to agriculture would be mitigated through implementation of the Agricultural Impact Mitigation Plan and prudent routing.

6.7.1.1 Existing Conditions

Most of Segment 2's land cover (approximately 65% of Segment 2 North's ROI and approximately 81% of Segment 2 South's ROI) is agriculture (Map 21). In both of the counties within the ROI, crops account for more than half of the share of sales by type, and the average farm size is 300 acres or less (Table 6-11). As noted in the joint certificate of need application and route permit application, principal crops include grain, soybeans, hay/haylage, sweet corn, corn for silage, green peas, corn for grain, and oats for grain. Farmers in the area also raise livestock, including hogs and pigs, dairy cows, beef cattle, and poultry.

Table 6-11 Segment 2 Agricultural Products Sold and Average Size of Farm

County	Market Value of Agricultural Products Sold (percent)		Average size of farm (acres)
	Crops	Livestock	
Goodhue [1]	57	44	300
Rice [2]	63	37	225

[1] Source: reference (209)
[2] Source: reference (99)

One apiary is present in Segment 2 North (Map 26-9). There are no center pivot irrigation systems or private airstrips used for agricultural purposes in Segment 2's ROI.

Three categories of soils identified by the Soil Survey Geographic Database (SSURGO) are subject to protection under the Farmland Protection Policy Act (FPPA): prime farmland, prime farmland when drained, and farmland of statewide importance. Prime farmland is defined by the NRCS as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Prime farmland when drained includes soils that have the potential to be prime farmland but require drainage or hydrologic alteration to achieve high productivity. Farmland of statewide importance includes soils that are nearly prime, but are not as productive due to permeability, slope, erosion potential, or some other soil property.

The ROI includes areas of prime farmland, prime farmland if drained, and farmland of statewide importance (Map 29). Approximately 78% of Segment 2 North's ROI is designated prime farmland, and approximately 83% of Segment 2 South's ROI is designated prime farmland (Appendix G).

The 2024 directory of Minnesota organic farms from the Minnesota Department of Agriculture (MDA) lists 29 potential organic farms in the two-county area (reference (100)). However, because organic farmers are not required to register with the MDA, there could be additional, unregistered organic farms within the project area. In addition, organic farm registration does not give the precise location of organic fields, only the registrant's mailing address.

Agriculture in this area also includes precision farming practices. Precision farming involves the use of GPS to guide farming equipment. One of the most precise types of GPS systems is known as real-time kinematic GPS (RTK GPS). Precision farming minimizes the potential for waste from, for example, duplicate row seeding or overlap in fertilizer or pesticide application.

6.7.1.2 Potential Impacts

Transmission lines have the potential to impact agriculture both temporarily and permanently. Temporary impacts result from transmission line construction, the extent of which are limited to the duration of construction, and annual transmission line inspections, the extent of which are temporary and periodic during operation. Impacts could include limiting the use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Temporary impacts from annual transmission line inspections might include pedestrian or light vehicle access, which would be limited to the ROW and areas where obstructions might require access from off the ROW. Impacts associated with annual transmission line inspections would be coordinated as part of easement negotiations between the applicant and the landowner before construction of the project.

Permanent transmission line impacts result from the placement of transmission line structures within crop, pasture, and other agricultural lands. The footprint of the transmission line structures is land that can no longer be used for agricultural production. This footprint can adversely impact farm income and property values depending on placement, structure type, and a variety of other factors. Permanent structures can have varying sized footprints due to the structure design and distance from each other. The project anticipates using steel monopole structures with concrete pier foundations ranging from 7 to 12 feet in diameter and a typical span of 1,000 feet between structures (Section 3.2.1). Single-circuit and double-circuit structures are anticipated to have similar impacts to agriculture because farming can occur around both types.

Structures can impede the efficient use of farm equipment and can significantly limit the management options for agricultural operations. Presence of structures can also impede efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields. Transmission line structures in agricultural fields could also potentially impede the use of irrigation systems such as center pivot 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 using the same practice.

Apiaries could be affected by EMF changes due to powerlines. Studies have found that EMF negatively affects honey bees, including their ability to learn, fly, and forage, their sense of balance, memory, and pollination behavior, increasing aggression, and changes in metabolism (references (101); (102); (103); (104); (105)). Decreases in energy metabolism could result in lower honey production.

While the presence of the project on or near an unregistered 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. For example, construction vehicles would need to be cleaned prior to entering organic farms to prevent tracking offsite soil or plant material onto the farm, and throughout operational maintenance of the ROW certain herbicides or pesticides could not be used on or near the organic farm. These measures would need to be coordinated on an individual basis between the applicant and the affected organic farm owner.

Livestock operations are present within the project area and could be temporarily affected during construction of the project. Construction activities could temporarily disrupt livestock access to pasture lands, and construction noise might disturb livestock. In addition, poultry could be sensitive to disease caused by pathogens introduced by offsite soils tracked on-site during construction.

Though stray voltage impacts are not anticipated to be caused by the project, stray voltage could be of concern to livestock farmers, particularly on dairy farms. NEV is by and large an issue associated with distribution lines and electrical service at a residence or on a farm (Section 6.6.4). Transmission lines do not create NEV stray voltage as they do not directly connect to businesses, residences, or farms (Section 6.6.4).

Transmission lines have the potential to interfere with RTK and standard GPS used for precision farming in two ways: (1) electromagnetic noise from a transmission line could potentially interfere with the frequencies used for RTK and standard GPS signals and (2) transmission line structures could cause line-of-site obstructions or create multi-path reflections such that sending and receiving of signals would be compromised. Interference could occur where the spectrum of transmission line electromagnetic noise overlaps the frequency spectrum used by RTK or standard GPS systems. As discussed earlier in this chapter, no GPS impacts are expected from the construction or operation of the project (Section 6.6.6).

Interference due to line-of-sight obstruction or multi-path reflection could occur in two ways: (1) obstruction of, or other reflection interference with, a GPS satellite signal and (2) obstruction of radio transmissions from an RTK base station to a mobile receiving unit. GPS uses information from multiple satellite signals to determine specific locations. Interference with one signal would not cause inaccurate navigation; however, simultaneous interference with two signals could lead to inaccurate navigation. Because simultaneous interference with two signals is relatively unlikely and any line-of-sight obstruction would be resolved with movement of the GPS receiver (for example, tractor) such that proper GPS reception would be quickly restored, line-of-sight obstruction impacts to precision farming systems are anticipated to be minimal and temporary.

A transmission line structure located very near an RTK base station could cause a line-of-sight obstruction in the signal from a base station. A transmission line structure near an RTK base station (within 100 feet) could also cause multi-path reflections that interfere in the signal from a base station. An RTK base station would need to be at least outside of the transmission line ROW, or 75 feet away. Multi-path reflections can also be caused by other structures and landscape features including homes, trees, sheds, and sudden changes in ground elevation.

6.7.1.3 Mitigation

Mitigation and restoration measures for vegetation on landowner property are standard Commission route permit conditions. The sample route permit (Section 5.3.7 of Appendix H) contains the following mitigation related to land-based economies: "The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads."

The applicant would implement an Agricultural Impact Mitigation Plan (AIMP) and reasonably restore and/or compensate landowners, as appropriate, for damages caused by the applicant as a result of transmission line construction. A draft version of the AIMP is provided in Appendix K. The applicant would work with landowners to determine whether to restore land and/or compensate landowners after discussions with them. The applicant would also implement a vegetation management plan to reduce impacts to agriculture, as appropriate.

To further mitigate impacts to agriculture and as described in the AIMP (Appendix K), the applicant would implement measures to reduce compaction, soil erosion, and sedimentation and would compensate producers for crop or livestock loss or damage. Post-construction restoration efforts would include restoration of any temporary access modifications and deep plowing to remove compaction. Both crop and livestock activities would be able to continue around project structures and facilities after construction.

The applicant notes in the joint certificate of need application and route permit application that no impacts are anticipated to affect agricultural activities during winter as the crop fields are unplanted and the ground is frozen. Construction is anticipated to occur year-round and impacts to agriculture could be avoided in winter months.

Impacts to agricultural operations could also be mitigated by prudent routing. Specifically, prudent routing could include selecting route alternatives that prioritize paralleling existing infrastructure (including roads and transmission lines) to maximize potential opportunity for ROW sharing and minimize potential interruptions or impediments of the use of farm equipment. Prudent routing would secondarily prioritize following existing division lines (including field, parcel, and section lines) where paralleling existing infrastructure is not an option. Following existing division lines could minimize impacts to the use of farm equipment if, for example, row crops start and stop along the division lines. Opportunities for paralleling existing infrastructure and division lines are summarized in Table 6-3.

6.7.2 Forestry

The ROI for the land-based economy of forestry is the route width. No notable forestry resources within Segment 2's ROI were identified and potential impacts to forestry resources or operations are not anticipated.

6.7.2.1 Existing Conditions

None of the following resources were identified within the ROI:

- DNR forestry lands
- State forests
- Forests for the Future state conservation easement areas
- Sustainable Forest Incentive Act land
- School Trust land

As such, potential impacts to land-based economies for forestry would be negligible.

6.7.2.2 Potential Impacts

There are no notable forestry resources within the ROI of Segment 2 and therefore no impacts to forestry operations are anticipated.

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

6.7.2.3 Mitigation

Impacts on forested areas would be reduced by minimizing the tree clearing to the extent feasible; however, tall-growing vegetation within the ROW would be cleared. The applicant would work with landowners to come to an agreement of any timber removed from private lands, as appropriate.

6.7.3 Mining

The ROI for the mining land-based economy is the route width. Potential impacts are assessed through identification of known, existing mining operations and assessing potential impacts to those operations given the potential introduction of the HVTL. Documented prospect mines are also noted where present within the ROI. No impacts to active facilities are anticipated. If the potential for impacts to mining operations would occur, the applicant would be required to coordinate those impacts with the mining operator.

6.7.3.1 Existing Conditions

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. Mining operations are prevalent in the project area and consist of aggregate mining operations and bedrock quarries owned either by individuals, private companies, or MNDOT. However, no aggregate operations were identified within the route widths of Segment 2 North or Segment 2 South.

6.7.3.2 Potential Impacts

No mining operations were identified within the ROI of Segment 2 and therefore no impacts are anticipated.

6.7.3.3 Mitigation

If the potential for impacts to mining operations would occur, the applicant would be required to coordinate those impacts with the mining operator.

6.7.4 Tourism

The ROI for the tourism land-based economy is the local vicinity. Potential impacts are assessed through identification of known resources utilized by non-residents that would likely be recreating in the area and bringing in non-local revenue (or tourism dollars) to the area. Most opportunities for tourist activities within the ROI include use of publicly accessible lands and water for outdoor activities (Section 6.5.8). Impacts to tourism are anticipated to be negligible to minimal.

6.7.4.1 Existing Conditions

Recreational opportunities identified within the ROI include publicly accessible lands and waters used for outdoor activities (Section 6.5.8). Nonresidents or tourists could visit the project area to take advantage of the area's hunting and fishing opportunities. Public and designated lands are discussed in Section 6.9.6. One private recreational facility, the Straight River Golf Course, is within the ROI of Segment 2 South. The anticipated alignment of Segment 2 South crosses through the golf course (Map 23-1).

Tourism opportunities within the ROI beyond outdoor activities were not identified. Human-built tourism in the two-county area includes county fairs, arts and crafts fairs, farmers markets, and smaller community events. These events and other opportunities for tourism are advertised in nearby incorporated towns and the activities are not located within the ROI.

6.7.4.2 Potential Impacts

The physical structures of Segment 2 South that would cross the Straight River Golf Course would impact the functional use of the golf course. Aesthetic and functional impacts could decrease the revenue of the golf course.

Other impacts to the tourism economy are anticipated to be negligible to minimal.

6.7.4.3 Mitigation

Impacts to the Straight River Golf Course could be avoided by selecting Segment 2 North.

No restricted access or direct impacts to other recreational areas that may be used by tourists is anticipated.

6.8 Archaeological and Historic Resources

The ROI for archaeological and historic resources is the route width. Direct and indirect impacts could occur from construction and operation of the project. Direct impacts to archaeological and historic resources could result from construction activities such as ROW clearing, placement of structures, the construction of new substations and access roads, temporary construction areas, and vehicle and equipment operation. Direct impacts could also result from the removal of historic buildings or structures. Direct impacts to historic resources could occur if the project is located near or within view of a resource (typically a historic building, structure, or TCP).

Potential impacts are assessed through identification of documented archaeological and historic resources within one mile of the route alternatives. An emphasis is placed on resources within the route widths, which could have the most potential impact.

6.8.1 Existing Conditions

Cultural resources consist primarily of archaeological sites and historic architectural resources. Archaeological sites are defined as the material remains of past human life or activities (reference (109)). Historic architectural resources are sites, buildings, and structures greater than 45 years in age that “create tangible links to the American past, whether in relation to historical events and people, traditional ways of life, architectural design, or methods of construction,” as defined in the Minnesota Historic and Architectural Survey Manual (reference (110)). Traditional Cultural Properties (TCP) are also considered cultural resources. TCPs are defined as locations of significance to a community because of their association with important cultural practices and beliefs (reference (111)).

Federal laws and regulations, including Section 106 of the National Historic Preservation Act (NHPA) of 1966, its implementing regulations found in 36 CFR 800, and the Archaeological Resources Protection Act of 1979, provide the standards for cultural resources identification, evaluation, and mitigation of impacts. Pursuant to Section 106 of the NHPA, a historic property is any archaeological site, historic architectural resource, or traditional cultural property included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Potential cultural resources investigations that could be required under Section 106 include archaeological surveys, historic architectural surveys, and/or TCP surveys which serve to identify TCPs. Section 106 applies to all undertakings that take place on federal lands, require federal permitting, and/or utilize federal funds.

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

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

Coordination with the Tribal Historic Preservation Offices (THPO) prevents impacts from the project to known TCPs. THPOs are officially designated by Tribes and serve the same function as a SHPO (reference (112)). THPOs assist with the preservation of Tribal historic properties and cultural traditions. They are also available to advise federal, state, and local agencies on the management of tribal interests. As noted in Section 8.1.1 of the route permit application, the applicant has engaged with multiple tribes and is committed to continued engagement and consultation.

Minnesota is divided into nine Archaeological Regions, which were defined by former State Archaeologist, Scott Anfinson (reference (113)), as part of a framework for building a predictive model developed by the Minnesota Department of Transportation (MNDOT) for the presence of archaeological sites, called the MnModel (reference (113)). These regions characterize features of the natural environment that have been fairly stable throughout precontact and contact periods. The distribution of resources among the nine regions is assumed to have influenced the distribution of precontact peoples (reference (113)).

The western portion of Segment 2 falls within the Prairie Lakes Archaeological Region (Region 2), extending through the eastern Rice County to Section 36 of Township 110N, Range 20W, and Section 1 of Township 109N, Range 20W. The Southeast Riverine Archaeological Region (Region 3) begins in eastern Rice County in Section 31 of Township 110N, Range 19W and Section 1 of Township 109N, Range 19W.

Region 2, the Prairie Lakes Archaeological Region, includes a large portion of southern Minnesota, including Big Stone, Blue Earth, Brown, Carver, Chippewa, Cottonwood, Faribault, Freeborn, Jackson, Lac Qui Parle, Le Sueur, Lyon, McLeod, Martin, Nicollet, Redwood, Renville, Scott, Sibley, Stevens, Swift, Watonwan, and Yellow Medicine counties and portions of Douglas, Grant, Kandiyohi, Lincoln, Meeker, Nobles, Otter Tail, Pipestone, Pope, Rice, Steele, Traverse, and Waseca counties. This region is characterized by “swell and swale topography”, hilly end moraines, features such as the Minnesota River trench, the Prairie des Coteau scarp, and numerous shallow lake basins (reference (113)). Precipitation ranges between 28 inches per year in the southeast to 22 inches annually in the northwest. At the time of Euroamerican contact, the region was characterized by tallgrass prairie, river-bottom forests, and oak woodland. Big Woods vegetation, consisting of Elm, Maple, and Basswood, began developing during the contact period. Bison were the dominant game animal during the late Holocene period, with white tail deer and elk also present in smaller numbers.

Region 3, the Southeast Riverine Archaeological Region, includes Dodge, Fillmore, Goodhue, Houston, Mower, Olmsted, Wabasha, and Winona counties, and portions of Dakota, Freeborn, Rice, and Waseca counties. This region was not glaciated during the Late Wisconsin Ice Age. The region is dominated by a stream-dissected landscape and contains three major river systems: the Cannon, Zumbro, and Root Rivers. The Zumbro River is located within ROI for Segment 2. No natural lakes are found within Region 3; however, valley bottom lakes are present along the Mississippi River. The climate is mild in the Southeast Riverine Region compared to the rest of the state. The average high temperature is 23 degrees Fahrenheit in January and 85 degrees Fahrenheit in July. Annual precipitation ranges between 28-30 inches. Faunal resources in this region during the late Holocene included deer and elk, with a small number of bison present in the upland areas. Aquatic resources could be found in the region's rivers and tributaries, and plant resources, such as prairie turnips and acorns were also present (reference (113)).

The Glacial ice had fully retreated from the Prairie Lakes Region by approximately 11,000 BC, while the Southeast Riverine Region remained unglaciated, allowing for human occupation of both regions by this time. Early hunter-gatherers maintained small group sizes and were very mobile, with subsistence patterns centered on hunting large and medium-sized game animals, primarily bison, in the Prairie Lakes region. This period, known as the early Paleoindian, spanned from approximately 11,200 to 10,500 BC, and is characterized by its distinctive fluted projectile points (e.g., Clovis, Folsom, Holcombe). Early prehistoric artifacts (fluted and Plano projectile points) have been recovered in these regions, though primarily as surface collections. There is potential for deeply buried precontact sites of all periods in floodplain alluvium. The late Paleoindian/early Archaic period (10,500 to 7,500 BC) saw an increase in subsistence diversification, evidenced in part in the archaeological record by a more diverse and specialized tool assemblage (reference (114)).

During this period and continuing into the Middle Archaic (7,500 to 3,000 BC), gradually increasing population sizes resulted in decreased, but still expansive, 'home range' areas for these hunter-gatherers, who still relied heavily on larger forest game animals for subsistence. The suite of stone tools continued to increase during this period, and copper tools made their first appearance at the end of the Middle Archaic (reference (114)).

The Late Archaic period (approximately 3,000 to 500 BC) is characterized by the appearance of exotic materials, such as marine shells, communal burial sites, and a more diverse material culture, including tools used in the manufacturing of dugout canoes. Copper tools were also prevalent during this time period. Lifeways during the late Archaic relied more heavily on second order foods, such as fish and other aquatic resources and plant life (e.g., wild rice). The Late Archaic was a period of resource intensification and, therefore, saw a decrease in mobility and home range areas, and an increase in group sizes (reference (114)). In Region 2, many sites in the Archaic period are located on islands and peninsulas on larger-sized lakes, or along major rivers. In Region 3, Archaic period sites have been identified in deep alluvial soils, and show similarities with Wisconsin cultural complexes. Lifeways continued to evolve during the Woodland period (between 1,000 to 500 BC, to approximately 1650 AD). The Woodland period is generally characterized by the appearance of pottery and burial mounds. The Woodland Effigy Mound tradition is most prominent in the Southeast Riverine Region, as is the Mississippian tradition. Woodland sites in this region are concentrated on terraces above the Red Wing area floodplain, at the confluence of the Mississippi and Cannon rivers, and along a tributary of the Root River. Later Woodland habitation sites in the Prairie Lakes region are most likely in river valleys, in sheltered, wooded areas.

Contact period sites (circa 1700) are mostly associated with the Dakota tribes (Yankton, Wahpeton and Sisseton in the Prairie Lakes Region and the Santee in the Southeast Riverine Region), and with French and Euroamerican fur traders (reference (113)).

The ROI for archaeological and historic architectural resources is the route width. However, for the purposes of analysis, documented archaeological and historic resources within a one-mile buffer of Segment 2 North, Segment 2 South, and their alternatives.
Because proximity to fresh water and food resources was vital to the survival of the early inhabitants of Minnesota, archaeological sites are typically concentrated on well-drained upland terraces along bodies of water. In the project area for Segment 2, the shores of the North Branch Zumbro River and its network of streams and tributaries represent areas of high potential for the presence of archaeological sites for this reason.

To determine potential impacts on cultural resources, known archaeological sites and historic architecture in or adjacent to the project were identified through a review of the OSA's online portal and MnSHIP, the Minnesota SHPO's online portal. MnSHIP is a comprehensive database of documented historic architectural resources for the entire state, while the OSA portal is a database of previously recorded archaeological sites in the state. The OSA portal was also reviewed for estimated locations of historic cemeteries, as recorded in 2011 by Vermeer and Terrell (reference (115)). This study identified unrecorded historic cemeteries based on various forms of documentation, such as historic maps and aerial imagery. These cemeteries are often mapped to a much larger area, such as the PLS section or township level, than their actual locations, as the exact locations might not be known or verified. Therefore, even in cases wherein an unrecorded historic cemetery appears to intersect the segment's ROW, the project may not impact this resource. These unrecorded Euroamerican cemeteries are therefore discussed as an added precaution.

Documented archaeological and historic resources within the study area of Segment 2 are summarized in the following tables.

- Table 6-12 summarizes the number of archaeological and historic resources within the project area (which is within one mile of the anticipated alignments) and the ROI (route width).

- Table 6-13 provides descriptions of the resources located within the route widths.

Map 30 shows the location of cultural resources within the ROI of Segment 2.

There are no previously identified resources that are listed, or determined eligible for listing, on the NRHP. However, additional cultural resources, beyond those summarized below, might be located during future survey efforts prior to construction.

Table 6-12 Segment 2 North and Segment 2 South Number of Archaeological and Historic Resources within the project Area and Route Width

Resource Type	Segment 2 North Project Area	Segment 2 North Route Width	Segment 2 South Project Area	Segment 2 South Route Width
Archaeological Sites	11	4	3	0
Historic Architecture	111	20	52	8
Historical Cemeteries	15	8	7	2

Table 6-13 Segment 2 Archaeological and Historic Resources within the Route Width Summary

Resource present within the ROI of:		Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
Segment 2 North	Segment 2 South					
X		21GDae	Archaeological Site	Old Wanamingo	Unevaluated	This alpha site consists of the post-contact Euroamerican town of Wanamingo mapped in Sections 25 and 26 of Township 110N, Range 17W. This town is depicted on the 1894 CM Foote & Co. Plat Map.
X		21GDag	Archaeological Site	Eldsvald	Unevaluated	This alpha site consists of the post-contact Euroamerican town of Eldsvald mapped in Sections 23 and 26 of Township 110N, Range 18W. This town is depicted on the 1894 CM Foote & CO. Plat Map.
X		21GDah	Archaeological Site	Finseth Station	Unevaluated	This alpha site consists of the post-contact Euroamerican town of Finseth Station mapped in Sections 29 and 32 of Township 110N, Range 18W. This town is depicted on the 1894 Geo. A. Ogle & CO. County Map.
1X		21GDw	Archaeological Site	Spring Creek	Unevaluated	This alpha site consists of the post-contact Euroamerican town of Spring mapped in Section 33 of Township 110N, Range 17W and Section 4 of Township 109N, Range 17W. This town is depicted on the 1894 CM Foote & Co. & Plat Map.
X		GD-CGR-00006	Historic Architecture	Cheese factory	Unevaluated	Cheese factory ceased operation in 1920 and was converted into a private garage in 1923.
X		GD-CGR-00007	Historic Architecture	Grain elevator	Unevaluated	
X		GD-CGR-00025	Historic Architecture	Bridge No. 6187	Not Eligible	Constructed 1932
X		GD-HOL-00065	Historic Architecture	Bridge No. L0729	Unevaluated	Constructed 1905
X		GD-HOL-00069	Historic Architecture	Bridge No. 25561	Not Eligible	Constructed 1993
X		GD-HOL-00071	Historic Architecture	Culvert 91831	Not Eligible	Constructed 1979
X		GD-MNO-00033	Historic Architecture	Culvert 91306	Not Eligible	Constructed 1973
X		GD-WMT-00038	Historic Architecture	Farmhouse (abandoned)	Unevaluated	N/A
X		GD-WMT-00076	Historic Architecture	Bridge No. 91314	Not Eligible	Constructed 1974
X		GD-WMT-00080	Historic Architecture	Bridge No. 8257	Not Eligible	Constructed 1932
X		RC-WAL-00004	Historic Architecture	Bridge L2733/Dump Road Bridge	Not Eligible	Constructed in 1904 and originally listed on the NRHP in 1989 under Criterion A for its association with the development of transportation to rural Minnesota communities and under Criterion C, based on its design as a pin-connected Pratt through truss bridge, this resource was removed from the NRHP 7/1/2002 due to its poor integrity, as the resource was demolished in 2001.
X	X	XX-ROD-00022	Historic Architecture	Trunk Highway 56	Not Eligible	Constructed 1921
X		XX-ROD-00042	Historic Architecture	Trunk Highway 60	Not Eligible	Constructed 1921
X	X	XX-ROD-00072	Historic Architecture	Trunk Highway 57	Not Eligible	N/A
X	X	XX-ROD-00178	Historic Architecture	Trunk Highway 65	Not Eligible	Constructed 1920
X	X	XX-RRD-CSP017	Historic Architecture	Milwaukee and St. Paul Railway Company/Chicago, Milwaukee and St. Paul Railway Company/Chicago, Milwaukee, St. Paul and Pacific Railroad Company: Iowa and Minnesota Division Main Line	Not Eligible	Constructed 1964-1969
X	X	XX-RRD-CSP018	Historic Architecture	Minnesota Central Railway Company/Milwaukee and St. Paul Railway Company/Chicago, Milwaukee, St Paul and Pacific Railway Company	Not Eligible	Constructed 1865

Resource present within the ROI of:		Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
Segment 2 North	Segment 2 South					
X	X	XX-RRD-CSP021	Historic Architecture	Minnesota Central Railway Company/Milwaukee and St. Paul Railway Company/Chicago, Milwaukee, St Paul and Pacific Railway Company, Minneapolis to Owatonna	Not Eligible	Constructed 1865
X		XX-RRD-CSP042	Historic Architecture	Minnesota Midland Railway Company/Chicago, Milwaukee and St. Paul Railway Company/Chicago, Milwaukee, St. Paul and Pacific Railroad Company	Not Eligible	Constructed 1878-1903
	X	GD-KNT-00008	Historic Architecture	District School No. 87	Unevaluated	Constructed 1887
	X	RC-WAR-00008	Historic Architecture	Bridge No. 66823	Unevaluated	N/A
X	X	Cemetery ID 20716	Historic Cemetery	Catholic Cemetery	N/A	Mapped at the PLS Township level in T109N.
X		Cemetery ID 20688	Historic Cemetery	Dale Cemetery	N/A	Mapped at the PLS Forty level in Section 34 of T110N, R17W.
X		Cemetery ID 23737	Historic Cemetery	Methodist Episcopal Church Cemetery	N/A	Mapped at the PLS Township level in T110N.
X		Cemetery ID 20766	Historic Cemetery	Old Hauge Cemetery	N/A	Mapped at the PLS Township level in T110N.
X		Cemetery ID 20672	Historic Cemetery	St. Michaels Cemetery	N/A	Mapped at the PLS Forty Level in Section 34 of Township 110N, Range 18W.
X		Cemetery ID 20723	Historic Cemetery	Unknown - Cemetery	N/A	Mapped at the PLS Section level in Section 5 of T108N, R26W. Est. 1864. May also be present in Section 8 of T108N, R26W.
X		Cemetery ID 20722	Historic Cemetery	Unknown-Cemetery	N/A	Mapped at PLS Forty level in Section 4, T109N, R17W.
X		Cemetery ID 23700	Historic Cemetery	Woodman Cemetery	N/A	Mapped at PLS Forty level in Section 8, T109N, R 20W; inactive cemetery, active between 1860 and 1972.
	X	Cemetery ID 23701	Historic Cemetery	Denison Cemetery		Mapped at PLS Forty level in Section 18, T109N, R20W; inactive cemetery, earliest burial 1860.

[1] Source: reference (130)

6.8.2 Potential Impacts

Potential impacts are assessed through identification of documented archaeological and historic resources within one mile of the anticipated alignments. An emphasis is placed on resources within the route width (i.e., the ROI), which could have the most potential impact. The majority of Segment 2 North could be double-circuited along the existing transmission line, which would minimize impacts to archaeological resources. However, within the double-circuited portions, structures may be replaced and/or relocated, which could result in additional ground disturbance. Segment 2 South would not be double-circuited nor would it parallel an existing transmission line, roadway or railway, and would therefore have more potential to impact intact cultural resources, if present.

Direct impacts to archaeological and historic architectural resources could result from construction activities, such as ROW clearing, placement of structures, new access roads, temporary construction areas, vehicle and equipment operation, and removal of historic buildings or structures. Additional direct impacts can result from transmission line location and operation, such as placement within view of a resource (typically a historic building, structure, or TCP) that results in negative effect on the setting, feeling, and/or association of the resource in the viewshed. This issue is particularly applicable when considering cultural resources where the surrounding environment plays an essential role in defining the character.

Within the route width of Segment 2 North, there are no previously identified cultural resources that have been listed, or determined eligible for listing, on the NRHP. Four previously documented archaeological sites intersect the route width, all unevaluated for the NRHP. Four unevaluated historic architectural resources are also within the route width of Segment 2 North. Eight historic cemeteries may be within the route width of Segment 2 North. However, these are mapped at the PLS Forty, Section, or Township level, and the exact locations are unknown.

Within the route width of Segment 2 South, there are no previously identified cultural resources that have been listed, or determined eligible for listing, on the NRHP. No archaeological sites are within the route width. There are two historic architectural resources which are unevaluated for listing on the NRHP, and two historic cemeteries may be within the route width of Segment 2 South. However, these cemeteries are mapped at the PLS Forty and PLS Township levels, and the exact locations are unknown.

6.8.2.1 Segment 2 North: Route Width

Four previously identified archaeological sites intersect the 2 North route width, all of which are unevaluated for listing on the NRHP. All of these sites are alpha sites consisting of post-contact towns. An alpha site is an archaeological site that has been recorded based on historic documentation, maps, or reporting but has not been investigated by a qualified archaeologist.

The Survey Implementation Model (MnModel 4), as available on the OSA Portal shows that the majority of the study area for Segment 2 North is of unknown potential for the presence of archaeological sites. However, some areas of high potential are shown along the North Branch Zumbro River and along some of the streams and tributaries that would have provided consistent sources of fresh water.

Of the 20 historic architectural resources that intersect the route width, none are listed, or eligible for listing, on the NRHP. Four resources are unevaluated for listing on the NRHP. These resources consist of a mid-twentieth century cheese factory (GD-CGR-00006), a grain elevator (GD-CGR-00007) an abandoned farmhouse (GD-WMT-00038), and Bridge L0729 (GD-HOL-00065). Resource GD-HOL-00065 is a bridge which crossed a stream along 450th Street in Holden Township in Goodhue County. Resource GD-CGR-00006 is a former cheese factory constructed in 1909, that ceased operation in 1920 and was converted to a private garage. in Cherry Grove Township in Goodhue County. At the time of reporting (1978), this structure was still standing, but the current status of the original structure is not available. Resource GD-CGR-00007 is an extant grain elevator, construction date unknown. Both resources are in Cherry Grove Township in Goodhue County along Highway 60. Resource GD-CGR-00038 is a farmhouse, construction date unknown, which was extant at the time of reporting (1978). Current aerials show that a residence is present in this location, however, it is unclear whether a portion, or all, of the original structure is intact. It is in Wanamingo Township in Goodhue County, also along Highway 60. This portion of Segment 2 North could be double-circuited along the existing transmission line. Therefore, impacts to these resources would be minimal, as the viewshed surrounding the structures would remain consistent with the setting's current character.

The remaining resources are not eligible for listing on the NRHP and consist primarily of bridges, culverts, trunk highways railroads.

6.8.2.2 Segment 2 South: Route Width

There are no previously identified archaeological sites that intersect the route width of Segment 2 South. MnModel 4 shows that the majority of the study area for Segment 2 South is of unknown potential for the presence of archaeological sites. However, upland terraces along consistent sources of fresh water, such as streams and tributaries of the North Branch Zumbro River, would have higher potential for the presence of archaeological sites.

Of the eight recorded historic architectural resources, none are listed, or determined eligible for listing, on the NRHP. Two resources are unevaluated for listing on the NRHP and consist of Bridge No. 66823 (RC-WAR-00008) and District School No. 87 (GD-KNT-00008). Resource RC-WAR-00008 is a bridge along 230th Street W. that crosses U.S. Highway 35 in Warsaw Township in Rice County. This portion of Segment 2 South could be double-circuited along the existing transmission line, and therefore, the viewshed for users of this resource would not be significantly altered, nor would the resource be impacted by project construction. Resource GD-KNT-00008 consists of a schoolhouse constructed in 1887, in Kenyan Township in Goodhue County along County Road 15. At the time of reporting in 1978, this structure was still standing; however, it is unknown whether the original structure is still intact. This portion of Segment 2 South would not be double-circuited or parallel an existing transmission line, so the viewshed of the users of this resource may be altered to include visibility of the transmission line and support structures from some portions of the property, though stands of trees north, west, and south of the resource provide substantial visual screening.

6.8.3 Mitigation

As noted in the joint certificate of need application and route permit application, the applicant designed routes to avoid physical impacts to known cultural resources. If a Route Permit is issued, and upon route selection, the applicant would consult with SHPO concerning additional required mitigation measures, and would develop a Phase I Cultural Resource Survey Strategy and associated Cultural Resource Survey Reconnaissance survey to identify unknown cultural resources along the proposed route. All investigations would be conducted by a professional archaeologist meeting the Secretary of the Interior's Standards for Archaeology as detailed in the Title 36 Code of Federal Regulations, Part 6. SHPO and interested Tribes will be consulted on methodology prior to completing the study.

As noted in Section 7.5.2 of the joint certificate of need application and route permit application, the applicant will develop an Unanticipated Discoveries Plan, which will outline protocol and mitigation measures, should archaeological resources or human remains be encountered during project construction. The plan will include contact information for SHPO officials, environmental inspectors, archaeologists, geologists, and county sheriffs.

The applicant has engaged, and will continue to engage, with THPOs and interested Tribes to share project information and to glean information about resources of tribal significance that may be impacted by the project.

6.9 Natural Environment

6.9.1 Air Quality

The ROI for air quality is the project area. Impacts can occur during construction and operation of a transmission line and substation. Potential impacts to air quality during construction would be intermittent, localized, short-term, and minimal. Impacts are associated with fugitive dust and exhaust and can be mitigated. Long-term impacts to air quality would also be minimal and are associated with the creation of ozone and nitrous oxide emissions along the HVTL and substations. These localized emissions would be below state and federal standards. Impacts are unavoidable and do not affect a unique resource.

6.9.1.1 Existing Conditions

The Clean Air Act is a federal law that regulates air emissions from stationary and mobile sources. The Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to set (NAAQS for six common air pollutants, referred to as "criteria pollutants". The six criteria pollutants are ground-level ozone O_3, PM_{10} and $PM_{2.5}$, SO_2, nitrogen dioxide (NO_2), carbon monoxide (CO), and lead (Pb) (reference (131)). NAAQS are set to address the public health and welfare risks posed by certain widespread air pollutants (references (132); (133)).

The Clean Air Act identifies two classes of NAAQS: primary standards, which are limits set to protect the public health of the most sensitive populations, such as asthmatics, children, and the elderly; and secondary standards, which are limits set to protect public welfare, such as protection against visibility impairment or damage to vegetation, wildlife, and structures. Compliance with the national and state air quality standards in the state of Minnesota is assessed at the county level. Minnesota's state air quality standards align with NAAQS. The EPA designates all counties traversed by Segment 2 to be in attainment for all NAAQS.

In Minnesota, air quality is monitored using stations located throughout the state. The MPCA uses data from these monitoring stations to calculate the AQI on an hourly basis for O_3, $PM_{2.5}$, SO_2, NO_2, and CO. Each day is categorized based on the pollutant with the highest AQI value for a particular hour (reference (134)).

The South Metro air quality monitoring station is in Dakota County, approximately 25 miles northwest of Segment 2. The station monitors for O_3 and $PM_{2.5}$. Table 6-14 summarizes the days in each AQI category at the South Metro monitoring station for the most recent five-year period available, 2019-2023.

Table 6-14 Days in Each Air Quality Index Category - South Metro Monitoring Station

Year	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy
2023	167	178	15	5	0
2022	257	108	0	0	0
2021	231	131	1	2	0
2020	252	113	1	0	0
2019	247	118	0	0	0

Air quality at the South Metro monitoring station has been considered "good" for the majority of the past five reported years, except for 2023. The reporting period 2023 had the largest number of days classified as moderate or worse, with 178 days classified as moderate, 15 days classified as unhealthy for sensitive groups, and five days classified as unhealthy.

6.9.1.2 Potential Impacts

Air emissions during construction would primarily consist of emissions from construction equipment and vehicles and would include pollutants such as CO_2, nitrogen oxides (NO_x), and PM. Dust generated from earth disturbing activities also gives rise to PM_{10}/$PM_{2.5}$. Double-circuiting with an existing transmission line would result in less PM_{10}/$PM_{2.5}$ emissions due to less ground disturbance. Adverse effects on the surrounding environment are expected to be negligible due to the temporary disturbance during construction and the intermittent nature of the emission- and dust-producing construction phases.

During operations, air emissions would not require any air quality permits. Small amounts of emissions would be associated with the intermittent project operation and maintenance activities via mobile combustion and particulate roadway dust generation.

During operation, small amounts of NO_X and O_3 would be created due to corona from the operation of transmission lines. The production rate of O_3 due to corona discharges decreases with humidity and less significantly with temperature. Rain causes an increase in O_3 production. In addition to weather conditions, design of the transmission line also influences the O_3 production rate. The O_3 production rate decreases significantly as the conductor diameter increases and is greatly reduced for bundled conductors over single conductors. Conversely, the production rate of O_3 increases with applied voltage (reference (135)). The emission of O_3 from the operation of a transmission line of the voltages proposed for the project would be minimal.

Emissions would be generated from fuel combustion during routine inspection and maintenance activities. The applicant would perform an annual aerial inspection of the line. Once every four years, crews would visually inspect the lines from the ground. Additionally, vegetation maintenance would generally occur once every four years. Emissions from routine inspection and maintenance activities would be minimal.

6.9.1.3 Mitigation

As noted in the joint certificate of need application and route permit application, if construction activities generate problematic dust levels, the applicant would employ construction-related practices to control fugitive dust as needed. This could include application of water or other commercially available non-chloride dust control agents on unpaved areas subject to frequent vehicle traffic, reducing the speed of vehicular traffic on unpaved roads, and covering open-bodied haul trucks.

As also noted in the route permit application, corona effects would be minimized during operation by using good engineering practices, such as the use of bundled conductors. A corona signifies a loss of electricity, so the applicant would engineer the transmission lines to limit corona.

6.9.2 Climate

The ROI for climate change is the project area. The impact analysis for climate considers existing patterns in the ROI and how the project could be impacted by climate change, as well as how the project could affect climate change. For the counties crossed by Segment 2, flood risk is moderate, and fire risk is moderate. The project would minimally contribute to climate change impacts as a result of GHG emissions. The project would be engineered to be resilient under changing climatic factors, including increased average temperatures and changes in precipitation intensities and quantities.

6.9.2.1 Existing Conditions

Climate change is observed as changes in temperature and precipitation patterns, increases in ocean temperatures and sea levels, changes in extreme weather events, and ecosystem changes. These changes are largely attributed to the greenhouse effect. As the amount of greenhouse gases (GHGs) in the Earth's atmosphere increases, the greenhouse effect causes the Earth to become warmer (reference (136)).

There are also naturally occurring climate variations. These are cyclical patterns caused by variations in ocean circulation and atmospheric pressure patterns that occur on timescales of weeks to decades. Increased global surface temperatures could change these natural climate patterns and the resulting impact on regional precipitation and temperature anomalies (reference (137)).

Warmer and wetter conditions have been observed in Minnesota since observations first began in 1895, especially in the past several decades. An increase in precipitation volume and intensity has also been observed, including large-area extreme rainstorms. A rise in temperatures, particularly during the winter season in Minnesota, has been occurring as well. These trends are expected to continue (reference (138)).

To understand how climate change is anticipated to affect the project area, historical and projected climate data is considered, as well as climate hazard projections.

Climate projections are based on the Minnesota dynamically downscaled climate model data that was developed by the University of Minnesota and are summarized in three scenarios: Shared Socioeconomic Pathway (SSP) 245, SSP370, and SSP585. SSP is a measure adopted by the Intergovernmental Panel on Climate Change (IPCC) to represent various greenhouse gas concentration pathways as well as social and economic decisions (reference (139)).

SSP245 represents a “Middle of the Road” scenario where economic, social, and technological trends follow historical patterns, population growth is moderate, and inequality persists. Additionally, SSP245 includes an intermediate emissions scenario, where a net radiative forcing of 4.5 watts per meter squared (W/m^2) is received by the earth due to the greenhouse gas (GHG) effect and emissions begin to decrease around 2040 (reference (139)).

SSP370 represents a “Regional Rivalry” scenario where nations focus on regional issues instead of cross-collaboration and development. SSP370 also includes a high emissions scenario, where a net radiative forcing of 7.0 W/m^2 is received by the earth(reference (139)).

SSP585 represents a “Fossil-fueled Development” scenario where there is increased development in competitive markets driven by an increased global consumption of fossil fuels. SSP585 also includes a very high emissions scenario, where a net radiative forcing of 8.5 W/m^2 is received by the earth and no emissions are reduced through 2100 (reference (139)).

Table 6-15 shows the modeled historical and projected temperature values for the project.

Table 6-15 Modeled Historical and Projected Temperature Trends for the Project

Scenario	Time Period	Average Daily Temperature (°F) – Ensemble Mean	Minimum Daily Temperature (°F) – Ensemble Mean	Maximum Daily Temperature (°F) – Ensemble Mean
Historical	1995-2014	44.9	35.4	57.3
SSP245	2040-2059	48.6 (3.7)	39.2 (3.9)	60.8 (3.5)
SSP245	2060-2079	49.9 (5.0)	40.6 (5.3)	62.0 (4.7)
SSP245	2080-2099	51.6 (6.7)	42.2 (6.8)	63.8 (6.5)
SSP370	2040-2059	50.0 (5.1)	40.2 (4.9)	62.7 (5.4)
SSP370	2060-2079	52.0 (7.2)	42.4 (7.0)	64.6 (7.3)
SSP370	2080-2099	53.9 (9.0)	44.5 (9.1)	66.1 (8.8)
SSP585	2040-2059	49.2 (4.3)	39.8 (4.4)	61.4 (4.1)
SSP585	2060-2079	51.9 (7.0)	42.6 (7.3)	63.9 (6.6)
SSP585	2080-2099	56.2 (11.3)	47.3 (11.9)	67.9 (10.6)

[1]Values in parentheses represent the difference from the modeled historical value.

Table 6-16 shows the modeled historical and projected precipitation values for the project.

Table 6-16 Modeled Historical and Projected Precipitation Trends for the Project

Scenario	Time Period	Total Annual Precipitation (in) - Ensemble Mean
Historical	1995-2014	35.3
SSP245	2040-2059	37.1 (1.8)
SSP245	2060-2079	36.3 (1.1)
SSP245	2080-2099	34.3 (-1.0)
SSP370	2040-2059	30.0 (-5.3)
SSP370	2060-2079	31.6 (-3.7)
SSP370	2080-2099	34.6 (-0.7)
SSP585	2040-2059	35.3 (0.1)
SSP585	2060-2079	38.6 (3.3)
SSP585	2080-2099	40.6 (5.3)

[1] Values in parentheses represent the difference from the modeled historical value.

The EPA Climate Resilience Evaluation and Awareness Tool (CREAT) provides 100-year storm intensity projections to help with planning for water, wastewater, and stormwater utilities (references (140); (141)). A 100-year storm is an event that has a one percent chance of occurring in a given year. The CREAT tool considers two time periods, 2035 and 2060. For each time period, two scenarios are considered, from a 'Not as Stormy' future to a 'Stormy' future. Within the counties traversed by the project, the 2035 time period shows a 1 to 5 percent increase in the 100-year storm intensity for the 'Not as Stormy' scenario, and an 11 to 20 percent increase for the 'Stormy' scenario. The 2060 time period shows a 6 to 10 percent increase in the 100-year storm intensity for the 'Not as Stormy' scenario, and a 26 to 30 percent increase for the 'Stormy' scenario.

The EPA Streamflow Projections Map summarizes general projections related to streamflow under climate change (reference (142)). The EPA Streamflow Projections Map for 2071 to 2100 (RCP 8.5) anticipates a general change in average streamflow of streams within the Segment 2 project area by a ratio of 1.26 to 1.29 (90th percentile) under wetter projections and a ratio of 0.83 (10th percentile) under drier projections when compared to baseline historical flows (1976 to 2005).

The First Street Risk Factor risk assessment and map tool was used to determine a risk assessment for each of the counties traversed by Segment 2 to help identify current and future climate change risks (reference (143)). Table 6-17 summarizes risks for flood, fire, wind, air quality, and heat as defined by Risk Factor (144); (145); (146); (147); (148)).

Table 6-17 Climate Change Risks for Counties Traversed by Segment 2

County	Flood Risk	Fire Risk	Wind Risk	Air Quality Risk	Heat Risk
Rice	Moderate	Moderate	Minor	Minor	Minor
Goodhue	Moderate	Moderate	Minor	Minor	Minor

Flood risk is moderate for all counties. The fire risk is moderate for all counties. The wind risk, air quality risk, and heat risk are all minor for all counties.

6.9.2.2 Potential Impacts

The project would result in GHG emissions that could minimally contribute to climate change impacts such as changes in temperature, precipitation, and extreme weather events. These emissions are discussed in Section 6.9.4. Double-circuiting with an existing transmission line would result in less GHG emissions from land use change. The climate change risks most susceptible to the project include increases in 100-year storm frequencies and soil erosion from increased storm intensities. The project could also be susceptible to more frequent wildfires.

6.9.2.3 Mitigation

The project would be engineered to be resilient under changing climatic factors including increased average temperatures and changes in precipitation intensities and quantities.

There may be periods of dry weather and concerns of wildfires. However, the transmission lines would be maintained following or exceeding NERC reliability standards that address vegetation management, including the increase of noxious weeds that could occur from changed conditions that allow them to spread. Surface water temperatures could increase in locations where the project requires tree clearing along shorelines, increasing sun exposure. This would be exacerbated by increased temperatures.

6.9.3 Geology and Topography

The ROI for geology and topography is the route width. Structure foundations have the potential to impact bedrock. Minimal impacts are anticipated to geologic features given the anticipated depth to

bedrock. Minimal impacts are anticipated to topography along the route width given that original surface contours are re-graded and revegetated to the extent feasible.

6.9.3.1 Existing Conditions

Surface geology is dominated by quaternary-aged glacial sediments deposited by ice of the Des Moines lobe from the most recent Wisconsin glaciation. Deposits of loamy diamicton of the Browerville Formation are most prevalent, along with deposits of sandy loam, sand, and gravel of the New Ulm Formation near Faribault. Post-glacial floodplain alluvium is also present (reference (149)). Thickness of the glacial deposits varies depending on the location and type of deposit; thickness generally ranges from less than 50 feet to over 300 feet (reference (150)). The project area is underlain by bedrock formed during the Ordovician period in the Paleozoic Era, and consists of limestone, dolostone, shale, and sandstone (reference (151)).

No karst features were identified within the route width. The nearest karst feature is a tile outlet approximately 1.2 miles north of Segment 2 North at an intermittent stream crossing along Lamb Avenue (reference (152)).

No springs were identified within the route width based on a search of the Minnesota Spring Inventory database (reference (153)).

Elevations along the route width range from about 1080 feet AMSL near Faribault to 1216 feet AMSL near Kenyon, and 1194 feet AMSL near Pine Island. Topography is generally flat with localized areas of steeper slopes occurring adjacent to waterbodies.

The project area seismic risk is very low; it is located within an area rated as less than a two-percent chance of damage from natural or human-induced earthquake in 10,000 years (reference (154)).

The type of landslide most common in Minnesota is shallow slope failure triggered by a heavy rain event. This slope failure is generally less than 3 feet deep but can erode the entire length of a slope. Deeper landslides, mudflows, and debris flows are much less common in Minnesota than in more mountainous areas. Less destructive landslides, such as slow-moving earthflows and soil creep, can also occur when soil moisture and shallow groundwater saturate sediments during heaving rain events or snowmelt. Human factors including inadequate storm water management, undercutting of slopes, placement of artificial fill, and land-use changes, such as urbanization and agricultural practices, can lead to erosion and landslides (reference (155)). No records of landslides within the Segment 2 ROI were noted (reference (156)).

6.9.3.2 Potential Impacts

Thick glacial deposits cover most of the project area. Bedrock is generally deeper than 50 feet, however, in some areas, bedrock may be present just below the surface. Construction and operation of transmission line projects can impact geology through temporary, construction-related impacts and/or long-term impacts.

Impacts to topography, such as the creation of abrupt elevation changes, are not expected. Transmission line structures would be installed at existing grade. Changes in slope are not anticipated during the project, so there would be limited risk of landslides.

6.9.3.3 Mitigation

The applicant would conduct geotechnical evaluations prior to project construction to identify structure placements and avoid impacts to subsurface geological features.

Geotechnical analyses would evaluate whether karst areas are present at structure locations, and micro-siting and structure foundation design would account for the presence of karst. If geotechnical analyses determine karst features are present where construction will occur, the applicant will comply with MPCA stormwater requirements and would prohibit infiltration of stormwater runoff within 1,000 feet up-gradient or 100 feet down-gradient of active karst features.

Should grading occur for installation of the HVTL structures, it would be restricted to establishing a flat, safe workspace. Major topographical changes to the landscape would not occur. Once construction is complete, disturbed areas would be regraded to restore original surface contours and revegetated to the maximum extent feasible.

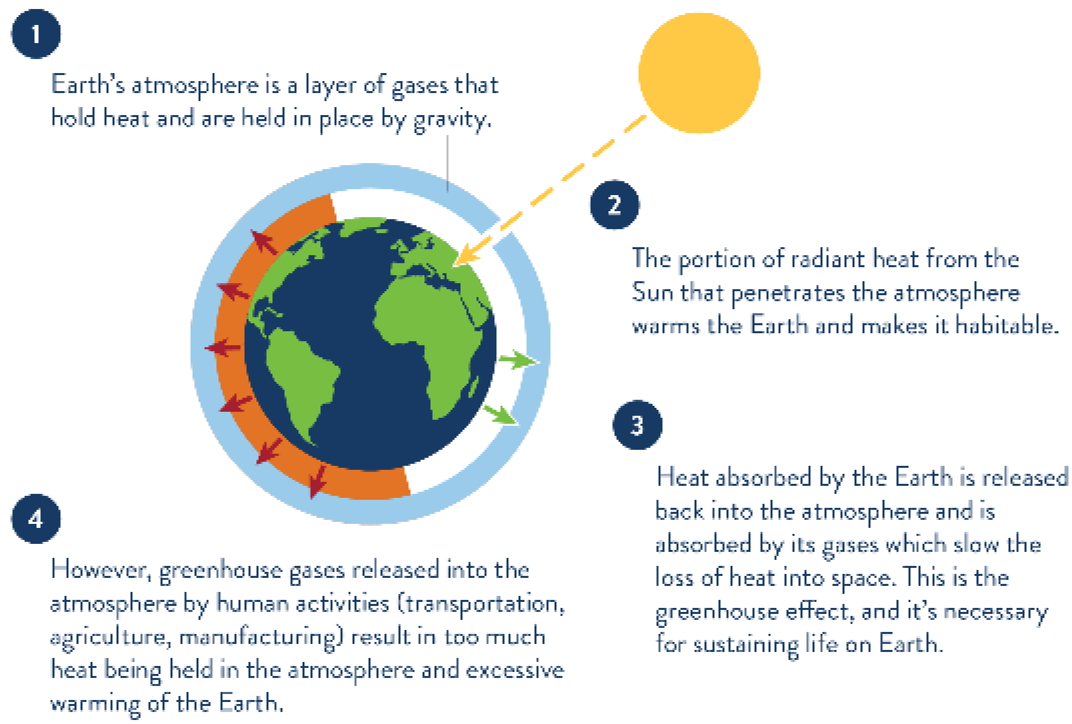
6.9.4 Greenhouse Gases

The ROI for greenhouse gas (GHG) emissions is the ROW. Construction activities would result in short-term increases in GHG emissions because of the combustion of fossil fuels in construction equipment and vehicles. These emissions would be short-term and dispersed over the ROI; therefore, total emissions would be minimal and not result in a direct impact to any one location. Maintenance activities would also cause GHG emissions, but to a much lesser extent. Operational impacts from formation of nitrous oxide and release of sulfur hexafluoride would be minimal. Impacts are unavoidable but can be minimized.

6.9.4.1 Existing Conditions

GHGs are gases that trap heat in the atmosphere. Some of the solar radiation that reaches Earth's surface radiates back toward space as infrared radiation. GHGs trap heat in the atmosphere from the absorption of this infrared radiation, which causes a rise in the temperature of Earth's atmosphere as illustrated in Figure 6-6. This warming process is known as the greenhouse effect (reference (157)).

**Figure 6-6	Greenhouse Gases and Earth's Atmosphere**



The most common GHGs include CO_2, CH_4, N_2O, and fluorinated gases. GHG emissions are calculated as carbon dioxide equivalent (CO_2e), which is equal to the global warming potential (GWP) for each pollutant multiplied by the potential pollutant emissions. CO_2e normalizes all GHGs emissions to CO_2 for comparability across different pollutants. Human GHG emissions are responsible for about two-thirds of the energy imbalance that is causing Earth's temperature to rise, which has direct and cascading effects on weather and climate patterns, vegetation, agriculture, disease, availability of water, and ecosystems (reference (158)).

Climate change and decarbonization have been discussed for decades at all levels of government, as well as in global, national, and local institutions. The state of Minnesota has established a goal for the reduction of GHG emissions, set forth in Minnesota Statute § 216H.02:

> *It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions by at least the following amounts, compared with the level of emissions in 2005: (1) 15 percent by 2015; (2) 30 percent by 2025; (3) 50 percent by 2030; and (4) to net zero by 2050.*

Minnesota Statute § 216B.1691 Renewable Energy Objectives, which became effective in 2023, requires all electric utilities to generate or procure 100 percent of electricity sold to Minnesota customers from carbon-free sources by 2040, with an interim goal of 80 percent (for public utilities) and 60 percent (for

other electric utilities) carbon-free electricity by 2030. Carbon-free sources are those that generate electricity without emitting CO_2. Electric utilities are also required to generate or procure 55 percent of electricity sold to Minnesota customers from an eligible energy technology by 2035. Eligible energy technology includes technology that generates electricity from solar, wind, and certain hydroelectric, hydrogen, and biomass sources (Minnesota Statute §216B.1691).

6.9.4.2 Potential Impacts

GHG emissions associated with the construction and operation of the project consist of direct emissions generated from combustion sources (for example, mobile on- and off-road sources) and land use change. Double-circuiting with an existing transmission line would result in less GHG emissions from land use change. Indirect emissions associated with the operation of the project include the GHG emissions associated with electrical consumption.

Construction emissions from mobile combustion were calculated for on-road vehicles and off-road construction equipment. Construction emissions from combustion sources are anticipated to be similar for each alternative. Therefore, the total construction combustion emissions and length of the applicant-proposed segments were used to calculate an emission rate per segment length, in metric tons CO_2e/mile, to quantify combustion emissions for each alternative. Construction emissions from temporary land use changes were calculated with an assumed construction duration of 60 days for each land use change area. The calculated emission rate per segment length is 70.86 metric tons CO_2e/mile. GHG emissions calculations are summarized in Appendix L.

Identified GHG emissions associated with operation of the project include direct emissions generated from combustion sources (for example, mobile on- and off-road sources) and land use change, and indirect emissions from electrical consumption. Operational emissions from mobile combustion are anticipated to be similar for each alternative. Therefore, operational emissions from mobile combustion have only been calculated for the applicant-proposed segments. Operational emissions from temporary land use changes were calculated with the assumption that forest land, cropland, and settlement land would be converted to grassland following completion of the project and for the duration of operations. Operational emissions from electrical consumption are assumed to be negligible and have not been calculated.

The PSD is a Clean Air Act permitting program for new or modified major sources of air pollution in attainment areas. It is designed to prevent NAAQS violations, preserve and protect air quality in sensitive areas, and protect public health and welfare (reference (159)). The current threshold for new facilities with GHG emissions is 100,000 tons CO_2e per year. Estimated project GHG emissions are below this threshold.

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

routinely because they are largely attributed to faulty equipment and leakage. Equipment containing SF_6 is designed to avoid SF_6 emissions (reference (160)).

6.9.4.3 Mitigation

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

The project would ultimately result in a net decrease of GHG emissions during operation, as it would facilitate the replacement of legacy fossil fuel generation with renewable resources. The project would also increase regional transmission reliability and allow additional carbon-free energy sources to be integrated into the power supply. The project will therefore assist in achieving climate goals.

6.9.5 Groundwater

The ROI for groundwater is the ROW. Documented active wells and DWSMA/WHPAs are present within the ROI. Associated wellhead protection plans should be reviewed by the applicant. To minimize impacts, the applicant would store materials, including fuel and gasoline, in sealed containers to prevent spills, leaks, or other discharges to soil and groundwater in accordance with the SWPPP during construction. Potential impacts to groundwater could also occur during construction (specifically installation of foundations) if artesian groundwater conditions are present and the confining layer is breached. Artesian groundwater conditions can be found throughout the state of Minnesota and are not limited to certain areas of geography. Provided the pressurized conditions and extents are identified and understood, and a plan is implemented to manage pressurized groundwater conditions should they be encountered, impacts would be minimized and/or mitigated.

6.9.5.1 Existing Conditions

The DNR divides Minnesota into six groundwater provinces based on bedrock and glacial geology. The aquifers within these provinces occur in two general geologic settings: bedrock and unconsolidated sediments deposited by glaciers, watercourses, and waterbodies. The ROW crosses the South-Central Province. Water availability in the South-Central Province is limited in surficial sands and moderate in buried sands. The South-Central province contains thick loam and clayey unconsolidated sediments, with limited extent surficial and buried sand aquifers, overlying thick sandstone and carbonate aquifers (reference (161)).

Groundwater flow direction in these shallow, unconsolidated sediments is expected to follow surface topography and surface water flow. However, groundwater flow direction could vary depending on factors such as the presence of shallow bedrock, underground utilities, and/or other surficial features. The depth to the water table is generally less than 50 feet below ground surface along the ROW (reference (162)).

The EPA defines a sole source aquifer (SSA) or principal source aquifer area as:

- One that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer
- Where contamination of the aquifer could create a significant hazard to public health
- Where there are no alternative water sources that could reasonably be expected to replace the water supplied by the aquifer.

There are currently no EPA-designated SSAs along the ROW (reference (163)).

Wells are abundant within the project area. The MWI, which is managed by the MDH, provides information about wells and borings such as location, depth, geology, construction, and static water level at the time of construction. According to the MWI there are no wells within the ROW (reference (164)).

The Wellhead Protection Area (WHPA) program administers the public and non-public community water supply source-water protection (SWP) in Minnesota. WHPAs are areas surrounding public water supply wells that contribute groundwater to the well. In these areas, contamination on the land surface or in water can affect the drinking water supply. WHPAs for public and community water-supply wells are delineated based on a zone of capture for 10-year groundwater time-of-travel to the well and are available through a database and mapping layer maintained by MDH (reference (165)). The viewer also includes the Drinking Water Supply Management Areas (DWSMA) and DWSMA Vulnerability. DWSMAs are delineated areas within the WHPA and are managed in a wellhead protection plan, usually by a city.

Segment 2 North's ROW intersects the Wanamingo DWSMA/WHPA which has a low vulnerability to contamination (Map 22-3).

A Special Well and Boring Construction Area, or well advisory, is a mechanism which provides for controls on the drilling or alteration of public and private water-supply wells, and environmental wells in an area where groundwater contamination has, or might, result in risks to the public health. There are no MDH-designated Special Well and Boring Construction Areas along the ROW (reference (166)).

Flowing wells and borings are drilled holes that encounter an aquifer with sufficient natural pressure to force water above the ground surface, so that water will flow without pumping. Flowing artesian conditions exist when a low permeability confining layer, such as clay or shale, overlies the aquifer. This puts the groundwater under pressure because the material doesn't permit water to flow through it. When a well or boring is completed, the confining layer is breached, creating a pressure relief valve that allows the water to rise above the top of the aquifer. If the pressure in the aquifer is great enough to force water to rise above the land surface, the well flows. Flowing conditions can also occur in an unconfined aquifer, most often at lower elevations in groundwater discharge areas near rivers, lakes, or other waterbodies. These unique features can be found throughout the state of Minnesota and are not limited to certain areas or geography (reference (167)).

6.9.5.2 Potential Impacts

When an unexpected artesian condition is found, it can have a substantial impact that could compromise the condition and use of the area in which the flow is encountered and could cause challenges with construction of transmission line tower foundations along the routes. Artesian groundwater conditions, when unintentionally encountered, can cause excavation stability issues and uncontrolled release of groundwater at the ground surface and to surface waters. If uncontrolled, artesian groundwater conditions can be extremely difficult to repair and in some instances are un-repairable. However, subsurface investigations and construction in artesian groundwater conditions can be completed successfully provided the pressurized conditions and extents are identified and understood, and a plan is implemented to manage pressurized groundwater conditions should they be encountered.

6.9.5.3 Mitigation

The applicant would coordinate with the DNR, as necessary, to confirm that ground disturbing activities such as geotechnical investigation and structure installation placement does not disrupt groundwater hydrology.

The applicant would conduct geotechnical evaluations prior to project construction to identify locations where potential groundwater impacts could occur. The applicant noted in the joint certificate of need application and route permit application that they would identify shallow depth to aquifer areas during geotechnical investigation, would continue to work with landowners to identify springs and wells, and if shallow depth aquifer areas are discovered, would use specialty structures that require wider, shallower excavation areas to avoid impacts to groundwater resources.

Depending on the results of the geotechnical evaluations, the applicant would obtain a Water Appropriation Permit from DNR if groundwater dewatering activities would be greater than 10,000 gallons of water per day or 1 million gallons per year.

The applicant would assess any wells identified within the ROW during project construction to determine if they are open, and seal them, if necessary, in accordance with MDH requirements.

Indirect impacts to groundwater can be mitigated by avoiding or minimizing impacts to surface waters. Measures to control soil erosion and sedimentation would be implemented during construction activities.

One DWSMA/WHPA is crossed by Segment 2 North ROW. The associated wellhead protection plan would be reviewed by the applicant. To minimize impacts, the applicant would store materials including fuel and gasoline in sealed containers to prevent spills, leaks, or other discharges to soil and groundwater in accordance with the SWPPP during construction.

6.9.6 Public and Designated Lands

The ROI for public and designated lands is the ROW. Public and designated lands often involve unique resources intended for protection, preservation, and/or recreational use. Public lands (local, state, or federal level) and conservation easements within the ROI are identified and qualitatively assessed for potential impact (e.g., vegetation clearing). Public land within the ROI includes a Wildlife Management Areas which is owned by the DNR. No other public lands such as local parks, state forests, or national forests were identified. Designated lands with easements within the ROI include Conservation Reserve Enhancement Program (CREP) and RIM easements. Occupying public and designated lands would require coordination with the landowner (Section 3.3.2.2).

6.9.6.1 Existing Conditions

Public lands include those owned at the local, state, and federal levels. No locally-owned (city or county) or federally-owned lands are present within the ROI. State public lands within the ROI of Segment 2 includes one WMA.

The Faribault WMA, which is owned by the DNR, is present within Segment 1 North and Segment 2 North's ROI (Map 26-1).

Privately held land could also be subject to special designations. The project crosses lands that are part of various conservation easement programs, including the Reinvest in Minnesota (RIM) Reserve program and Conservation Reserve Enhancement Program (CREP). The Minnesota BWSR acquires, on behalf of the state, conservation easements to permanently protect, restore and manage critical natural resources without owning the land outright. The RIM Reserve program compensates landowners for granting conservation easements and establishing native vegetation habitat on economically marginal, flood-prone, environmentally sensitive or highly erodible lands (reference (171)). RIM land is present within Segment 2 South's ROI in one location (Map 26-2).

CREP is a federal program that leverages federal and non-federal funds to target specific state, regional, or nationally significant conservation concerns. In exchange for removing environmentally sensitive land from production and establishing permanent resource-conserving plant species, farmers and ranchers are paid an annual rental rate along with other federal and non-federal incentives as specified in each CREP agreement (reference (172)). Two CREP easements are present within Segment 2 North's ROI (Map 26-5).

6.9.6.2 Potential Impacts

If Segment 2 North were selected, impacts to the Faribault WMA could be avoided depending upon the location of the final alignment. The WMA abuts up to the anticipated alignment for Segment 2 North which is aligned with the property boundary (Map 26-1). If Segment 2 South were selected, the anticipated alignment would cross the WMA and would do so in a location where the project could be double-circuited with an existing 161 kV transmission line.

If Segment 2 South were selected, impacts to the RIM conservation easement could be avoided depending upon the location of the final alignment. The easement abuts up to the anticipated alignment for Segment 2 South which is aligned with the property boundary (Map 26-2).

If Segment 2 North were selected, impacts to the CREP conservation easements could be avoided depending upon the location of the final alignment. Two easements abut up to the anticipated alignment for Segment 2 North. The first is aligned with a property boundary at the Falls Creek crossing location and the second is in a location where the project could be double-circuited with an existing 69 kV line (Map 26-5).

Public lands and the lands subject to conservation easement programs aim to establish native and permanent plant species and/or conserve and protect the natural habitat. Permanent clearing of vegetation, or the expansion of the cleared areas in cases where an existing line is already present, within the conservation areas would impact the function and intent of these areas and potentially have long-term effects to the unique resources.

6.9.6.3 Mitigation

Coordination would be required to occupy public lands within the ROW and/or temporary workspace areas for construction activities within the route width. As described in Section 3.3.2.2, where new ROW would be required, rights would consist primarily of permanent electric transmission easements, providing a 150-foot-wide easement area for Segment 2. Where an existing ROW would be used for the project, the applicant's ROW agents would contact each property owner as an expansion of the ROW would more than likely be required.

The sample route permit (Section 5.3.17 of Appendix H) contains the following mitigation related to public and designated lands: "The Permittee shall restore the ROW, temporary workspaces, access roads, abandoned ROW, and other public or private lands affected by construction of the Transmission Facility." The applicant avoided areas with designated easements as practicable and identified these areas as a routing constraint in the joint certificate of need application and route permit application. If easements are crossed, the applicant would work with landowners to determine measures to avoid and minimize impacts on these agricultural resources and to avoid interfering with landowner participation in the CREP, PWP, or RIM programs. Additionally, the applicant would continue to coordinate potential easement crossings with BWSR.

6.9.7 Rare and Unique Natural Resources

Rare and unique natural resources include federally and state-protected species and sensitive ecological resources. The ROI for protected species is the project area (1 mile) and the ROI for sensitive ecological resources is the route width. Impacts to protected species are evaluated by reviewing documented occurrences of these species within the ROI. Potential impacts to sensitive ecological resources, which could provide suitable habitat for protected species, are evaluated by assessing the presence of these resources within the ROI.

One federally protected species and several state-protected species have been documented within the ROI for Segment 2. Potential direct or indirect impacts to protected species could occur should they be present within or near the ROW during construction or maintenance activities. While more mobile species would leave the area for nearby comparable habitats, non-mobile species, such as vascular plants or nesting birds, could be directly impacted. Several sensitive ecological resources, such as native plant communities, intersect the ROI for Segment 2. Construction activities also have the potential for direct impacts to sensitive ecological resources if they are present within the area subject to construction disturbance. Long-term impacts would involve permanent clearing of vegetation in areas identified as sensitive ecological resources which could indirectly impact any protected species associated with these habitats.

Several measures could be implemented to avoid, minimize, or mitigate impacts to protected species and sensitive ecological resources, including those provided in the DNR's Natural Heritage Review response (Appendix M). Some measures are specific to the protected species and their associated habitats and could include rare species surveys to confirm ahead of construction activities or monitoring during construction. Measures to avoid, minimize, or mitigate impacts include but not limited to prudent routing, implementation of BMPs, working in already disturbed areas, and working in frozen ground conditions. The applicant committed to continuing to work with the DNR to minimize and mitigate potential impacts.

6.9.7.1 Existing Conditions

Federally endangered or threatened species are protected under Section 7 of the ESA of 1973 and are typically evaluated and protected by the USFWS. Data on federally protected species were reviewed using the USFWS IPaC online tool.

At the state level, the evaluation and protection of Minnesota's rare and unique natural resources are overseen by the DNR Division of Ecological and Water Resources through the identification and evaluation of threatened and endangered species and sensitive ecological resources. State-endangered or threatened species are protected under the Minnesota Endangered Species Statute (Minnesota Statute § 84.0895).

The DNR Natural Heritage Inventory System (NHIS) database (License Agreement #2022-008) was used to assess the presence of state-protected species within the Segment 2 project area. Although the NHIS database does not represent a comprehensive survey, it provides information on the potential presence of protected species. The NHIS is continually updated as new information becomes available and is the most complete source of data on Minnesota's protected species. Although reports or queries might not show records for state-protected species within the vicinity of a project, it does not necessarily mean that they are not present. It could simply mean that the area has not been surveyed or that records have not been reported to the DNR.

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

Map 31 provides an overview of sensitive ecological resources within the ROI for Segment 2. In order to protect federally and state-protected species from exploitation or destruction, documented locations of these species are not identified on any maps.

6.9.7.1.1 Federal Protected Species

The USFWS IPaC online tool was queried on January 17, 2025, for a list of federally threatened and endangered species, proposed species, candidate species, and designated critical habitat that may be present within the vicinity of Segment 2 (Appendix M). Neither Segment 2 North nor Segment 2 South would traverse any federally designated critical habitat or proposed critical habitat. The IPaC query identified eight federal species that could potentially be in the project area of Segment 2 North and Segment 2 South, including three endangered species, one threatened species, three proposed endangered or threatened species, and an experimental population, nonessential species. The species identified in the IPaC query and their typical habitats are summarized in Table 6-18.

Table 6-18 Federal Species Potentially Present within Vicinity of Segment 2 North and Segment 2 South

Scientific Name	Common Name	Federal Status	State Status	Habitat
Myotis septentrionalis	Northern long-eared bat	Endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Bombus affinis	Rusty Patched bumble bee	Endangered	Watchlist	Areas with consistent flowering vegetation throughout the growing season. Overwinter in upland forests and woodlands.[1]
Erythronium propullans	Minnesota dwarf trout lily	Endangered	Endangered	River terrace, mesic oak-basswood forest, or mesic maple-basswood forest on a north-facing slope above or near a stream.[1]
Lespedeza leptostachya	Prairie bush clover	Threatened	Threatened	Bedrock outcrop prairie or north-, northeast, or northwest-facing mesic prairie to dry prairie.[1]
Perimyotis subflavus	Tri-colored bat	Proposed endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Argynnis idalia occidentalis	Western regal fritillary	Proposed threatened	Not listed	Tall grass prairie, wet fields, meadows, marshes.[2]

Scientific Name	Common Name	Federal Status	State Status	Habitat
Danaus plexippus	Monarch butterfly	Proposed threatened	Not listed	Areas with a high number of flowering plants. Presence of milkweed (*Asclepias* spp.) to complete the caterpillar life stage.[3]
Grus americana	Whooping crane	Experimental population, non-essential	Not listed	Wetlands, lakes, ponds, rivers, and agricultural fields.[4]

[1]Habitat information from reference (175).
[2]Habitat information from reference (176)).
[3]Habitat information from reference (177)).
[4]Habitat information from reference (178)).

Federally proposed threatened or endangered species are species that the USFWS has determined are in danger of extinction throughout all or a significant portion of their range and have proposed a draft rule to list them as threatened or endangered. Proposed species are not protected by the take prohibitions of the federal ESA. A non-essential experimental population is a designation that refers to a population that has been established within its historical range under Section 10(j) of the ESA to aid in recovery of the species. Species designated as non-essential experimental populations are only protected by the federal ESA within a national wildlife refuge or a national park; the route widths of Segment 2 North and Segment 2 South do not intersect a national wildlife refuge or a national park.

6.9.7.1.2 State Protected Species

The DNR's NHIS database was queried in January 2025 (Barr License Agreement LA-2022-008), to determine if any state-endangered, threatened, or special concern species have been documented within 1 mile of Segment 2 North or Segment 2 South; the DNR uses a 1 mile buffer as a standard distance to capture the range of species that have already been documented and could be present in a particular area, given presence of suitable habitat. The NHIS database identified records for three state-endangered species, seven state-threatened species, and 10 state special concern species within 1 mile of Segment 2 North and/or Segment 2 South. State endangered and threatened species documented in the NHIS database, along with their typical habitats, are summarized in Table 6-19. State special concern species documented in the NHIS database within 1 mile of Segment 2 North and/or Segment 2 South are summarized in Appendix M. While these species are tracked by the DNR, they are not legally protected under the Minnesota Endangered Species Statute.

Table 6-19 Natural Heritage Information System Database Records of State or Federally Threatened or Endangered Species within 1 Mile of Segment 2 North and Segment 2 South

Scientific Name	Common Name	Type	Federal Status[1]	State Status[2]	Habitat[3]	Segment 2 North			Segment 2 South		
						ROW	Route width	1 mile	ROW	Route width	1 mile
Erythronium propullans	Dwarf trout lily	Vascular plant	END	END	River terrace, mesic oak-basswood forest, or mesic maple-basswood forest on a north-facing slope above or near a stream.			X			X
Juglans Cinerea	Butternut	Tree	Not listed	END	Northern and central mesic hardwood forests.			X			X
Lanius ludovicianus	Loggerhead shrike	Bird	Not listed	END	Upland native and non-native grasslands; perching sites contain shrubs or small trees.			X			
Actinonaias ligamentina	Mucket	Mussel	Not listed	THR	Medium to large rivers.	X	X	X	X	X	X
Eurynia dilatate	Spike	Mussel	Not listed	THR	Small to large rivers.	X	X	X	X	X	X
Glyptemys insculpta	Wood turtle	Reptile	Not listed	THR	Small to medium fast moving rivers and streams with adjacent forest.			X			
Lasmigona costata	Fluted-shell	Mussel	Not listed	THR	Medium to large rivers.	X	X	X			X
Napaea dioica	Glade mallow	Vascular plant	Not listed	THR	Stream banks, floodplains, and terrace forests.			X			X
Platanthera flava var. herbiola	Tubercled rein orchid	Vascular plant	Not listed	THR	Moist or wet meadows or sunny swales in savannas.			X			
Valeriana edulis var. ciliata	Edible valerian	Vascular plant	Not listed	THR	Moist, sunny, calcareous habitat, including calcareous fens, wet meadows, and moist prairies.			X			
Venustaconcha ellipsiformis	Ellipse	Mussel	Not listed	THR	Headwater reaches of rivers.	X	X	X			X

[1] "END" = endangered
[2] "THR" = threatened; "WL" = watchlist (tracked by the DNR but not protected at the state level)
[3] Habitat information from reference (175))

6.9.7.1.3 Sensitive Ecological Resources

The DNR has established several classifications for sensitive ecological resources across the state, many of which are scattered throughout the Segment 2 geographic area (Map 31). Some of these sensitive ecological resources are crossed by the ROI for Segment 2 North and/or Segment 2 South, including Sites of Biodiversity Significance (SBS), native plant communities, and railroad rights-of-way prairies.

The DNR maps SBS and assigns a biodiversity significance rank to sites surveyed across the state. These ranks are used to communicate statewide native biological diversity of each site and help to guide conservation and management activities (reference (180)). As shown on Map 31, SBS intersect the ROI for Segment 2 North and Segment 2 South. The DNR assigns biodiversity significance ranks, as follows:

- **Outstanding** – best occurrences of the rarest species and native plant communities.
- **High** – good quality occurrences of the rarest species and high-quality examples of native plant communities.
- **Moderate** – occurrences of rare species, moderately disturbed native plant communities.
- **Below** – sites with moderately disturbed native plant communities, but lacking occurrences of rare species).

The DNR identifies and maps areas containing native plant communities across the state. A native plant community is a group of native plants that interact with each other and their environment in ways that have not been greatly altered by modern human activity or introduced organisms (reference (181)). The DNR provides a state conservation status to each native plant community, as follows:

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

As shown on Map 31, several native plant communities intersect the ROI for Segment 2 North, including the following types and associated state conservation status (or range of statuses if multiple subtypes):

- Red Oak – White Oak Forest; S3
- Willow – Dogwood Shrub Swamp; S5
- Southern Dry – Mesic Oak Forest; S3, S4

The 1997 Minnesota State Legislature directed the DNR to survey active railroad rights-of-way for native prairie (reference (210)). These areas undergo active management to maintain the existence of prairie communities. As shown on Map 31-1, a mesic railroad right-of-way prairie intersects the ROI for Segment 2 North.

State and federal lands that are preserved or managed for wildlife are scattered throughout Segment 2; these areas would also be considered sensitive ecological resources and are discussed in Section 6.9.12.1.

6.9.7.2 Potential Impacts

Project construction and operation have the potential to impact protected species and sensitive ecological resources. Construction-related potential short-term impacts on federally or state-protected wildlife species would be similar to those described for non-listed species in Section 6.9.12.2 and could include displacement during construction activities that generate noise, dust, or disturbance of habitat. Ground disturbing activities (e.g., grading), permanent clearing of vegetation, and construction activities in areas identified as sensitive ecological resources could impact protected species associated with these habitats.

6.9.7.2.1 Federal Protected Species

The species identified in the IPaC query are potentially present within the vicinity of Segment 2 North and/or Segment 2 South, where suitable habitat is present.

The NHIS database does not document the presence of northern long-eared bats, maternity roost trees, or hibernacula within 1 mile of Segment 2 North or Segment 2 South. However, suitable forested habitat is present in the route widths of Segment 2 North and Segment 2 South. Impacts to northern long-eared bats could occur if tree clearing or construction take place during the bat's active season, when the species are breeding, foraging, or raising pups in forested habitat. Bats could be injured or killed if occupied trees are cleared during the active season, and the species could be disturbed during clearing or construction activities due to noise or human presence. The NHIS database does not identify any records of tricolored bats within 1 mile of Segment 2 North or Segment 2 South; however, forested areas within the route widths of Segment 2 North and Segment 2 South could provide suitable habitat for the species. Potential impacts to tricolored bats would be similar to those described for northern long-eared bats.

The NHIS database identifies records of Minnesota dwarf trout lily within 1 mile of Segment 2 North and Segment 2 South. However, suitable habitat for this species could be present within the route widths of Segment 2 North and Segment 2 South. Impacts to Minnesota dwarf trout lily could occur should this species or suitable habitat be present in areas undergoing grading or clearing activities associated with project construction.

The NHIS database does not identify any records of prairie bush clover within 1 mile of Segment 2 North or Segment 2 South. With the exception of the railroad right-of-way prairie that intersects the western part Segment 2 North, no other prairie habitat suitable for prairie bush clover has been identified within the route width or ROW of Segment 2 North or Segment 2 South. The railroad right-of-way prairie would be spanned by Segment 2 North; as such impacts to this habitat would not be anticipated.

The NHIS database does not identify any records of rusty patched bumble bees within 1 mile of Segment 2 North or Segment 2 South. Although the route widths of Segment 2 North and Segment 2 South are primarily agricultural, suitable foraging habitat for rusty patched bumble bees is present in non-agricultural areas with flowering plants, and suitable overwintering habitat is present in the forested areas within the route widths. In addition, as shown on Map 31-1, both Segment 2 North and Segment 2 South intersect rusty patched bumble bee high potential zone, an area identified by the USFWS where rusty patched bumble bees are likely to be present. Potential impacts to rusty patched bumble bees could occur as a result of ground disturbing activities and/or removal of vegetation that serves as habitat.

The NHIS database does not track documented records of western regal fritillary. Suitable habitat for western regal fritillary is present in the wet meadows and marshes that intersect the route widths of Segment 2 North and Segment 2 South. Potential impacts to western regal fritillary could occur as a result ground disturbing activities and/or removal of vegetation that serves as habitat.

The NHIS database does not track documented records of monarch butterflies. Suitable habitat for monarch butterflies is present in the non-agricultural parts of the route width and ROW of Segment 2 North and Segment 2 South. Potential impacts to monarch butterflies could occur as a result of ground disturbing activities and/or removal of suitable reproductive (milkweed plants) or feeding (flowering plants) habitat.

Whooping cranes are rare in the state of Minnesota, and the NHIS database does not track documented records of them. Potential impacts to whooping cranes would be similar to those described for other waterfowl/avian species in Section 6.9.12.2.

6.9.7.2.2 State Protected Species

The state-threatened and endangered species identified in Table 6-19 and special concern species identified in Appendix M are known to occur in the vicinity of Segment 2 North and Segment 2 South where suitable habitat is present. The discussion below is focused on potential impacts to state-threatened and endangered species; however, impacts to and mitigation measures for special concern species would generally be similar for many species occupying similar habitats.

As noted in Table 6-19, two state-endangered and 3 state-threatened vascular plant species have been documented within 1 mile of Segment 2 North, three of which have been found within 1 mile of Segment 2 South. None of these vascular plant species have been documented within the ROW or route width of Segment 2 North or Segment 2 South. The Minnesota dwarf trout lily is one of the state-endangered species documented within a mile of Segment 2 North and Segment 2 South; this species, which is also a federally endangered species, is discussed under federally protected species in the section above.

While the route width and ROW for both Segment 2 North and Segment 2 South is largely agricultural, small areas of suitable habitat for the other four vascular plant species identified in Table 6-19 could be present. Impacts to these vascular plant species could occur should they or suitable habitat be present in areas undergoing grading or clearing activities associated with project construction.

The loggerhead shrike has been documented within 1 mile of Segment 2 North but has not been documented within its route width or ROW, and it has not been documented within a mile of Segment 2 South. However, suitable habitat for this species is present within the route width and ROW of both Segment 2 North and Segment 2 South. Potential impacts to the loggerhead shrike would be similar to those described for other avian species in Section 6.9.12.2.

The wood turtle has been documented within 1 mile of Segment 2 North but has not been documented within its route width or ROW, and it has not been documented within a mile of Segment 2 South. Wood turtle habitat generally includes fast moving streams, which would be spanned by both Segment 2 North and Segment 2 South. However, wood turtles are also found foraging and basking in adjacent forested or agricultural uplands. Potential impacts to wood turtles could occur during project construction as a result of construction equipment and ground disturbing activities should they be present in suitable upland habitat adjacent to streams.

All watercourses would be spanned by Segment 2 North and Segment 2 South; as such, direct impacts to the state-protected mussel species identified in Table 6-19 are not anticipated.

6.9.7.2.3 Sensitive Ecological Resources

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

Creation of new transmission line rights-of-way or expansion of existing rights-of-way through sensitive ecological resources could impact protected species associated with habitats within them. This could occur as a result of habitat conversion or fragmentation or due to the placement of structures and other infrastructure within them. The route widths and rights-of-way of both Segment 2 North and Segment 2 South would intersect sensitive ecological resources, as summarized in Table 6-20 and shown on Map 31. However, as discussed in Section 6.4, Segment 2 North could be double-circuited with existing 69 kV, 115 kV, or 345 kV transmission lines for 69 percent of its length. Segment 2 North would also parallel existing road rights-of-way. Segment 2 South would primarily be constructed in a new ROW, with only a small portion of the line at the east end double-circuiting an existing 345 kV line and a small portion at the western end double-circuiting an existing 161 kV line (Map 4). Approximately one-quarter of Segment 2 South would parallel existing transmission line and/or road rights-of-way, while the majority of Segment 2 South would follow property lines (Map 4). In areas where Segment 2 North or Segment 2 South could be double-circuited with an existing transmission line and/or where the segments would parallel existing transmission line and/or road ROW, impacts to sensitive ecological resources would be minimized.

Table 6-20 Sensitive Ecological Resources within the Route Width and ROW of Segment 2 North and Segment 2 South

Resource	Units	Segment 2 North	Segment 2 South		
		Route width	ROW	Route width	ROW
Sites of Biodiversity Significance	Outstanding rank (acres)	16	4	0	0
	High rank (acres)	0	0	0	0
	Moderate rank (acres)	10	1	0	0
	Below rank (acres)	11	<1	11	<1
	Total acres	37	6	11	<1
Native Plant Communities	Conservation Status S1 (community is critically imperiled), S2 (community is imperiled), or S3 (community is vulnerable to extirpation or extinction) (acres)	6	0	0	0
	Conservation Status S4 (community is apparently secure) and S5 (community is demonstrably widespread, abundant, and secure) (acres)	16	4	0	0
	Total acres (Conservation Status S1-S5)	22	4	0	0
Railroad Rights-of-Way Prairie	Crossings (count)	1	1	0	0

The route width and ROW of Segment 2 North would intersect SBS ranked outstanding, moderate, and below in areas that could be double-circuited with existing 69 kV or 345 kV transmission lines. The route width and ROW of Segment 2 South would intersect SBS ranked below; however, its ROW would generally avoid SBS, with less than an acre intersecting the ROW in an area that could be double-circuited with an existing 345 kV transmission line.

The route width and ROW of Segment 2 North would intersect native plant communities and a railroad right-of-way prairie. Where the Segment 2 North ROW intersects native plant communities, the line could be double-circuited with an existing 69 kV transmission line. The anticipated alignment for Segment 2 North crosses the railroad right-of-way prairie perpendicularly and would do so while paralleling an existing road ROW. As such, impacts to this resource would be minimized by spanning it. The route width and ROW of Segment 2 South would avoid native plant communities and railroad right-of-way prairie.

Although impacts to sensitive ecological resources would be minimized by double-circuiting with an existing transmission line, the ROW width required would likely be wider than the existing ROW and could require permanent vegetation removal beyond the existing ROW. The applicant would be required to coordinate potential easement modifications with the DNR (Section 6.9.6).

6.9.7.3 Mitigation

Through prudent routing and implementation of BMPs and mitigation measures, impacts to federally or state-protected species and sensitive ecological resources can be minimized. The primary means to mitigate potential impacts to federally and state-protected species is to avoid routing through habitat used by these species. Additionally, impacts can be mitigated by incorporating species (or species type) specific BMPs in coordination with the USFWS and/or the DNR. The primary means to mitigate impacts to sensitive ecological resources is by avoiding and/or spanning these communities if possible. In addition, double-circuiting and/or paralleling existing rights-of-way, such as roads, would reduce the potential for fragmentation of these resources.

Mitigation and minimization measures for potential impacts to rare and unique natural resources are not standard Commission route permit conditions. However, as noted in Appendix H, there are standard route permit conditions to minimize potential impacts to vegetation and avian species, which would be applicable to minimizing impacts to federal and state-protected species and sensitive ecological resources; these are summarized in Section 6.9.10.3 and Section 6.9.12.3, respectively.

As summarized in their route permit application, the applicant has committed to the following measures to minimize the potential for impacts to federal and state-protected species and sensitive ecological resources:

- Obtaining available USFWS and DNR rare species databases prior to construction activities to determine locations where the routes and structures are near or adjacent to known locations of listed species.
- Conducting rare species surveys in those areas and similar high-quality habitats preferred by listed species.
- Avoiding impacts to federal- and state-listed species to the maximum extent practicable and coordinating with the appropriate federal and/or state agency in the unlikely event of unavoidable impacts to listed species.
- Continuing to work with the DNR to refine the final alignments and reduce impacts to natural resource sites.
- Potentially incorporating some seasonal restrictions, such as fencing of rare features, and vegetation restoration as applicable.
- Working with the DNR to refine the final alignments and reduce impacts to SBS and native plant communities.
- Implementation of integrated vegetation management plans associated with its existing pollinator initiative, which was created to enhance pollinator habitat.

In their Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR recommended the following to minimize potential impacts to sensitive ecological resources:

- Avoid working in Minnesota Biological Survey and rare (S1-S3) native plant communities.
- As much as possible, operate within already-disturbed areas.
- Retain a buffer between proposed activities and Minnesota Biological Survey Sites.
- Confine construction activities to the opposite side of the road from Minnesota Biological Survey Sites. If this is not feasible, confine construction activities to the existing road rights-of-way.
- Minimize vehicular disturbance in the area (allow only vehicles necessary for the proposed work).
- Do not park equipment or stockpile supplies in the area.
- Do not place spoil within Minnesota Biological Survey Sites or other sensitive areas.
- If possible, conduct the work under frozen ground conditions.
- Inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of invasive species.
- Use effective erosion prevention and sediment control measures.
- Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible.
- Use only weed-free mulches, topsoils, and seed mixes. Of particular concern is birdsfoot trefoil (*Lotus corniculatus*) and crown vetch (*Coronilla varia*), two invasive species that are sold commercially and are problematic in prairies and disturbed open areas, such as roadsides.

In their Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR recommended the following to minimize potential impacts to state-listed species:

- To minimize potential impacts to loggerhead shrike, tree and shrub removal must not occur within potential habitat during the breeding season, April through July. If avoiding tree or shrub removal within potential habitat from April through July is not feasible, a qualified surveyor will need to conduct a survey for active nests before any trees or shrubs will be removed.
- To avoid impacts to Blanding’s turtles, the following avoidance measures are required:
  - Avoid wetland and aquatic impacts during hibernation season, between September 15th and April 15th, if the area is suitable for hibernation.
  - Erosion and sediment control should be limited to wildlife friendly erosion control to avoid the inadvertent take of Blanding’s turtles.
  - Hydro-mulch products should not contain any materials with synthetic (plastic) fiber additives, as the fibers can re-suspend and flow into waterbodies.

- Construction areas, especially aquatic or wetland areas, should be thoroughly checked for turtles before the use of heavy equipment or any ground disturbance.
- Check any holes that have been left unattended for prolonged periods for turtles before being filled.
- The DNR's Blanding's turtle flyer must be given to all contractors working in the area (reference (183)). Illegal collection is a concern with wood turtles; therefore, no signs that would bring attention to the presence of wood turtles should be posted.
- Monitoring during construction should be completed, and any sightings should be reported to Reports.NHIS@state.mn.us including date, observer, location, and photograph of the Blanding's turtle.
- If turtles are in imminent danger, they must be moved by hand out of harm's way, otherwise they are to be left undisturbed. Directions on how to move turtles safely are found in reference (184).

* To avoid impacting timber rattlesnakes the following avoidance measures are required:
    - Crews working the area should be advised that if they encounter any snakes, the snakes should not be disturbed.
    - Erosion and sediment control should be limited to wildlife friendly erosion control to avoid the inadvertent take of timber rattlesnakes.
* Timber rattlesnake precautions may include, but are not limited to, the following recommendations:
    - Wear appropriate personal protection equipment, such as thick pants, boots, and leather gloves.
    - Care should be taken around stockpiled materials as snakes may be using these materials for shelter.
    - Sightings should be reported to Reports.NHIS@state.mn.us; including date, observer, location, and photograph of the timber rattlesnake.
* To avoid impacts to aquatic species, stringent erosion prevention and sediment control practices should be maintained throughout the duration of the project to prevent adverse debris and material from impacting downstream populations.
* To avoid impacting state-protected plants, all known occurrences of state-protected plant species and all potential habitats must be avoided. If this is not feasible, a qualified surveyor will need to (1) resurvey known occurrences and (2) determine if suitable habitat exists within the activity impact area and, if so, conduct a survey prior to any project activities.
* To minimize impacts to northern long-eared bats and other bat species, tree removal should be avoided from June 1 through August 15.

6.9.8 Soils

The ROI for soils is the ROW. Existing soil types and associated qualities are reviewed to better understand the most likely impacts to occur as a result of construction activities. Nearly all soils within the ROI have a moderate or severe rutting hazard rating. Common soil impacts include rutting, compaction, and erosion. Potential impacts would be short-term during construction, localized, and can be minimized. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicant would obtain a NPDES/State Disposal System Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicle trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored in a suitable location. Disturbed areas would be promptly seeded after construction.

6.9.8.1 Existing Conditions

Soil information for Segment 2 was obtained from the USDA-NRCS SSURGO database. Map 32 shows the surface soil textures across Segment 2. Soil types within the ROI of Segment 2 were reviewed to identify soil characteristics that could be more prone to impacts in some areas versus others (Table 6-21).

Table 6-21 Segment 2 NRCS Mapped Soils within ROI

Segment ID	Buffer Width (ft.)	Total Acreage	Compaction Prone Medium or higher rating (acres (%))	Erosion Hazard Moderate or higher rating (acres (%))	Rutting Hazard Moderate or severe rating (acres (%))	Hydric Soils[1] 67-99% or 100% (acres (%))	Revegetation Concerns[2] NCC class of 3 or greater (acres (%))
Segment 2 North	75	748	550 (74%)	217 (29%)	747 (99%)	195 (26%)	31 (4%)
Segment 2 South	75	613	456 (74%)	306 (50%)	612 (100%)	157 (26%)	10 (2%)

[1]A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil profile. Hydric soils are typically associated with lowlands and wetlands and are rated by their proportion of hydric soil in the map unit.
[2] Soils with a non-irrigated land capability classification of 3 or greater were considered to have low revegetation potential.

Nearly all of the soils within the ROI of Segment 2 North and Segment 2 South have a moderate or severe rutting hazard rating. Ratings in this hazard category indicate the potential of surface rut formation through the operation of heavy, wheeled equipment. Ratings are based on depth to the water table, rock fragments on or below the surface, the classification of the soil material based on the Unified Soil Classification System, depth to a restrictive layer, and slope. A rating of "moderate" indicates that rutting is likely and "severe" indicates that ruts form readily.

Approximately three-fourths of the soils within the ROI of Segment 2 North and Segment 2 South have a medium or higher soil compaction rating. Soil compaction occurs when moist or wet soil particles are pressed together, reducing pore space between them, and is primarily caused by heavy vehicular traffic or permanent structure placement, such as with the new substations. Soils are rated based on their susceptibility to compaction from the operation of ground-based equipment for planting, harvesting, and site preparation activities when soils are moist. A "medium" rating means that after the initial compaction (that is, the first equipment pass), the soil can support standard equipment with only minimal increases in soil density. A "high" rating means that the soil will continue to compact after each equipment pass.

6.9.8.2 Potential Impacts

Transmission line projects have the potential to impact soils during construction and operation of the project. Construction might require some amount of grading to provide a level surface for safe operation of construction equipment. In addition, potential topsoil and subsoil mixing might result from the excavation, stockpiling, and redistribution of soils during installation of transmission line structures. Localized soil erosion, compaction, and topsoil and subsoil mixing could affect revegetation within temporary work areas.

6.9.8.3 Mitigation

The sample route permit (Section 5.3.8 of Appendix H) includes the following measures to mitigate impacts to soils:

> *"The Permittee shall implement those erosion prevention and sediment control practices recommended by the Minnesota Pollution Control Agency (MPCA) Construction Stormwater Program. If construction of the Transmission Facility disturbs more than one acre of land or is sited in an area designated by the MPCA as having potential for impacts to water resources, the Permittee shall obtain a National Pollutant Discharge Elimination System/State Disposal System Construction Stormwater Permit from the MPCA that provides for the development of a Stormwater Pollution Prevention Plan that describes methods to control erosion and runoff.*
>
> *The Permittee shall implement reasonable measures to minimize erosion and sedimentation during construction and shall employ perimeter sediment controls, protect exposed soil by promptly planting, seeding, using erosion control blankets and turf reinforcement mats, stabilizing slopes, protecting storm drain inlets, protecting soil stockpiles, and controlling vehicle tracking. Contours shall be graded as required so that all surfaces provide for proper drainage, blend with the natural terrain, and are left in a condition that will facilitate re-vegetation and prevent erosion. All areas disturbed during construction of the Transmission Facility shall be returned to pre-construction conditions."*

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicant would obtain a NPDES/State Disposal System Construction

Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicle trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored in a suitable location. Disturbed areas would be promptly seeded after construction. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

6.9.9 Surface Water

The ROI for surface water is the route width. Impacts to surface waters were assessed by identifying watercourses and waterbodies and considering their proximity to the project and special designations. Segment 2 North's anticipated alignment crosses more watercourses than Segment 2 South but would also be double-circuited with existing transmission lines at approximately half of the crossing locations. Direct impacts caused by structures placed in surface waters would be avoided by spanning surface waters. Direct impacts to other resources can cause indirect impacts to surface waters. For example, construction activities near surface waters could cause riparian vegetation disturbance and surface erosion, which can lead to runoff impacting surface waters. In addition to spanning surface water crossings, impacts to surface waters would be mitigated through implementation of the SWPPP, AIMP, and VMP.

6.9.9.1 Existing Conditions

Several federal and state laws regulate watercourses and waterbodies. The Clean Water Act (CWA) establishes the structure for regulating the discharge of materials into waters of the United States and for developing water quality standards for surface waters (U.S. Code [USC]: Chapter 33 § 1311 and 1344). The CWA could potentially regulate several types of activities and their impacts associated with the project.

Watercourses and waterbodies may be regulated under Section 10 of the Rivers and Harbors Act (USC Chapter 33 § 401) and Section 404 of the CWA (USC Chapter 33 § 328.3 and 1344). The Rivers and Harbors Act regulates activities such as excavating, dredging, and altering the course of Section 10 designated waters (USC Chapter 33 § 403). Section 404 of the CWA prohibits discharge of dredged or fill materials without a permit. It provides legal protection to more waterbodies than the Rivers and Harbors Act, namely all jurisdictional waters of the United States, including navigable waters, interstate waters, and wetlands with a significant nexus to navigable waters (USC Chapter 33 § 320). The USACE holds both Section 10 and Section 404 permitting authority.

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

Section 303(d) of the CWA requires states 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. Waters that do not meet their designated uses because of water quality standard violations are listed as impaired. In Minnesota, the MPCA has jurisdiction over determining 303(d) waters which are described and listed as impaired.

Some watercourses and waterbodies are designated as public waters and are listed in the PWI by the state of Minnesota. The statutory definition of a public water is found in Minnesota Statute § 103G.005, Subdivision 15a (Minnesota Statute §103G.005). These water resources are under the jurisdiction of the DNR, and a DNR license to cross public waters would be required when an activity would cross, change, or diminish the course, current, or cross-section of public waters by any means, including filling, excavating, or placing materials in or on the beds of public waters. PWI watercourse crossings are unavoidable, and the applicant would be required to coordinate with the DNR to obtain licenses to cross.

Minnesota regulates trout streams according to Minnesota Statute § 6264.0050. As provided by Minnesota Rules 6135.1100, subpart 4, item B: Crossings on or under the beds of streams designated by the commissioner of natural resources as trout waters shall be avoided unless there is no feasible alternative. When unavoidable, maximum efforts shall be taken to minimize damage to trout habitat.

Minnesota designates some water resources as Outstanding Resource Value Waters because of their exceptional qualities. Minnesota Statute § 7050.0180 prohibits, or stringently controls, new or expanded discharges from either point or nonpoint sources to outstanding resource value waters.

Segment 2 is in the Minnesota River and Lower Mississippi River Basins and crosses two major watersheds, as delineated by the USGS: Zumbro River (8-digit HUC 07040004) and Cannon River (8-digit HUC 07040002). According to the WHAF, the mean watershed score for these two major watersheds ranges from 41 to 50 on a hundred-point scale (reference (185)). Watershed scores are scaled 0 (least healthy) to 100 (best health). The mean watershed score is the average score of five separate components: hydrology, geomorphology, biology, connectivity, and water quality. At the state scale, mean watershed scores tend to decrease further downstream. Urban watershed degradation is attributed, in part, to impervious surfaces, intensity of water use, and point source pollution (reference (186)).

Map 22 shows the watercourses in the route width of Segment 2. Surface waters in the route width of Segment 2 include rivers and streams (watercourses) and lakes and ponds (waterbodies). Major watercourses within the route width of Segment 2 include, but are not limited to: Dry Run Creek, North Fork Zumbro River, Pearl Creek, Bitter Creek, Falls Creek, Shingle Creek, Spring Creek, Straight River, and unnamed watercourses. Several of these watercourses are designated as public watercourses in the Public Waters Inventory (PWI) and are also classified as impaired watercourses (Map 22). None of the watercourses crossed by Segment 2 are designated as Outstanding Resource Value Waters, Section 10 navigable waters (reference (187)), or trout streams.

Map 22 shows the waterbodies in the route width of Segment 2. The route width of Segment 2 South includes one wetland that is designated as a public waters wetland in the PWI (Map 22-1).

The route width of Segment 2 includes 100-year floodplains designated by the Federal Emergency Management Administration (FEMA) (Map 22). Three surface waters are associated with these 100-year floodplains. The route width of Segment 2 North and Segment 2 South both include the 100-year floodplains of the Straight River, North Fork Zumbro River or its tributary, and Dry Run Creek.

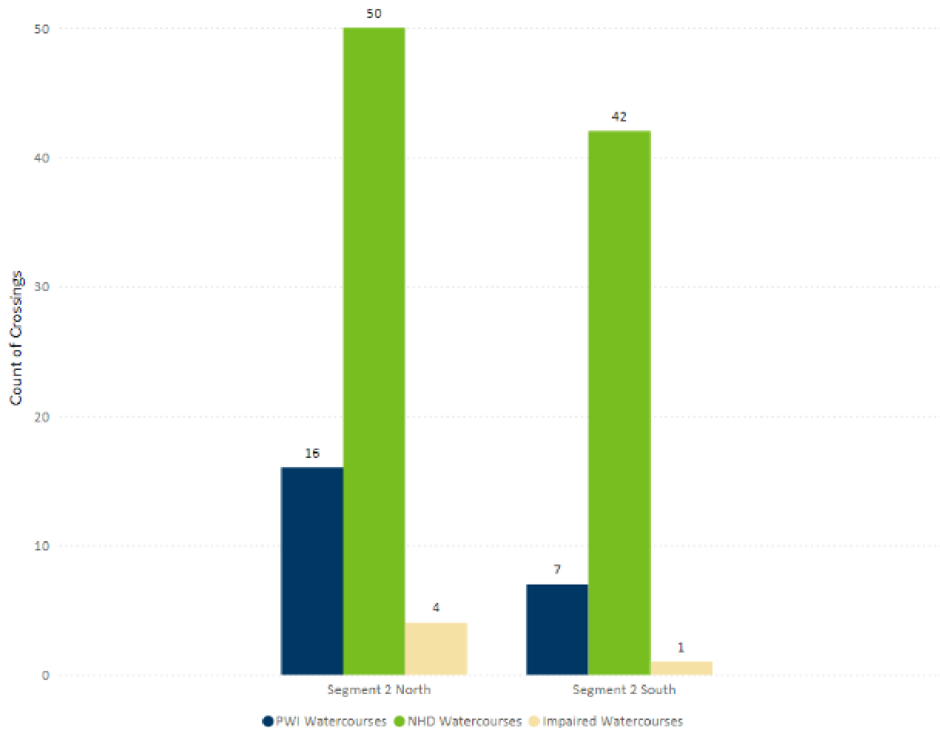
6.9.9.2 Potential Impacts

The project was designed to span watercourses, waterbodies, and floodplains to the extent practicable and to minimize the number of structures in surface water resources where these resources cannot be spanned or crossings cannot use double-circuiting. The maximum transmission line structure span distance for watercourses, waterbodies, and floodplains is 1,000 feet. The crossing length of most of these resources is less than 1,000 feet, meaning that the project is expected to be able to span most watercourses and waterbodies. No structures would be placed within the surface waters that can be spanned by Segment 2 North and Segment 2 South, and no direct impacts on these watercourses and waterbodies are anticipated.

Segment 2 North has more NHD, PWI, and impaired watercourse crossings than Segment 2 South (Figure 6-7); however, most of the Segment 2 North crossing locations would occur where the project could be double-circuited. The PWI watercourses and impaired streams crossed by the anticipated alignments for Segment 2 North and Segment 2 South include the following:

- **Public Watercourses:** Segment 2 North crosses Spring Creek, Shingle Creek, Falls Creek, and unnamed watercourses. Segment 2 South crosses unnamed watercourses. Segment 2 North and Segment 2 South both cross Dry Run Creek, Straight River, and North Fork Zumbro River.
- **Impaired Watercourses:** Segment 2 North crosses North Fork Zumbro River, Shingle Creek, and an unnamed watercourse. Segment 2 North and Segment 2 South both cross the Straight River.

Figure 6-7 Segment 2 North and Segment 2 South Watercourse Crossings



Segment 2 South crosses an unnamed PWI wetland/waterbody. The waterbody is classified in the NWI as a shallow marsh and could require a crossing length greater than 1,000 feet. However, there is an existing 161 kV transmission line at this PWI crossing. Segment 2 North does not cross any PWI wetlands or waterbodies.

Despite spanning watercourses, indirect impacts associated with crossing surface water resources could occur during construction. Removal of vegetation and soil cover could result in short-term water quality impacts due to increased turbidity. Construction impacts could also remove riparian or shoreline forest areas within the ROW that currently assist with water attenuation and decreasing erosion impacts. In addition to habitat changes, vegetation clearing could increase light penetration to watercourses and waterbodies, potentially resulting in localized increases in water temperatures and changes to aquatic communities, especially those that rely on cold water such as trout.

Impacts to floodplains during construction would include soil disturbance and vegetation removal. Vegetation clearing within a floodplain, especially tree removal, can greatly destabilize the area, make it more prone to ongoing erosion and sediment issues, and further contribute to water quality issues. The project might require that transmission line structures be placed within FEMA-designated floodplains. However, Segment 2 North and Segment 2 South's floodplain crossings do not exceed 1,000 feet and therefore no structures would be anticipated within floodplains within Segment 2.

6.9.9.3 Mitigation

The sample route permit (Section 5.3.9 of Appendix H) includes the following measures to mitigate impacts to surface water:

- Space and place structures at variable distances to span and avoid watercourse and floodplains.
- Contain soil excavated from riparian areas and not place it back into the riparian area.
- Access riparian areas using the shortest route possible in order to minimize travel and prevent unnecessary impacts.
- Do not place staging or stringing set up areas within or adjacent to water resources, as practicable.
- Assemble structures on upland areas before they are brought to the site for installation.
- Restore water resource areas disturbed by construction activities to pre-construction conditions in accordance with the requirements of applicable state and federal permits or laws and landowner agreements.
- Meet the USACE, DNR, Minnesota BWSR, and local units of government water resource requirements.

Mitigation measures are anticipated to prevent and minimize impacts to watercourses and waterbodies. The applicant would obtain a NPDES Construction Stormwater permit from the MPCA for construction of the project which requires development of a SWPPP that identifies BMPs to be used during construction to minimize erosion and sedimentation. Per the stormwater permit, additional BMPs would be required for work near special waters which include impaired waters. Sediment barriers, such as silt fence, straw bales, and bio-logs, would be used along waterways and slopes during construction to minimize soil erosion and sedimentation. The applicant would maintain water and soil conservation practices during construction and operation of the project to protect topsoil and adjacent water resources and minimize soil erosion. If tree removal is required along waterways, trees would be cut, leaving the root systems intact to retain bank stability. Construction would be completed according to NPDES permit requirements and an approved AIMP and VMP.

Impacts would be mitigated by using BMPs. Watercourses would only be crossed by construction equipment where required to support construction activities. Crossing PWI waters would require a DNR license to cross public waters and work near special or impaired waters would require additional BMPs as detailed in the construction stormwater permit. According to the joint certificate of need application and route permit application, the applicant would work with the DNR to confirm that all proper licenses and approvals are obtained for public water crossings. Further, the joint certificate of need application and route permit application also states that through the licensing process, the applicant would work with the DNR to determine appropriate mitigation measures for these crossings.

6.9.10 Vegetation

The ROI for vegetation is the ROW. Impacts to vegetation are primarily evaluated by examining vegetative landcover types within the ROW. Most existing vegetation is agricultural.

Potential short-term impacts, such as clearing, compacting, or otherwise disturbing vegetation, could occur during construction and maintenance activities. Potential long-term impacts on vegetation would occur where structures are located or where conversion of forested vegetation to low-growing vegetation would be required. Impacts would be localized, and unavoidable.

Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation including but not limited to implementation of the VMP and AIMP. The applicant committed to working with state and local agencies to coordinate appropriate BMPs for noxious weeds and also committed to implementing integrated vegetation management plans associated with its existing pollinator initiative.

6.9.10.1 Existing Conditions

The DNR and the USFS have developed an ECS for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features (reference (10)). The ECS splits the state of Minnesota into Ecological Provinces, Sections, and Subsections.

Segment 2 is within the Eastern Broadleaf Forest Province. The Eastern Broadleaf Forest Province is characterized as a transition zone between semi-arid portions of Minnesota that were historically prairie and semi-humid mixed coniferous-deciduous forests to the northeast (reference (189)). Within this province, Segment 2 North and Segment 2 South would cross the Big Woods and Oak Savanna subsections.

Segment 2 crosses the Big Woods subsection in Rice County. Prior to European settlement, vegetation in the Big Woods subsection consisted of oak woodlands and maple-basswood forest on the irregular ridges, with aspen, bur oak, red oak and white oak found along the western and other margins of this subsection. At present, the Big Woods subsection is dominated by cropland and pasture, with a small percentage of it being either upland forest or wetland (reference (11)).

The project crosses the Oak Savanna subsection in Rice and Goodhue Counties. Vegetation in the Oak Savanna subsection consisted of predominantly of bur oak savanna, with areas of tallgrass prairie and maple-basswood forest, before European settlement. Bur oak savanna was found on rolling moraine ridges at the western edge of the subsection and in dissected ravines at the eastern edge. Tallgrass prairie concentrated on gently rolling portions of the landscape, in the center of the subsection. Maple-basswood forest was found in steep, dissected ravines or where stream orientation reduced fire frequency or severity. At present, the subsection is dominated by agricultural vegetation, with urban development accelerating along the northern boundary (reference(12)).

Segment 2 crosses the Rochester Plateau subsection in Goodhue County. Prior to European settlement, vegetation in the subsection consisted of tallgrass prairie and bur oak savanna. At present, the Rochester Plateau subsection is heavily farmed, with small areas of characteristic of oak openings and barrens (reference (199)).

In general, the vegetation resources across the project are dominated by agricultural vegetation and crops including grain, soybeans, hay/haylage, sweet corn, corn for silage, green peas, corn for grain, and oats for grain (Section 6.7.1). Map 21 provides an overview of landcover types according to the NLCD across Segment 2, and Table 6-22 summarizes the landcover types within the ROW of Segment 2 North and Segment 2 South. The NLCD is derived from Landsat imagery along with various other data sources. As such, it provides only an approximation of existing landcover types.

Natural vegetation, forested and grassy wind breaks, scattered woodlots, drainage ditches, and large grassland pastures regularly disturbed by grazing cattle are scattered throughout both Segment 2 North and Segment 2 South. Agricultural land (65 percent) and developed land (27 percent) makes up most of Segment 2 North's landcover. Segment 2 South's landcover is primarily agricultural (81 percent). Developed land areas in both segments include rural existing roadways, residential lots, and businesses concentrated around the cities of Faribault, Kenyon, and Wanamingo. Wetlands are discussed in Section 6.9.11 and native plant communities and other sensitive ecological resources are discussed in Section 6.9.7.

Table 6-22 Landcover Types within the ROW of Segment 2 North and Segment 2 South

Landcover Type	Segment 2 North		Segment 2 South	
Agricultural (cultivated crops and hay/pasture)	489.7 acres	65%	499.5 acres	81%
Barren Land (rock/sand/clay)	0.6 acres	<1%	0.6 acres	<1%
Developed (low-high intensity; open space)	198.9 acres	27%	60.6 acres	10%
Forest (upland and wetland)	20.3 acres	3%	13.7 acres	2%
Herbaceous (upland and wetland)	38.1 acres	5%	38.6 acres	6%
Open Water	0.9 acres	<1%	0.2 acres	<1%
Shrub/Scrub (upland and wetland)	0 acres	0%	0	0%
Total acres	748.5 acres		613.1 acres	

6.9.10.2 Potential Impacts

Impacts to landcover associated with the project would primarily be associated with ROW clearing within rangeland and agricultural areas. Construction of the project would result in short-term impacts on existing vegetation, including localized physical disturbance and soil compaction. 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. These impacts to low growing vegetation would be temporary, having the ability to regrow after construction. Vegetation would be permanently removed where structures and foundations would be installed.

Construction would also result in long-term impacts to vegetation by permanently removing high growing and forested vegetation within the ROW where present; the ROW would be maintained with low-growing vegetation during operations. The clearing of trees and tall vegetation is required for the construction, maintenance, and safe operation of the project.

Construction and maintenance activities have the potential to result in the introduction or spread of noxious weeds and other non-native species. Noxious weeds, which are regulated under Minnesota Statute 18, can be introduced to new areas through propagating material like roots or seeds transported by contaminated construction equipment. Activities that could potentially lead to the introduction of noxious weeds and other non-native species include ground disturbance that leaves soils exposed for extended periods, introduction of topsoil contaminated with weed seeds, vehicles importing weed seed, and conversion of landscape type, particularly from forested to open settings. Noxious weeds establish more quickly on disturbed soil surfaces than native vegetation and in turn displace existing native land cover without proper controls in place.

Segment 2 North and Segment 2 South's ROI both have minimal NLCD-mapped forested land cover. Where Segment 2 North and Segment 2 South are double-circuited, the forested vegetation within the existing ROW would already be partly cleared and maintained but the ROW would be widened. These areas of forest have generally already been fragmented. Conversion from forest to open habitats in the ROW could have impacts on native vegetation by altering environmental conditions, such as light penetration; this could alter the vegetation community adjacent to the ROW and increase the potential spread of noxious weeds and other non-native species.

6.9.10.3 Mitigation

Mitigation and minimization measures for potential impacts to vegetation resources are standard Commission route permit conditions (Section 5.3.10, 5.3.11, 5.3.12, and 5.3.13 of Appendix H) and include the following:

- Minimize number of trees to be removed in selecting the ROW specifically preserving to the maximum extent practicable windbreaks, shelterbelts, living snow fences, and vegetation in areas such as trail and stream crossings where vegetative screening could minimize aesthetic impacts.
- Remove tall growing species located within the transmission line ROW that endanger the safe and reliable operation of the transmission line. Leave undisturbed, to the extent possible, existing low growing species in the ROW or replant such species in ROW to blend the difference between the ROW and adjacent areas, to the extent that the low growing vegetation that will not pose a threat to the transmission line or impede construction.
- Employ BMPs to avoid the potential introduction and spread of invasive species on lands disturbed by construction activities. Develop an Invasive Species Prevention Plan and file with the Commission prior to construction.

- Take all precautions against the spread of noxious weeds during construction. Site appropriate seed certified to be free of noxious weeds should be used and to the extent possible, native seed mixes should be used.
- Restrict pesticide use to those pesticides and methods of application approved by the Minnesota Department of Agriculture, DNR, and the U.S. EPA. Selective foliage or basal application shall be used when practicable.

As summarized in the route permit application, the applicant has committed to the following measures as the primary means to mitigate impacts to vegetation and minimize the potential for the introduction or spread of noxious weeds and invasive species:

- Limiting vehicle traffic to roads and pathways along the proposed ROW and within previously disturbed areas to the extent practicable
- Restricting equipment to narrow paths within the proposed ROW
- Spanning areas of sensitive vegetation
- Installing the line as a double circuit with an existing transmission line
- Routing parallel or adjacent to existing rights-of-way, such that tree removal is minimized

The applicant committed to working with the state and counties crossed by the project to identify where noxious weeds may be present and develop appropriate BMPs to minimize impacts. The applicant would implement a vegetation management plan to mitigate impacts and restore lands impacted by construction, as provided in the applicant's route permit application. Furthermore, the applicant committed to implementing integrated vegetation management plans associated with its existing pollinator initiative, created to enhance pollinator habitat. The plans minimize chemical use by avoiding broadcast applications and employ spot treatments for control of invasive species.

6.9.11 Wetlands

The ROI for wetlands is the ROW. Impacts to wetlands were evaluated by examining wetland type, size, and potential for spanning. The total acres of NWI wetlands and forested wetlands are similar within Segment 2 North and Segment 2 South.

Localized direct impacts to wetlands would include vegetation clearing, movement of soils, and construction traffic which could alter or impair wetland functions. Forested wetlands would be subject to long-term impacts given their conversion to non-forested wetlands. Wetland crossings longer than 1,000 feet might require one or more structures to be placed in the wetland, resulting in small, localized permanent wetland impacts. Both Segment 2 North and Segment 2 South would require wetland crossings exceeding 1,000 feet. For both, these crossings would be required in areas where existing transmission lines are not present and PWI watercourses are immediately adjacent.

Impacts can be minimized using BMPs. Wetland impacts would be regulated and could require permits. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible.

Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW, moving the anticipated alignment to a least impactful alignment within the route width, or minimizing clearing required in forested wetlands by selecting a route with an existing ROW where the project could be double-circuited.

6.9.11.1 Existing Conditions

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

Minnesota also has state-level regulations focused on protecting wetlands. The Minnesota Wetland Conservation Act (WCA) (Minnesota Rules 8420) is administered by the BWSR under Minnesota Rules 8420.0100, subpart 3 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 (1) avoid disturbing the wetland if feasible, (2) minimize wetland impacts, and (3) replace lost wetland acres, functions, and values. Certain activities are exempt from the WCA, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation.

A second state-level program that offers protection to the state's waters and wetlands is the PWI program administered by the DNR (Minnesota Statute § 103G.005). The DNR regulates work below the ordinary high-water level of PWI wetlands and waters through the public waters work permit program. Examples of work activities addressed by this program include filling, excavation, bridges and culverts, dredging, structures, and other construction activities.

Wetlands are areas with hydric (wetland) soils, hydrophytic (water-loving) vegetation, and wetland hydrology (inundated or saturated much of the year). Wetlands detain floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. Wetland types vary widely due to differences in topography, soils, hydrology, vegetation, water chemistry, climate, and other factors.

Calcareous fens are rare and distinctive peat-accumulating wetlands that receive groundwater rich in calcium and other minerals. The Wetlands Conservation Act (WCA), authorized by Minnesota Statute Section 103G.223, states that calcareous fens may not be filled, drained, or otherwise degraded, wholly or partially, by any activity, except as provided for in a management plan approved by the commissioner of the DNR. The DNR regulates calcareous fens under Minnesota Rules 8420.0935.

The USFWS National Wetlands Inventory (NWI), as updated by the DNR, identifies wetland complexes and isolated wetlands within the ROI of Segment 2 (Map 22). Wetland types in Segment 2 generally include seasonally flooded wetlands, wet meadows, shallow marshes, deep marshes, shallow open water, shrub swamps, wooded swamps, and riverine wetlands. As shown on Map 22, wetlands in the route width are mostly non-forested. Segment 2 North's ROI includes no PWI wetlands, and Segment 2 South's ROI includes one PWI wetland. Two calcareous fens (Wanamingo 22 and Holden 1 West sites) are located approximately 2.2 and 4.5 miles north of Segment 2 North (Figure 6-8), respectively (reference (190)).

6.9.11.2 Potential Impacts

The proposed transmission line could temporarily or permanently impact wetlands if they cannot be avoided during project design. Construction of transmission line structures typically includes vegetation clearing, movement of soils, and construction traffic. These activities could alter or impair wetland functions. Even small changes in hydrology (for example, periods of inundation, changes in flow, and sedimentation) can impair wetland function. Any wetland that would receive permanent transmission line infrastructure would also be impacted long term during operation of the project due to equipment access through the wetland for maintenance.

Transmission lines cannot be safely or reliably operated with trees growing within the ROW. As such, existing trees must be removed throughout the ROW, including forested wetlands. Forested wetlands, within any new transmission line ROW, would likely undergo a permanent change in wetland/vegetation type. Wetlands can also be impacted by soil erosion and sediment deposition during construction. Sedimentation and ground disturbance in wetlands can make them more susceptible to the establishment of invasive plant species, such as reed canary grass, which would adversely impact wetland function by reducing vegetative biodiversity and altering wildlife habitat.

Segment 2 South's ROI has more acres of wetland than Segment 2 North (Figure 6-9). Segment 2 North's ROI has a slightly higher acreage of forested wetlands (3 acres versus 2) subject to wetland type conversion than Segment 2 South's ROI (Figure 6-9). Given that approximately 69 percent of Segment 2 North could be double-circuited with existing transmission lines, forested wetlands within the existing ROW have been cleared.

Figure 6-8 Location of Wanamingo 22 and Holden 1 West Calcareous Fens

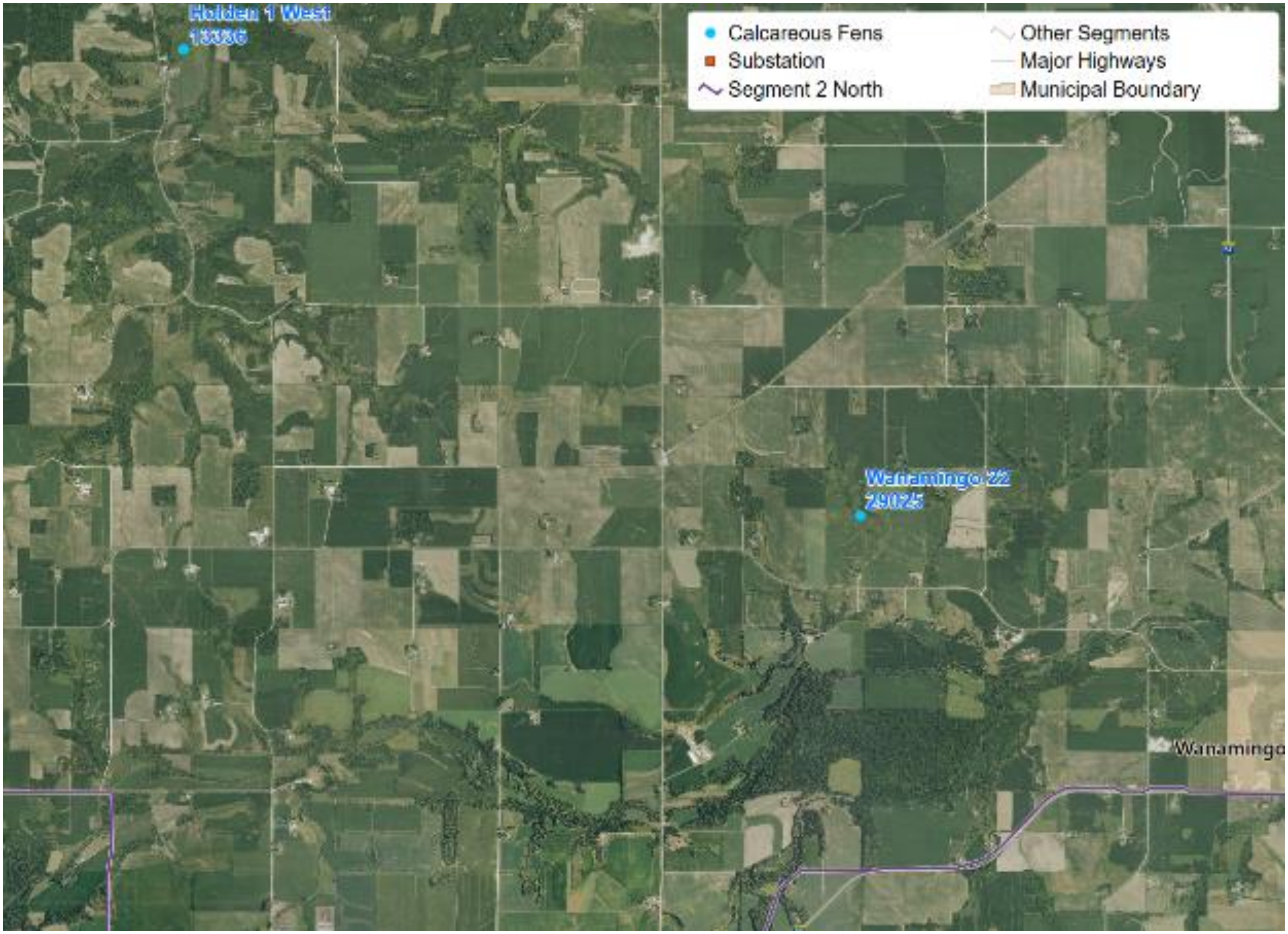
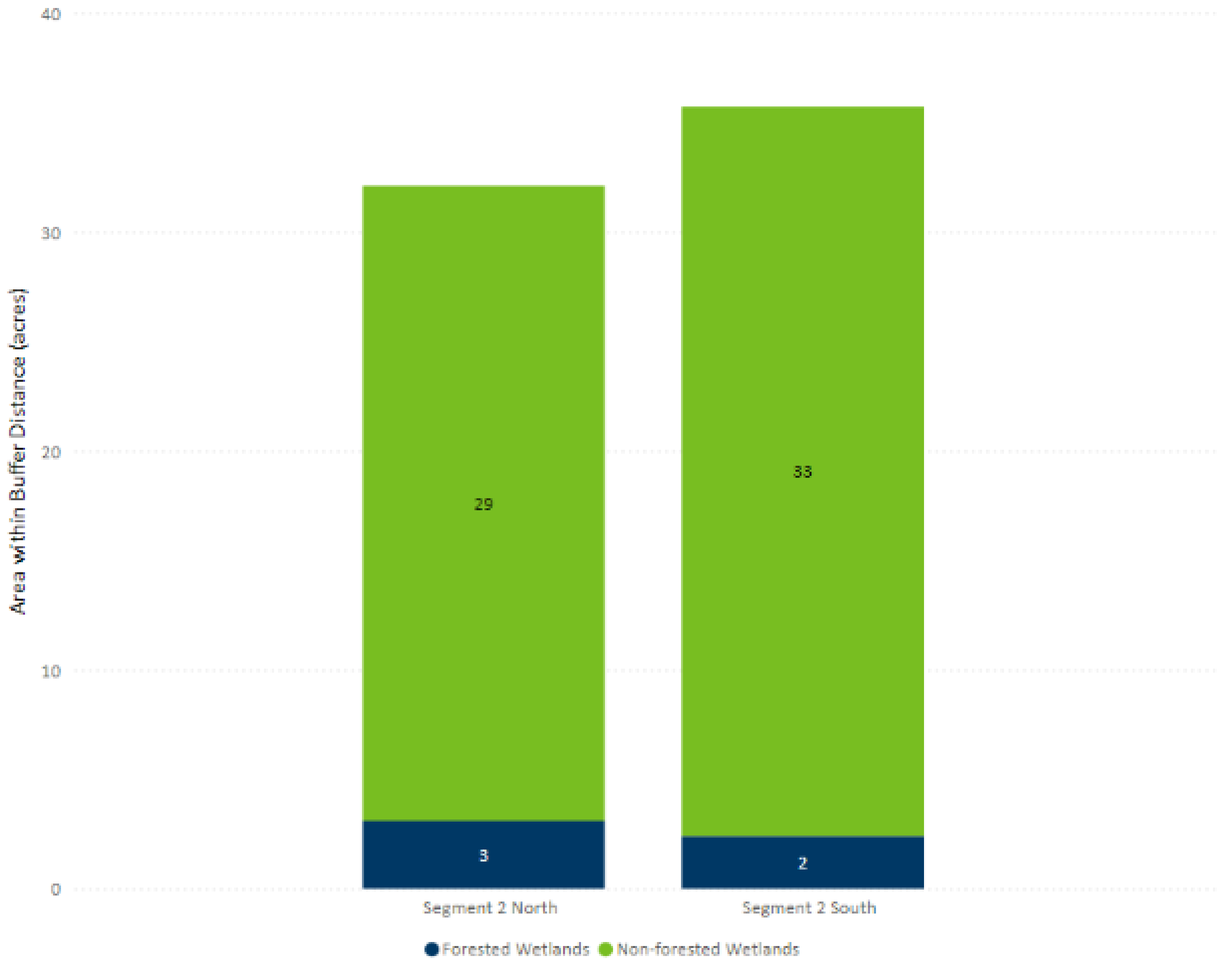


Figure 6-9 Wetlands within ROW of Segment 2 North and Segment 2 South



In most cases, wetlands can be spanned to avoid placing structures within them. However, wetland crossings longer than 1,000 feet might require one or more structures to be placed within the wetland. Segment 2 North and Segment 2 South's anticipated alignments would cross wetlands wider than 1,000 feet and could therefore require pole placement within the wetlands. Segment 2 North crosses two wetlands wider than 1,000 feet just east of Connector 2G, where existing transmission lines are not present, and where wetlands are adjacent to the North Fork Zumbro River, a public watercourse (Map 22-1). Segment 2 South crosses two wetlands wider than 1,000 feet where existing transmission lines are not present and where wetlands are adjacent to Dry Run Creek, a public watercourse (Map 22-3), and a tributary to the Straight River (Map 22-1).

In its Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR noted that many of the unique characteristics of calcareous fens result from the upwelling of groundwater through calcareous substrates. Because of this dependence on groundwater hydrology, calcareous fens can be affected by nearby activities or even those several miles away. Activities that affect surface water flows (e.g., stormwater flow, erosion) or activities that affect groundwater hydrology (e.g., groundwater pumping, contamination, discharge, or excavation) can impact calcareous fens.

6.9.11.3 Mitigation

Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width.

The sample route permit (Section 5.3.9 of Appendix H) includes the following measures to mitigate impacts to wetlands:

- Develop wetland impact avoidance measures and implement them during construction of the project.
- Space and place the structures at variable distances to span and avoid wetlands.
- Limit unavoidable wetland impacts as a result of the placement of structures to the immediate area around the structures.
- Construct in wetland areas during frozen ground conditions where practicable and according to permit requirements by the applicable permitting authority.
- Use wooden or composite mats to protect wetland vegetation when construction during winter is not possible.
- Contain soil excavated from the wetlands and not place it back into the wetland.
- Access wetlands using the shortest route possible in order to minimize travel through wetland areas and prevent unnecessary impacts.
- Do not place staging or stringing set up areas within or adjacent to wetlands, as practicable.
- Assemble structures on upland areas before they are brought to the site for installation.
- Restore wetland areas disturbed by construction activities to pre-construction conditions in accordance with the requirements of applicable state and federal permits or laws and landowner agreements.
- Meet the USACE, DNR, Minnesota BWSR, and local units of government wetland requirements.

In order to avoid impacting or altering the Wanamingo 22 fen and Holden 1 West fen, the applicant could obtain a no effect concurrence decision from the DNR prior to construction given Segment 2’s proximity within 5 miles of the fens. If the DNR determines the no effect concurrence to be required, the applicant would need to demonstrate that any temporary or permanent disturbance from any project-related activities, including dewatering (amount, timing, and duration), is avoided. In their Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR noted to ensure compliance with WCA, the applicant would be required to contact the Calcareous Fen Program Coordinator for further coordination. If through further coordination, the DNR determines if any impacts to the fen would occur during any phase of the project, the applicant could be required to develop a Calcareous Fen Management Plan in coordination with the DNR, as specified in Minnesota Statute § 103G.223. A special condition could be added to the route permit to direct the applicant to coordinate with DNR to ensure an appropriate plan and protections are in place.

6.9.12 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width. Impacts to wildlife and wildlife habitat are assessed both by considering wildlife inhabiting the ROI as well as assessing the presence of potential habitat for wildlife within the ROI, including areas that are preserved or managed for wildlife. Potential short-term, localized impacts to wildlife could occur from displacement during construction or maintenance activities. Potential long-term impacts could occur as a result to habitat loss, conversion, or fragmentation.

Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife and associated habitat. The primary means for mitigating impacts to wildlife or associated habitat is to avoid areas known to contain high-quality habitat or which serve as migratory corridors. Use of existing rights-of-way can minimize habitat loss and fragmentation. Impacts to wildlife can also be minimized by spanning habitats and minimizing the number of structures in high-quality habitat through the use of specialty structures.

6.9.12.1 Existing Conditions

Wildlife inhabiting the ROI are typical of those found in disturbed habitats associated with agriculture and rural and suburban development. Watercourses and waterbodies, and areas of natural vegetation, such as wetlands, forested areas, and open herbaceous areas, also provide habitat for wildlife in the area. Wildlife species inhabiting the ROI are generally adapted to disturbance associated with agricultural activities and human settlement. Typical species include mammals such as deer, fox, squirrels, coyote, and racoons; songbirds, such as robins and red-winged blackbirds; waterfowl, such as eagles and wood ducks; reptiles, such as snakes and turtles; amphibians, such as toads and frogs; and aquatic biota such as fish and mussels.

The state of Minnesota is in the Mississippi Flyway of North America. The Mississippi Flyway is a bird migration route that encompasses the Great Plains of the U.S. and Canada. Migratory birds use portions of the Mississippi Flyway as resting grounds during spring and fall migration, as well as breeding and nesting grounds throughout the summer. Suitable habitat for migratory birds is present throughout Segment 2.

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

Minnesota is home to over 2,000 known native wildlife species and over 300 of these species have been identified as Species in Greatest Conservation Need (SGCN) because they are rare, their populations are declining, or they face serious threats that can cause them to decline and thus have populations below levels desirable to promote their long-term health and stability. Minnesota's Wildlife Action Plan 2015-2025 includes a habitat approach, which focuses on sustaining and enhancing terrestrial and aquatic habitats for SGCN in the context of the larger landscapes (reference (191)). The Wildlife Action Plan lays out the basis for the long-term vision of a Wildlife Action Network composed of terrestrial and aquatic habitat cores and ROWs to support biological diversity and ecosystem resilience with a focus on SGCN. As shown on Map 33, several Wildlife Action Network corridors are scattered throughout Segment 2 and are crossed by the ROI for Segment 2 North and Segment 2 South. The Wildlife Action Network is a metric that can be used to assess buffers and connectors of habitats representing the diversity of habitat quality, supporting SGCN. As detailed by the DNR, "Consideration should be given to projects or activities that could result in the loss, degradation or fragmentation of habitat within the Wildlife Action Network, as habitat loss was identified as a substantial contributor to SGCN population declines" (reference (191)). As detailed by the DNR, "Consideration should be given to projects or activities that could result in the loss, degradation, or fragmentation of habitat within the Wildlife Action Network, as habitat loss was identified as a substantial contributor to SGCN population declines" (reference (191)).

Lands that are preserved or managed for wildlife and associated habitat are scattered throughout Segment 2 and include DNR WMAs and USFWS Grassland Bird Conservation Areas (GBCAs) (Map 33).

The DNR manages over one million acres of land as WMAs to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses (reference (192)). The Fairbault WMA intersects the ROI for Segment 2 North and Segment 2 South in the western extent of Segment 2 (Map 33-1).

The USFWS designates GBCAs priority areas for grassland protection and enhancement that are thought to provide suitable habitat for many or all priority grassland bird species in tall grass prairie. Several GBCAs intersect the ROI for Segment 2 North and Segment 2 South (Map 33-1 and Map 33-3).

In addition to the lands that are preserved or managed for wildlife, there are several sensitive ecological resources, such as native plant communities, that would also provide habitat for wildlife; these resources are discussed in Section 6.9.7.1.

6.9.12.2 Potential Impacts

6.9.12.2.1 General Wildlife Impacts

Construction activities that generate noise, dust, or disturbance of habitat could result in short-term, indirect impacts on wildlife. During project construction, wildlife would generally be displaced within and adjacent to the ROW. Clearing and grading activities could also affect birds' eggs or nestlings and small mammals that might be unable to avoid equipment. Many wildlife species would likely avoid the immediate area during construction and possibly not return following construction; the distance that animals would be displaced depends on the species and the tolerance level of each animal. However, comparable habitat is available adjacent to the project.

Construction of the project could result in long-term adverse impacts on wildlife due to loss, conversion, or fragmentation of habitat, particularly areas that are preserved and/or managed for wildlife. The route widths and rights-of-way of both Segment 2 North and Segment 2 South would intersect areas preserved or managed for wildlife, as summarized in Table 6-23 and shown on Map 33.

As discussed in Section 6.4, Segment 2 North could be double-circuited with existing 69 kV, 115 kV, or 345 kV transmission lines for 69 percent of its length. Segment 2 North would also parallel existing road-rights-of-way. Segment 2 South would primarily be constructed in a new ROW, with only a small portion of the line at the east end double-circuiting an existing 345 kV line and a small portion at the western end double-circuiting an existing 161 kV line (Map 4). Approximately one-quarter of Segment 2 South would parallel existing transmission line and/or road rights-of-way, while the majority of Segment 2 South would just follow property lines (Map 4). In areas where Segment 2 North or Segment 2 South could be double-circuited with an existing transmission line and/or where the segments would parallel existing transmission line and/or road ROW, impacts to wildlife and associated habitat would be minimized because habitat fragmentation has already occurred in these areas.

Table 6-23 Wildlife Resources within the Route Width and ROW of Segment 2 North and Segment 2 South

Resource	Units	Segment 2 North		Segment 2 South	
		Route width	ROW	Route width	ROW
Wildlife Management Areas	Acres	15	2	91	14
Grassland Bird Conservation Areas	Acres	988	146	351	49
Wildlife Action Network corridors	High or medium-high rank (acres)	116	16	27	4
	Medium rank (acres)	182	27	25	3
	Low or medium-low rank (acres)	105	17	17	3
	Total acres	403	59	68	10

The route width and ROW of Segment 2 South would intersect more acreage of the Fairbault WMA and the East Minnesota River Game Refuge relative to Segment 2 North. The anticipated alignment and ROW of Segment 2 South would intersect the WMA in a location that could be double-circuited with an existing 161 kV line. The anticipated alignment of Segment 2 North would not cross the WMA; however, its ROW would intersect the WMA in a location that would not double-circuit an existing line or parallel an existing transmission line or road ROW.

The route widths, ROWs, and anticipated alignments of both Segment 2 North and Segment 2 South would intersect GBCAs and Wildlife Action Network corridors in areas that could be double-circuited and in areas that would not parallel an existing transmission line or road ROW. Segment 2 North would intersect more GBCAs and Wildlife Action Network corridors relative to Segment 2 South.

6.9.12.2.2 Avian Impacts

Potential impacts to avian species (for example, songbirds, raptors, and waterfowl) could occur due to electrocution and collision with transmission line conductors. Electrocution occurs when an arc is created by contact between a bird and energized lines or an energized line and grounded structure equipment. Electrocution occurs more frequently with larger bird species, such as hawks, because they have wider wingspans that are more likely to create contact with the conductors.

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

As discussed above, impacts to wildlife and associated habitat would be minimized by double-circuiting with existing transmission lines. However, the incidence of birds colliding with transmission lines is influenced by the number of horizontal planes in which the conductors are strung. Stringing the conductors in a single horizontal plane presents less of a barrier to birds crossing the transmission line ROW. The proposed double-circuiting for both Segment 2 North and Segment 2 South would require adding another horizontal plane to the transmission line, which could increase potential impacts to avian species. However, Segment 2 South would mostly traverse areas where existing transmission lines are not currently present. Construction of a new transmission line corridor would add a potential new impact to avian species.

6.9.12.3 Mitigation

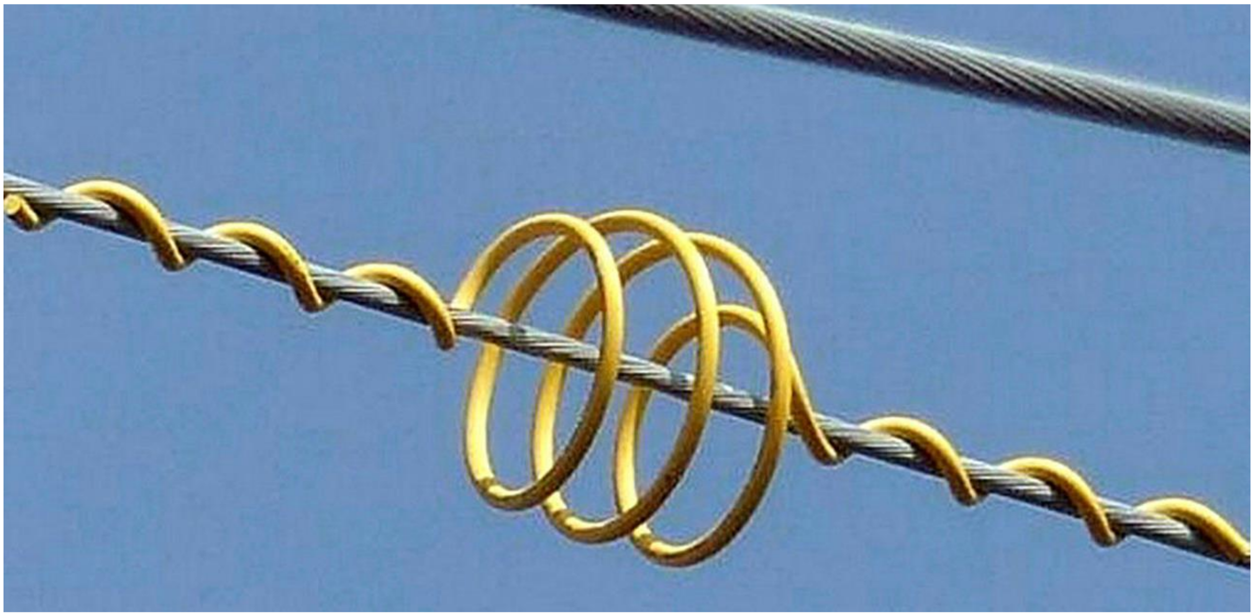
Potential impacts to wildlife and wildlife habitat can often be minimized or mitigated through several strategies. The primary strategy for mitigating impacts is to select route alternatives away from areas known to contain high-quality habitat or which serve as migratory corridors. Use of existing rights-of-way can minimize habitat loss and fragmentation. Impacts to wildlife can also be minimized by spanning habitats and minimizing the number of structures in high-quality habitat through the use of specialty structures.

Mitigation and minimization measures for potential impacts to avian species, including federally and/or state protected avian species, are standard Commission route permit conditions. As noted in

Appendix H, as part of the Commission's route permit, the applicant, in cooperation with the DNR, would need to identify areas of the transmission line where bird flight diverters would be incorporated into the transmission line design to prevent large avian collisions attributed to visibility issues. A typical bird flight diverter installation is shown in Figure 6-10. In addition, standard transmission design would need to incorporate adequate spacing of conductors and grounding devices in accordance with Avian Power Line Interaction Committee standards to eliminate the risk of electrocution to raptors with larger wingspans that could simultaneously come in contact with a conductor and grounding devices.

As discussed in Section 6.9.10.3, there are several standard Commission route permit conditions to mitigate or minimize potential impacts to vegetation resources; these standard route permit conditions would also be applicable to mitigating and minimizing potential impacts to wildlife habitat.

Figure 6-10 Typical Bird Flight Diverter



As summarized in its route permit application, the applicant has committed to the following measures to minimize the potential for impacts to wildlife and wildlife habitat:

- Designing the route to avoid wildlife habitat identified to the extent possible during a constraints analysis completed during the routing process.
- Implementation of specific BMPs for protected species that would also be beneficial to wildlife in general; these are discussed in Section 6.9.7.3.
- Coordinating with the DNR and/or USFWS to identify wildlife migration pathways, particularly avian flyways crossed by the route alternatives and to identify areas where transmission lines should be marked to minimize avian interactions.

Currently the state of Minnesota does not track locations of bald eagles or their nests and the USFWS does not have any public data available on eagle nests. The DNR is in the process of developing a database of eagle nest locations; however, it is not currently available. The DNR suggests reporting any eagle sightings on eBird (https://ebird.org/home); these reports will ultimately become part of the DNR's eagle database.

The USFWS bald eagle management guidelines indicate that activities within 660 feet of an active nest and occur within line of sight of the nesting location might have the potential to disturb nesting bald eagles (reference (198)). Impacts to bald eagles could be minimized by conducting a visual inspection for bald eagle nests not more than two weeks prior to the start of construction, if work will occur during the active nesting period for bald eagles (January 15th – July 31st). If an active nest is observed and if construction would need to take place during the time that the nest remains active, consultation with the USFWS would need to occur to determine the appropriate next steps. Under such a circumstance, a variety of options are available, including the presence of a biological monitor to observe and determine if project activities are resulting in disturbance, a shift in project schedule to avoid the active nesting season, or a submittal for an incidental take permit that would allow work to proceed even if it is likely to result in disturbance.

As summarized in their joint certificate of need application and route permit application, the applicant has committed to continuing coordination with the USFWS regarding the 2024 revised regulations for the issuance of permits for eagle incidental take and eagle nest take (Permits for Incidental Take of Eagles and Eagle Nests, 50 Code of Federal Regulations CFR, Parts 13 and 22, 2024).

6.10 Electric System Reliability

In the joint certificate of need application and route permit application, the applicant summarized MISO's reliability analysis findings and noted that the applicant completed their own examination of system reliability improvements yielded by the project. Reliability analyses studied all NERC contingency categories (P1-P7). These analyses support the purpose and need of the project.

The purpose of the project, as also discussed in Section 4.1, is to construct an HVTL to provide additional transmission capacity to reduce congestion and to improve electric system reliability throughout the region as more renewable energy resources are added to the high-voltage transmission system. The project would provide additional transmission capacity that is needed to mitigate current capacity issues and as part of the Long Range Transmission Planning (LRTP) Tranche 1 Portfolio, would address reliability violations as defined by the NERC at over 300 different sites across the Midwest. The project would increase transfer capability across the MISO Midwest subregion to allow reliability to be maintained for all hours under varying dispatch patterns driven by differences in weather conditions.

The joint certificate of need application and route permit application discussed that the existing 230 kV transmission system in eastern North Dakota and South Dakota plays a key role in transporting and delivering energy to customers in Minnesota, but the existing 230 kV system is currently at its capacity. The project, as part of LRTP Tranche 1, would provide a new 345 kV transmission line, which is designed to provide additional transmission capacity to mitigate current capacity issues on the existing 230 kV transmission system and to improve electric system reliability as more renewable energy resources are added throughout the region.

The applicant designed the project with the intent of meeting the project's electric system reliability needs. Reliability was also considered by the applicant in their alternatives analysis.

6.11 Costs that are Dependent on Design and Route

The applicant's overall project costs, as presented in the joint certificate of need application and route permit application and discussed in Section 3.5, are based on high and low-cost estimates of the project as a whole, and do not distinguish between the individual route segments and alternatives. The transmission line is expected to cost approximately $3.7 million per mile. The estimated project construction cost at the time of the application was between $524.7 million and $577.2 million. Also as discussed in Section 3.5, since the filing of the joint certificate of need application and route permit application, the applicant has updated this range of project costs to include alternatives, and the updated estimated cost is between $436.8 million and $583.8 million.

Construction cost estimates rely on the best available information at the filing time of the estimate. Estimates include (1) transmission line structures and materials; (2) transmission line construction and restoration; (3) transmission line and substation permitting and design; (4) transmission line ROW acquisition; and (5) substation materials, substation land acquisition, and construction. The cost estimates assume the applicant would pay prevailing wages for applicable positions during project construction.

The following variables were considered when estimating project costs:

- Unexpected weather conditions
- Environmental sensitivities resulting in the need for mitigation measures
- Poor soil conditions in areas where no data was obtained
- Transmission line outage constraints
- Potential shallow bedrock
- River crossings
- Labor shortages
- Market fluctuations in material pricing and availability
- Labor costs

These cost estimates could increase over time for any number of reasons such as, but not limited to escalation, inflation and commodity pricing, especially for these types of large-scale 345 kV transmission projects that have multi-year schedules.

6.12 Segment 2 Relative Merits

The Commission is charged with locating transmission lines in a manner that is "compatible with environmental preservation and the efficient use of resources" and that minimizes "adverse human and environmental impact(s)" while ensuring electric power reliability per Minnesota Statute § 216E.02. Minnesota Statute §216E.03, subdivision 7(b) identifies considerations that the Commission must consider when designating transmission lines routes. These considerations are further clarified and expanded by Minnesota Rule 7850.4100, which identifies the following 14 factors the Commission must consider when making a transmission line route permit decision:

A. Effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services;
B. Effects on public health and safety;
C. Effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining;
D. Effects on archaeological and historic resources;
E. Effects on the natural environment, including effects on air and water quality resources and flora and fauna;
F. Effects on rare and unique natural resources;
G. Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity
H. Use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries;
I. Use of existing large electric power generating plant sites;
J. Use of existing transportation, pipeline, and electrical transmission systems or rights-of-way;
K. Electrical system reliability;
L. Costs of constructing, operating, and maintaining the facility which are dependent on design and route;
M. Adverse human and natural environmental effects which cannot be avoided; and
N. Irreversible and irretrievable commitments of resources.

These routing factors are used to conduct a relative merits analysis of Segment 2 North and Segment 2 South with the exception of some elements of resource categories that are considered to have minimal impacts that might not vary significantly and/or the routing factors are not applicable. These include:

- Impacts on human settlements (factor A)— cultural values, environmental justice, noise, property values, socioeconomics, transportation, and public services.
- Impacts on public health and safety (factor B)—EMF, implantable medical devices, stray voltage, public and worker safety, stray voltage, induced voltage, and electronic interference.

- Impacts on the natural environment (factor E) – air quality, climate, geology and topography, floodplains, groundwater, and soils.

With respect to routing factor G, it is assumed that Segment 2 North and Segment 2 South are equal with regard to maximizing energy efficiencies and accommodating expansion of transmission capacity. With respect to environmental impacts, the examination of such impacts suggested by routing factor G is included in the discussion of other routing factors and elements that more specifically address an environmental impact (for example, effects on vegetation and wildlife, routing factor E, or rare and unique natural resources, routing factor F).

Routing factor I, the use of existing large electric power generating plant sites, is not relevant to this project and is not discussed further.

Routing factors M and N— the unavoidable and irreversible impacts of the project—are discussed in Chapter 12.

A relative merits analysis was completed to compare Segment 2 North and Segment 2 South using these routing factors. The analysis uses graphics (Table 6-24) to provide a visual assessment of the relative merits for each route segment. The graphic for a specific routing factor or element is not meant to be indicative of the "best" route segment but is provided as a relative comparison to be evaluated together with all other routing factors. For routing factors where impacts are anticipated to vary, the graphic represents the magnitude of anticipated difference between these anticipated impacts and compares them across the different route options within a given region. For routing factors that express the state of Minnesota's interest in the efficient use of resources (for example, the use and paralleling of existing rights-of-way), the graphic represents the consistency of the route alternative with these interests and compares them to each other. Table 6-25 summarizes the relative merits analysis for Segment 2.

Table 6-24 Guide to Relative Merits Analysis

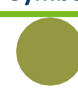
Consistency with Routing Factor or Anticipated Impacts	Symbol
Segment option is consistent with the routing factor OR Impacts are anticipated to be negligible to minimal or the impact is positive	
Segment option is consistent with routing factor but less so than the other options OR Impacts are anticipated to be minimal but the potential for impacts is greater than the other options or require special permit conditions OR Impacts are anticipated to be moderate	
Route is not consistent with routing factor or consistent only in part OR Impacts might be moderate but the potential for impacts is greater than the other options or might require special permit conditions OR Impacts are anticipated to be significant	

Table 6-25 Relative Merits of Segment 2 North and Segment 2 South

Routing Factor / Resource	Segment 2 North	Segment 2 South	Summary
Factor A Human Settlement			
Aesthetics			Aesthetic impacts are anticipated to be moderate for both Segment 2 North and Segment 2 South. Segment 2 South has less residences within the ROW, route width, and local vicinity (with a total of 67 residences within the local vicinity compared to 201). It also has less non-residential structures within the local vicinity. Segment 2 North and Segment 2 South would result in aesthetic impacts to areas used for recreational purposes as both would introduce new crossings at the Straight River, a state water trail, where there is no existing infrastructure already present. Segment 2 North could be double-circuited with existing transmission lines for 69% of its length and 80% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads). Segment 2 South could be double-circuited with existing transmission lines for 15% of its length and 27% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads).
Displacement			Segment 2 North has 1 residence that could be subject to displacement within the ROW; however, the applicant has indicated no residences would be displaced. Segment 2 South does not contain any residences within the ROW. Segment 2 North has 3 non-residential structures, and Segment 2 South has 2 non-residential structures, that could be subject to displacement within ROW.
Land Use and Zoning			Impacts to existing land use patterns, future land use planning, and local zoning are anticipated to be minimal within the counties crossed by Segment 2 North or Segment 2 South's ROW.
Recreation			Recreational resources within the route width and subject to impacts include public watercourses, snowmobile trails, and a private golf course. Intermittent impacts would occur during construction and long-term impacts would include aesthetic impacts (discussed above). The Straight River is a designated state water trail and is located within the route width of Segment 2 North and Segment 2 South. There are no existing transmission lines at either crossing. The Straight River Golf Course is within the route width of Segment 2 South. The physical structures of Segment 2 South that would cross through the Straight River Golf Course would impact the functional use of the golf course resulting in permanent impacts.
Factor C Land-Based Economies			
Agriculture			Most land within the route width is agricultural (65% of Segment 2 North and 81% of Segment 2 South) and impacts cannot be avoided but can be mitigated. Prudent routing (e.g., ROW sharing via double-circuiting or paralleling with existing infrastructure) could help minimize impacts. Segment 2 North shares or parallels existing infrastructure (transmission lines, roads, and railroads) for 80% of its length and Segment 2 South shares or parallels existing infrastructure for 27% of its length.

Routing Factor / Resource	Segment 2 North	Segment 2 South	Summary
Forestry			No notable forestry resources were identified within Segment 2 North or Segment 2 South's route width; therefore, no impacts to forestry are anticipated.
Mining			No active gravel pits were identified within Segment 2 North or Segment 2 South's route width; therefore, impacts to mining are anticipated to be minimal and independent of the route segment selected.
Tourism			Known events and other opportunities for tourism are advertised in nearby incorporated towns and the activities are not located within the ROI. Recreational opportunities identified within the ROI include publicly accessible lands and waters used for outdoor activities. Additionally, one private recreational facility, the Straight River Golf Course, is within the ROI of Segment 2 South. The anticipated alignment of Segment 2 South crosses through the golf course. Impacts to the tourism-based economy are anticipated to be negligible to minimal.
Factor D Archaeological and Historic Resources			
Archaeological			Segment 2 North's route width contains more unevaluated sites for the NRHP compared to Segment 2 South (four versus zero). Segment 2 North's route width contains more potential historic cemeteries than Segment 1 South (eight versus two). However, the exact locations of the cemeteries are unknown. Survey efforts would be completed by the applicant and would inform potential impacts; impacts could be avoided and/or mitigated.
Historic			Segment 2 North and Segment 2 South's route width have zero previously documented NRHP-eligible historic architectural resources. Segment 2 North's route width includes more (4 versus 2) historic architectural resources which are unevaluated for the NRHP. Survey efforts would be completed by the applicant and would inform potential impacts; impacts could be avoided and/or mitigated.
Factor E Natural Resources			
Public and Designated Lands			Public land within Segment 2 North and Segment 2 South's ROW includes the Faribault WMA which is owned by the DNR. Impacts by Segment 2 North could be avoided depending upon the location of the final alignment. Impacts by Segment 2 South are anticipated to be minimal as the crossing is in a location where the project could be double-circuited with existing transmission line. The applicant would be required to coordinate with DNR. Segment 2 South's ROI includes one RIM easement. Impacts by Segment 2 South could be avoided depending upon the location of the final alignment. Segment 2 North's ROI includes two CREP easements. Impacts by Segment 2 North could be avoided depending upon the location of the final alignment.
Surface Water			Segment 2 North has more watercourse crossings than Segment 2 South but most of the crossings for Segment 2 North would occur in areas that could be double-circuited with existing transmission lines. Segment 2 South crosses three PWI waterbodies (unnamed wetlands). Segment 2 South requires a crossing greater than 1,000 feet of a PWI waterbody that is classified in the NWI as a shallow marsh. Structures within the waterbody could be required.

Routing Factor / Resource	Segment 2 North	Segment 2 South	Summary
Vegetation			Segment 2 North has slightly more acres of forested vegetation in the ROW (20 acres) than Segment 2 South (14 acres). However, Segment 2 North would double-circuit an existing transmission line for 69 percent of its length, therefore these forested areas have generally already been fragmented from the existing ROW.
Wetlands			Segment 2 South has more acres of wetland in the ROW than Segment 2 North, but they have a similar acreage of forested wetland in the ROW. Segment 2 South's ROW includes one PWI wetland compared to none in Segment 2 North. Two calcareous fens are located approximately 2.2 and 4.5 miles north of Segment 2 North's ROW. Segment 2 North and Segment 2 South's ROW would each cross wetlands wider than 1,000 feet and would therefore require pole placement within the wetlands.
Wildlife and Wildlife Habitat			Segment 2 North and Segment 2 South would both intersect wildlife resources. The ROW of Segment 2 South would intersect more acreage of the Faribault WMA but would do so in an area that could be double-circuited within an existing 161 kV line. Segment 2 North and Segment 2 South would intersect Grassland Bird Conservation Areas and Wildlife Action Network corridors, with Segment 2 North intersecting more acres of both resources. However, given that Segment 2 North would double-circuit an existing transmission line for 69 percent of its length, habitat in many of these areas has already been fragmented.
Rare and Unique Natural Resources			Segment 2 North has more NHIS records of state protected species within 1 mile than Segment 2 South. Segment 2 North has 4 NHIS records within its ROW while Segment 2 South has 2. However, all of the NHIS records within the ROW for both segments are mussel species; all watercourses would be spanned and impacts to mussels are not anticipated. The ROW of Segment 2 North would intersect more acres of SBS than Segment 2 South. The ROW of Segment 2 North would also intersect native plant communities and a railroad right-of-way prairie; Segment 2 South would avoid these resources. Although Segment 2 North would intersect more sensitive ecological resources, impacts would be somewhat minimized because the anticipated alignment would intersect these resources in areas that have already been fragmented by existing transmission line or road rights-of-way.
Minnesota Statute § 216E.03 - subdivision 7 (15e) (transmission lines)			
Paralleling Existing Transmission Line			Segment 2 North could be double-circuited within existing 69 or 345 kV transmission line for 28.4 miles which is 69% of its length. Segment 2 South could be double-circuited within existing 161 or 345 kV transmission line for 5.7 miles which is 15% of its length.

Routing Factor / Resource	Segment 2 North	Segment 2 South	Summary
Minnesota Statute § 216E.03 - Subdivision 7 (8) (roads/railroads)			
Paralleling Roads and Railroads			Segment 2 North would parallel roads for 24.8 miles which is 60% of its length. Segment 2 South would parallel roads for 5.4 miles which is 14% of its length. Segment 2 South also parallels some existing railroad.
Factor H Paralleling Division Lines			
Paralleling existing survey lines, natural division lines, and agricultural field boundaries			Segment 2 North would follow existing division lines (field, parcel, and section lines) for 37.4 miles which is 91% of its length. Segment 2 South would follow existing division lines (field, parcel, and section lines) for 29.4 miles which is 77% of its length.
Factor J Paralleling Existing Infrastructure			
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.			Cumulatively, Segment 2 North parallels existing infrastructure (transmission lines, roads, or railroads) for 80% of its length. Cumulatively, Segment 2 South parallels existing infrastructure (transmission lines, roads, or railroads) for 27% of its length.
Factor L Costs			
Costs Dependent on Design and Route			The applicant's overall project costs, as presented in the joint certificate of need application and route permit application and discussed in Section 3.5, are based on high and low-cost estimates of the project as a whole, and do not distinguish between the individual route segments and alternatives. The application noted that the transmission line is expected to cost approximately $3.7 million per mile. Segment 2 North is 41.2 miles in length compared to Segment 2 South which is 38.1 miles in length.

6.13 Segment 2 East of Faribault to west of North Rochester study area

As described in Section 3.1.2.3, Connector 2G connects Segment 2 North and Segment 2 South in Rice County and presents options for connecting north and south options from just east of Faribault to west of North Rochester. Connector 2G could provide opportunity to avoid or minimize impacts. The four options are illustrated in Figure 6-11 and are summarized below.

- Segment 2 North-North
  - This option is 38.5 miles long and would be a subpart of Segment 2 North (in other words, this option remains on the northern options and does not use Connector 2G).
- Segment 2 South-South
  - This option is 31.0 miles long and would be a subpart of Segment 2 South (in other words, this option remains on the southern options and does not use Connector 2G).
- Segment 2 North-South
  - This option is 31.2 miles. West of Connector 2G, this option uses the northern option. Then using Connector 2G, this option uses the southern option leading to the area's end point.
- Segment 2 South-North
  - This option is 39.8 miles. West of Connector 2G, this option uses the southern option. Then using Connector 2G, this option uses the northern option leading to the area's end point.

The potential impacts of the four options in this study area are summarized in Table 6-26.

Figure 6-11 Segment 2 Faribault (West Faribault Substation) to North Rochester Study Area

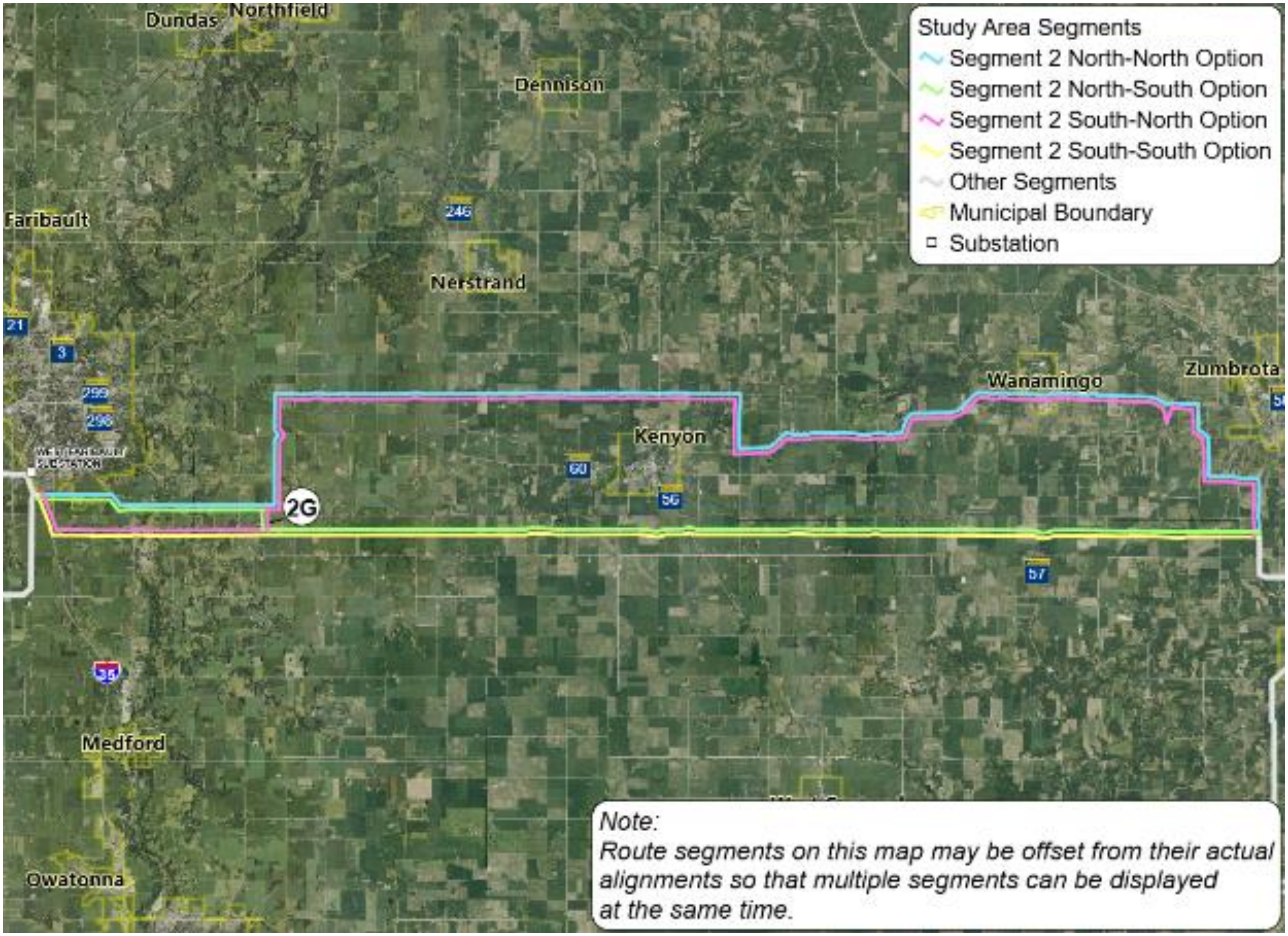


Table 6-26 Human and Environmental Impacts in Segment 2 West Faribault to North Rochester Study Area

Resource	Element	Segment 2 West Faribault to North Rochester Study Area				Notes
		North-North	South-South	North-South	South-North	
Length (miles)		38.5	31.0	31.2	39.8	
Opportunities for Double-Circuiting	Double-circuit with existing 69 kV line (miles, percent)	21.2, 55%	0, 0	0, 0	21.2, 53%	The greatest opportunity for double-circuiting is on the northern option east of Connector 2G (Map 4) where there are opportunities to double-circuit with 69, 161, and 345 kV existing transmission lines. West of Connector 2G, the southern option includes 3.1 miles that could be double-circuited with existing 161 kV transmission line (Map 4).
	Double-circuit with existing 161 kV line (miles, percent)	0, 0	3.1, 10%	0, 0	3.1, 8%	
	Double-circuit with existing 345 kV line (miles, percent)	4.6, 12%	0, 0	0, 0	4.6, 12%	
	Total opportunity for double-circuiting (miles, percent)	25.8, 67%	3.1, 10%	0, 0	28.9, 73%	
ROW Sharing / Paralleling	Transmission line (miles, percent)	25.8, 67%	3.1, 10%	0, 0	28.9, 73%	The greatest opportunity for sharing or paralleling existing ROW is present on the northern option east of Connector 2G (Map 4) where there is existing transmission lines, roads, and railroads. The least opportunity for sharing or paralleling existing ROW is present on the southern option east of Connector 2G (Map 4) where more of the length follows division lines but not existing infrastructure.
	Roads (miles, percent)	24.8, 64%	5.4, 17%	5.6, 18%	24.6, 62%	
	Railroad (miles, percent)	0, 0	1.1, 3%	0, 0	1.1, 3%	
	Total ROW sharing or paralleling (transmission line, road, railroad, and pipeline) (miles, percent)	30.4, 79%	7.5, 24%	5.6, 18%	32.3, 81%	
	Total ROW Paralleling (Parcel, section, and division lines) (miles, percent)	34.9, 91%	26.9, 87%	25.9, 83%	37.5, 94%	
	Total ROW Paralleling (all) (miles, percent)	35.6, 93%	27.2, 88%	25.9, 83%	38.4, 96%	
Human Settlement	Residences within 0 - 75 feet, ROW (count)	1	0	0	1	Residences and non-residential structures are most concentrated on the northern option east of

Resource	Element	Segment 2 West Faribault to North Rochester Study Area				Notes
		North-North	South-South	North-South	South-North	
	Residences within 75 - 250 feet (count)	45	11	23	33	Connector 2G (Map 28); this subpart also has one residence within its ROW (Map 26-2). The south-south and north-south options have less residences and non-residential structures within 500', the route width (1,000'), and the local vicinity (1,600').
	Residences within 250 – 500 feet, Route Width (count)	55	22	25	52	
	Residences within 500 – 1,600 feet (count)	97	31	34	94	
	Total Residences (count)	198	64	82	180	
	Non-residential structures within 0 - 75 feet (count)	3	2	1	4	
	Non-residential structures within 75 - 250 feet (count)	77	27	32	72	
	Non-residential structures within 250 - 500 feet (count)	249	61	81	229	
	Non-residential structures within 500 - 1,600 feet (count)	147	74	67	156	
	Total Non-residential structures (count)	476	164	181	461	
Conservation Easements	RIM (acres in ROW)	0	2.5	0	2.5	RIM and CREP easements are not present within the ROW of the north option west of Connector 2G or the south option east of Connector 2G. As described in Section 6.9.6.2, where easements are within the ROW – they could potentially be avoided depending upon the location of the final alignment.
	CREP (acres in ROW)	2.0	0	0	2.0	
	Agricultural land (acres in ROW)	448	457	479	447	

Resource	Element	Segment 2 West Faribault to North Rochester Study Area				Notes
		North-North	South-South	North-South	South-North	
Land-Based Economies	Prime farmland (acres in ROW)	556	481	492	554	The study area is comprised predominantly of agricultural land. Impacts to agricultural operations could be mitigated by prudent routing; specifically, prudent routing could include selecting route alternatives that prioritize paralleling existing infrastructure to maximize potential opportunity for ROW sharing and minimize potential interruptions or impediments of the use of farm equipment. The north-north and south-north options would share or parallel the most existing infrastructure.
Archaeology and Historic Architecture	Archaeological sites in route width (count in route width)	4	0	0	4	The route widths of the south-south option and north-south options do not intersect with any previously documented archaeological sites. There north-south and south-south option route widths may each intersect with one unrecorded historic cemetery, compared to seven for the other options.
	Historic architectural resources in route width (count in route width)	20	8	8	20	
	Historic cemeteries (count in route width)	7	1	1	7	
Water Resources	NHD stream crossings (count)	48	40	37	53	The north option west of connector 2G and the south option east of connector 2G would minimize stream crossings; however, the north option east of Connector 2G would cross most of these streams while double-circuiting an existing transmission line. Using the north option west of Connector 2G would avoid crossing PWI wetlands. The north option west of connector 2G and the south option east of connector 2G would avoid crossing wetlands greater than 1,000 feet.
	PWI stream crossings (count)	16	17	9	7	
	Impaired stream crossings (count)	4	1	1	4	
	PWI basin/wetland crossings (count)	0	3	0	3	
	Forested wetlands (acres in ROW)	2	2	1	3	
	Total wetlands (acres in ROW)	28	33	21	42	
	Wetland crossings greater than 1,000 feet (count)	1	1	0	2	
Vegetation	Forested landcover in the ROW (acres)	18	12	6	25	The north option west of Connector 2G and the south option east of Connector 2G have the least amount of forested vegetation in the ROW.

Resource	Element	Segment 2 West Faribault to North Rochester Study Area				Notes
		North-North	South-South	North-South	South-North	
Wildlife	Grassland Bird Conservation Areas (acres in ROW, acres in route width)	146 988	49 351	80 546	139 952	The north and south options west of Connector 2G would intersect similar amounts of GBCA; the south option east of Connector 2G would not intersect any GBCAs and the north option east of Connecter 2G would intersect a GBCA but would do so while double-circuiting an existing line. The north and south options west of Connector 2G would intersect a WMA; the south option would intersect more acres of the WMA but would do so while double-circuiting an existing line. The north option east of Connector 2G would intersect the most acres of Wildlife Action Network corridors but would do so while double-circuiting an existing line.
	Wildlife Management Areas (acres in ROW, acres in route width)	2 15	14 91	2 15	14 91	
	Wildlife Action Network Corridors (acres in ROW, acres in route width)	59 403	10 60	1 25	68 446	
Rare and Unique Natural Resources	State Threatened or Endangered Species (documented records in NHIS database; count in ROW, count in route width)	4 4	2 2	4 4	2 2	All documented state threatened or endangered species are aquatic and impacts are not anticipated. Although the north option east of Connector 2G would intersect SBS and native plant communities, it would do so in an area that has already been disturbed with an existing transmission line and that line could be double-circuited. The north option west of Connector 2G would cross a railroad-right-of-way prairie but it could be spanned.
	Sites of Biodiversity Significance (acres in ROW, acres in route width)	5 26	0 0	0 0	5 26	
	Native Plant Communities (acres in ROW, acres in route width)	4 22	0 0	0 0	4 22	
	Railroad Rights-of-way Prairie (crossing count)	1	0	1	0	

7 Route Segment 17 (Hwy 14 Option) - Affected Environment, Potential Impacts, and Mitigation

This chapter provides an overview of the human and environmental resources that could be affected by Route Segment 17 (Hwy 14 Option) which is described in Section 3.1.3. It discusses potential impacts relative to the construction and operation of the project on these resources. It also discusses ways to avoid, minimize, and mitigate these impacts.

Route Segment 17 (Hwy 14 Option) would be a new 345 kV transmission line that would run from the Wilmarth Substation in the city of Mankato, to the Byron Substation, and ultimately to the North Rochester Substation, just north of the city of Pine Island. It is referred to as the "Hwy 14 Option" because it would primarily parallel U.S. Highway 14 (Map 5). It is approximately 86.1 miles long and requires a wider right of way (ROW) and route width (Section 3.3.1).

Route Segment 17 (Hwy 14 Option) is referred to as Route Segment 17 because it was proposed during scoping as an alternative. It is an alternative option to Segments 1 and 2 combined. Route Segment 17 was proposed during scoping to follow U.S. Highway 14 and to avoid agricultural land and natural resources.

7.1 Terms and Concepts

Understanding proposed and alternative route impacts involves contextualizing their duration, size, intensity, and location. This form of contextual information serves as the basis for assessing the overall project impacts on resources. To provide appropriate context, the following terms and concepts are used to describe and analyze potential impacts:

- **Duration –** Impacts vary in length of time. Short-term impacts are generally associated with construction but might extend into the early operational phase of the project. Long-term impacts are associated with the operation of the project. Permanent impacts extend beyond project decommissioning and reclamation.
- **Size –** Impacts vary in size. To the extent possible, potential impacts are described quantitatively, for example, the number of impacted acres or the percentage of affected individuals in a population.
- **Uniqueness –** Resources are different. Common resources occur frequently, while uncommon resources are not ordinarily encountered.
- **Location –** Impacts are location-dependent. For example, common resources in one location might be uncommon in another.

The context of an impact, in combination with its anticipated on-the-ground effect, is used to determine an impact intensity level, which can range from highly beneficial to highly harmful.

Impact intensity levels are described using qualitative descriptors, which are explained below. These terms are not intended as value judgments, but rather a means to confirm common understanding among readers and to compare potential impacts between route alternatives.

- **Negligible** impacts do not alter an existing resource condition or function and are generally not noticeable to an average observer. These short-term impacts affect common resources.
- **Minimal** impacts do not considerably alter an existing resource condition or function. Minimal impacts might, for some resources and at some locations, be noticeable to an average observer. These impacts generally affect common resources over the short- or long-term.
- **Moderate** impacts alter an existing resource condition or function and are generally noticeable to the average observer. Impacts might be spread out over a large area making them difficult to observe but can be estimated by modeling. Moderate impacts might be long-term or permanent to common resources, but generally short- to long-term to uncommon resources.
- **Significant** impacts alter an existing resource condition or function to the extent that the resource is impaired or cannot function as intended (highly harmful). Significant impacts are likely noticeable or predictable to the average observer. Impacts might be spread out over a large area, making them difficult to observe, but can be estimated by modeling. Significant impacts can be of any duration and affect common or uncommon resources.

Also discussed are opportunities to mitigate potential impacts through mitigation. Mitigation means:

- Avoiding impacts altogether by not undertaking a certain project or parts of a project;
- Minimizing impacts by limiting the degree of magnitude of a project;
- Rectifying impacts by repairing, rehabilitating, re-creating, or restoring the affected environment;
- Reducing or eliminating impacts over time by preservation and maintenance operations during the life of the project;
- Compensating for impacts by replacing or providing substitute resources or environments; or
- Reducing or avoiding impacts by implementing pollution prevention measures.

Some impacts can be avoided or minimized; some might be unavoidable but can be minimized; others might be unavoidable and unable to be minimized but can be rectified (corrected). The level at which an impact can be mitigated might change the impact intensity level.

When referring to construction practices or mitigation measures, this environmental impact statement (EIS) uses the convention of describing these as actions by Xcel Energy (the applicant), even if the action would be carried out by the applicant’s contractor.

7.2 Regions of Influence

Potential impacts on human and environmental resources are analyzed within specific geographic areas called regions of influence (ROI). The ROI is the geographic area where the project might exert some influence and is used as the basis for assessing potential impacts. ROIs vary by resource and potential impact (Table 5-1). As necessary, the EIS discusses potential impacts and mitigation measures beyond the identified ROI to provide appropriate context. Direct impacts within the ROI might cause indirect impacts outside the ROI.

This EIS uses the following ROIs:

- **Right-of-Way –** the ROW for the 345 kV transmission line is 150 feet wide (75 feet on each side of the anticipated alignment). In some locations, ROW may already exist but could require expansion as described in Section 3.3.2.
- **Route Width –** the route width varies but is most commonly 1,000 feet wide (500 feet on each side of the anticipated alignment). However, Route Segment 17 (Hwy 14 Option) requires variations in the route width to allow for flexibility as the applicant continued ongoing coordination efforts with MnDOT as described in Section 3.3.1. The route width is shown on Map 39.
- **Local vicinity –** within 1,600 feet of the anticipated alignment (in other words - a 3,200-foot-wide buffer area distributed equally on either side of the anticipated alignment)
- **Project area –** within one mile of the anticipated alignment (in other words - a two-mile-wide buffer distributed equally on either side of the anticipated alignment)
- **Six-county area** – term used to collectively describe the six counties in which the project is located (including Blue Earth, Dodge, Goodhue, Olmsted, Steele, and Waseca counties).

Table 7-1 Regions of Influence

Resource Type	Resource Element	Region of Influence
Human settlement	Aesthetics	Local vicinity
	Cultural values	Six-county area
	Displacement	ROW
	Environmental justice	Census Tracts within the route width
	Land use and zoning	ROW
	Noise	Local vicinity
	Property values	Local vicinity
	Recreation	Route width
	Socioeconomics	Six-county area
	Transportation and Public Services	Roadways/rail - Local vicinity/Route Width Public utilities - ROW Emergency Services – Six-county Area Airports – 3.78 miles

Resource Type	Resource Element	Region of Influence
Human health and safety	Electromagnetic fields	ROW
	Implantable medical devices	ROW
	Public and worker safety	ROW
	Stray voltage	ROW
	Induced voltage	ROW
	Electronic interference	ROW
Land-based economies	Agriculture	Route width
	Forestry	Route width
	Mining	Route width
	Tourism	Local vicinity
Archaeological and historic resources	Archaeological and historic resources	Route width
Natural environment	Air quality	Project area
	Climate	Project area
	Geology and topography	Route width
	Greenhouse Gases	ROW
	Groundwater	ROW
	Public and designated lands	ROW
	Rare and unique natural resources	Project area for protected species; route width for sensitive ecological resources
	Soils	ROW
	Surface water	Route width
	Vegetation	ROW
	Wetlands	ROW
	Wildlife and Wildlife Habitat	Route width

7.3 Environmental Setting

Segment 17's project area is dominated by rural and agricultural land use, with concentrated areas of development on the west end of Segment 17 near Mankato and on the east end of Segment 17 near Pine Island (Map 34), along with several municipalities along the route segment. Segment 17 crosses the Straight River and the Middle Fork of the Zumbro River (Map 35). The Minnesota River Valley Scenic Byway is also crossed by Segment 17 near Mankato (Map 36).

The Minnesota Department of Natural Resources (DNR) and the U.S. Fish and Wildlife Service (USFWS) have developed an Ecological Classification System (ECS) for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features (reference (10)). Under this classification system, Segment 17 is in the Eastern Broadleaf Forest Province (Map 37). This section is further divided into subsections including the Big Woods, Oak Savanna, and Rochester Plateau subsections. These subsections are used below to classify the environmental setting of the project.

The Big Woods Subsection is primarily characterized by a loamy mantled end moraine with landscapes consisting of circular, level-topped hills bounded by smooth side slopes. Closed depressions within level areas between hills contain lakes and peat bogs, and drainages are often controlled by lake levels. Underlying bedrock at depths of 100 to 400 feet includes Ordovician and Cambrian sandstone, shale, and dolomite to the south and Cretaceous sandstone and clay to the north. Loamy soils are dominant and are classified primarily as Alfisols, with some Mollisols to the west of the subsection. Oak woodland and maple-basswood forest were the most common presettlement vegetation. Most of the area is farmed at present (reference (11)).

The Oak Savanna Subsection is primarily characterized by rolling plains of loess-mantled ridges over sandstone and carbonate bedrock and till. The boundaries are characterized by end moraines to the west and land dominated by hardwood forests to the east. Topography is gently rolling throughout the subsection and Stagnation moraines with steep slopes in the southwest. Glacial drift is generally less than 100 feet thick, with a maximum thickness of about 200 feet. Soils within this subsection are a combination of Alfisols and Mollisols and include Aquolls, Udolls, Udalfs, and Aqualfs. Presettlement bur oak savanna was the primary vegetation; at present, most of the area is farmed (reference (12))).

The Rochester Plateau Subsection is primarily characterized by level to gently rolling older till plains, overlying dolomite, limestone and sandstone. The boundaries are characterized by end moraines to the west, and by an area of transition between a level to rolling plateau and dissected landscapes to the east. Topography is controlled by underlying glacial till along the western edge. As glacial till thins to the east, topography is largely bedrock controlled. Depth of drift over bedrock varies from 100 to 200 feet in the west to 10 to 100 feet in the east with bedrock exposures common. Loess thickness is variable, ranging from 30 feet thick on broad ridgetops, to less than a foot on valley walls. The predominant soils are Udalfs, with localized Aquents along the floodplains and major rivers. Presettlement tallgrass prairie and bur oak savanna were the primary vegetation; at present, most of the area is farmed (reference (199)).

Segment 17 is in Blue Earth, Waseca, Steele, Dodge, Olmsted, and Goodhue Counties. Major communities nearest to Segment 17 include Mankato to the west, Eagle Lake, Janesville, Waseca, Owatonna, Dodge Center, Kasson, Byron, and Pine Island to the east. Existing transmission lines are scattered throughout the broader area (Map 25). Segment 17 is generally bound by U.S. Highway 169 to the west and U.S. Highway 52 to the east. Except for where it runs directly north/south at its eastern end, Segment 17 is parallel to Highway 14 (Map 5).

7.4 Use or Paralleling of Existing Rights-of-Way

When the Minnesota Public Utilities Commission (Commission) makes a final decision about the route permit and per Minnesota Statute § 216E.03, subpart 7(e), it must make specific findings that it has considered locating a route for a new HVTL along an existing HVTL route or parallel to existing highway right-of-way (ROW), and, to the extent these are not used, the Commission must state the reason(s).

When considering a new HVTL along an existing HVTL route, there is a difference in potential impacts between using ROW for double-circuiting and paralleling existing ROW. Both would present opportunities for combining new ROW with existing ROWs which minimizes fragmentation of the landscape and can minimize human and environmental impacts (e.g., aesthetic and agricultural impacts).

Use of existing ROW for double-circuiting would involve either:

- Expanding the existing ROW and replacing existing transmission line structures (for existing lines of a smaller voltage than 345 kV) with new structures capable of double-circuiting the new 345 kV line.
- Using the existing ROW and placing the new 345 kV line on the existing double-circuit capable poles (for existing 345 kV lines which already have existing double-circuit capable poles present).

Route Segment 17 offers partial opportunity to double-circuit with an existing 345 kV line (Table 7-2). In other areas, Route Segment 17 could be double-circuited with a 115 kV transmission line; this would involve replacing the existing transmission line structures (Section 3.2.1) and expanding the ROW for the existing 115 line to accommodate the project's 345 kV line. Opportunities for use or paralleling existing ROW for double-circuiting are summarized in Table 7-2.

Table 7-2 Route Segment 17 (Hwy 14 Option) and Its Equivalent, Opportunities for Double-Circuiting

	Unit	Route Segment 17 (Hwy 14 Option)
Total Segment Length	Miles	95.2
Double-circuit with existing 115 kV line	Miles (percent)	4.0 (4%)
Double-circuit with existing 345 kV line	Miles (percent)	13.9 (15%)
Total opportunity for double-circuiting	Miles (percent)	17.9 (19%)
Parallels existing transmission line (i.e., not double-circuited but parallel and adjacent to)	Miles (percent)	3.3 (3%)
Double-circuiting or paralleling existing transmission lines (total)	Miles (percent)	21.2 (22%)

Paralleling existing ROW would involve installing the new 345 kV line parallel and adjacent to existing transmission lines or transportation, pipeline, and electrical transmission systems or rights-of-way. As described in Section 3.3.2, the total width of the new ROW required could be reduced from 150 feet where some of the ROW would overlap with existing ROW. Opportunities for paralleling existing ROW, including highway rights-of-way (which is the intent of this alternative as proposed), are further discussed in Section 7.5.1.

7.5 Human Settlements

7.5.1 Aesthetics

The ROI for aesthetics is the local vicinity. Transmission lines alter a viewshed. Because aesthetic impacts are subjective, the potential impacts can vary widely and be unique to each person. Impacts are largely assessed by reviewing the number of nearby residences and opportunities for double-circuiting with an existing transmission line and/or ROW paralleling. Where double-circuiting occurs within Route Segment 17's equivalent, existing transmission line structures would be replaced with larger structures and the ROW would be extended. Determining the relative scenic value or visual importance in any given area is subjective and depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question.

Aesthetic impacts can be minimized by selecting routes that are located away from homes, schools, businesses, and other places where people congregate (for example, parks or other recreation areas). Aesthetic impacts can also be minimized by following existing transmission line ROW where elements of the built environment already define the viewshed and the addition of an additional transmission line would have an incremental impact. Following other infrastructure, such as roads and railroads, would also be expected to reduce potential impacts but not to the same extent.

7.5.1.1 Existing Conditions

The aesthetic and visual resources of a landscape are defined as the existing natural and built features which affect the visual quality and character of an area. A landscape's character is largely influenced by topography, vegetation, water resources, existing development, and infrastructure. Determining the relative scenic value or visual importance in any given area depends, in large part, on the individual viewer, or community of viewers, whose perceptions are shaped by their values and experiential connection to the viewing area, as well as their physical relationship to the view, including distance to structures, perspective, and duration of the view.

Viewer sensitivity is understood as an individual's interest or concern for the quality of a viewshed and varies depending upon the activity viewers are engaged in, their values and expectations related to the viewshed, and their level of concern for potential changes to the viewshed. High viewer sensitivity is generally associated with individuals engaged in recreational activities; traveling to scenic sites for pleasure and to or from recreational, protected, natural, cultural, or historic areas; or experiencing viewsheds from resorts, roadside pull-outs, or residences. Residents have a higher sensitivity to potential aesthetic impacts than temporary observers. Low viewer sensitivity is generally associated with individuals commuting, working, or passing through an area.

For the purpose of this document, it is assumed that landscapes which are, for the average person, harmonious in form and use are generally perceived as having greater aesthetic value. Infrastructure which is not harmonious with a landscape or affects existing landscape features reflects a change in the aesthetic view that for some, or many, could negatively affect a viewer's perception and expectation of the area. Assessing visual quality reflects the difference between the landscape change and the individual or communal reaction to that change. As noted above, individual or communal perspectives are complex, affected by individual or shared values and experiences with the land. As such, some viewers could perceive the project setting as having high visual quality while others might perceive the area to have less visual quality. Perceived aesthetics can carry more weight when they are tied to a specific feature, like residential properties, scenic byways, or historic/archaeological/natural features. This is a key reason among those that prefer to co-locate new infrastructure among the built environment (utility ROWs, road, railways, pipelines).

The topography of Route Segment 17 is generally level to moderately rolling. Route Segment 17 is primarily agricultural (70 percent) and developed (20 percent), with small amounts of area that are barren, forested, and herbaceous.

There are several municipalities near Route Segment 17. Route Segment 17 begins in the city of Mankato, traveling south until it crosses US Highway 14 and turns east. It then follows US Highway 14, going through the cities of Eagle Lake, Janesville, Waseca, Owatonna, Claremont, Dodge Center, and Kasson. It then turns north just west of the city of Byron. There are also other recreational features that influence the visual character and enjoyment of these areas, like parks and trails. There are no wind or solar farms in the local vicinity of Route Segment 17.

The route width of Route Segment 17 contains existing infrastructure, most notably road right-of-way, but also some electric transmission lines (Map 38). The existing transmission structures within Route Segment 17's ROI generally range in height from 45 to 175 feet, depending on the size of the existing line.

- Where existing transmission lines are 115 kV, the structures are typically 55 to 95 feet tall.
- Where existing transmission lines are 345 kV, the structures are typically 85 to 175 feet.

Certain landscape areas have higher aesthetic value due to their scenic qualities. These areas could include scenic byways, recreation areas, and river crossings. Route Segment 17 would cross the Minnesota River Valley Scenic Byway, which is a public roadway in an area of regionally significant scenic, natural, recreational, cultural, historic, or archaeological resources. Route Segment 17 would cross the scenic byway just east of the Wilmarth Substation (Map 36-1). Route Segment 17 would cross the Straight River (Map 36-4 and Map 36-5) and Zumbro River (Map 36-7, Map 36-8, and Map 36-9), which are state water trails.

7.5.1.2 Potential Impacts

The project's HVTL structures and conductors would create aesthetic impacts. The ROI for aesthetic impacts is the local vicinity. The new 345 kV transmission line structures would range in height from 85 to 175 feet. Aesthetic impacts would also include clearing existing woody vegetation and creating a new fragmented landscape and/or expanding the fragmented landscape with the expansion of the existing ROW. The degree of impacts depends in large part on opportunities to share or parallel existing ROW and the magnitude of viewer sensitivity.

Paralleling and/or sharing other types of existing ROW would have an incremental impact relative to existing horizontal elements, such as existing transmission lines, highways, county roads, and/or railroads (collectively referred to as "existing infrastructure"). In some cases, portions of a route segment could parallel ROW with more than one of these existing features at the same time (e.g., be sharing or paralleling transmission line and be paralleling road ROW). Map 5 illustrates where ROW paralleling occurs and shows existing infrastructure. Where subparts parallel more than one existing type of infrastructure, precedence is given to showing where the alternative could be double-circuited or paralleling an existing transmission line over showing it paralleling existing road ROW.

As shown in Table 7-3, Route Segment 17 would primarily follow existing infrastructure (86 percent of its length). Route Segment 17 would not follow either existing infrastructure or follow division lines for six miles.

Table 7-3 Route Segment 17 (Hwy 14 Option) and Its Equivalent, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

	Route Segment 17 (Hwy 14 Option) (95.2 mi total)	
Double-circuited with or paralleling existing transmission lines	21.2 mi	22%
Follows existing roads	67.3 mi	71%
Follows existing railroads	8.2 mi	9%
Follows existing infrastructure (transmission lines, roads, and railroads)	81.5 mi	86%
Follows division lines (field, parcel, and section lines)	81.4 mi	86%
Total ROW paralleling	89.1 mi	94%
Total length that does not follow existing infrastructure or division lines	6.0 mi	6%

[1] Total ROW paralleling represents the total length of the segment that either parallels existing infrastructure (transmission lines, roads, and railroads) *or* follows division lines (field, parcel, and section lines). Some parts of a segment fall into both categories but are not double-counted in this total.

For nearly a quarter of Route Segment 17, aesthetic impacts would be diminished because the existing infrastructure (existing transmission lines or highway) is already a part of the aesthetic area. Aesthetic impacts would include removal of existing structures and installation of the larger structures (Section 3.2.1). The increased structure height (typically 85 to 175 feet) for the new structures could be 130 feet taller than the existing structures (ranging from 45 to 120 feet, Section 7.5.1). Impacts due to taller structures would be localized to the far western end. Where Route Segment 17 could be double-circuited with an existing 345 kV line, existing structures would be used (Table 7-3). In some cases, existing structures are wood and would be replaced with steel structures. Impacts for double-circuited areas would also include vegetation clearing to accommodate the expansion of the ROW width (Section 3.3.2 Right of Way). In some cases, the aesthetic impacts could be shifted from one side of a road to another. For example, if the existing transmission line is on the north side of the road and the final alignment for the project is on the south side of the road, aesthetic impacts would be shifted.

In addition to opportunities to share or parallel existing ROW, the degree of aesthetic impacts would also be dependent on the magnitude of viewer sensitivity and exposure. Visual impacts are expected to be minimal for those with low viewer sensitivity, such as people traveling to and from work. For those with high viewer sensitivity, for example, neighboring landowners or recreationalists, visual impacts are anticipated to be moderate to significant. Viewer exposure refers to variables associated with observing a viewshed, and can include the number of viewers, frequency and duration of views, and view location. Viewer exposure would typically be highest for views experienced by high numbers of people, frequently, and for long periods. To the extent these impacts can be quantified depends on the presence of several on-the-ground factors linked to the concepts of viewer quality, sensitivity, and exposure. These factors include:

- Proximity to residences, schools, churches, etc., where relatively more observers are present to experience aesthetic impacts;
- Views valued by the public at large, for example, scenic overlooks or scenic byways; or
- Locations where people recreate or otherwise enjoy leisure activities.

Appendix G summarizes human settlement features in the local vicinity of the route segments. The proximity of residential structures (homes, daycares, and nursing homes) and non-residential structures (for example, agricultural buildings and sheds) to Route Segment 17 is summarized in Table 7-4.

Table 7-4 Route Segment 17, Proximity of Residential Structures

	Route Segment 17 (Hwy 14 Option)	
	Residential Structures	Non-Residential Structures
Within 0-75 feet (150-ft ROW)	4	9
Within 75-250 feet	19	53
Within 250-500 feet (route width)	172	295
Within 500-1,600 feet (local vicinity)	59	412

Recreational resources are also considered in the aesthetic impacts analysis in that they might include certain landscapes with higher aesthetic value due to their scenic qualities and could also have the potential for higher viewer sensitivity, especially if people are expected to congregate in recreational areas. Recreationalists subject to potential impacts in Route Segment 17's ROI would include travelers on the Minnesota River Valley Scenic Byway and users of the state water trails. The aesthetic impacts to the Minnesota River Valley Scenic Byway would be minimal for the byway, given the existing transmission lines and adjacent existing development (Map 36-1).

Route Segment 17 crosses two state water trails, the Straight River and the Zumbro River (Map 36). The Straight River would be crossed where Highway 14 goes along the Southern Edge of Owatonna. There are no existing transmission lines at the crossing, and it would be by a railroad and road surrounded by agricultural and forested land. The Zumbro River would be crossed three times, on the easternmost portion of the segment. At each of these three crossings, there are existing transmission lines.

7.5.1.3 Mitigation

The primary strategy for minimizing aesthetic impacts is prudent routing—that is, choosing routes where an HVTL is most harmonious with the landscape. This could include:

- Maximizing ROW sharing and/or paralleling with existing linear rights-of-way (for example, transmission lines, roadways, and railroads) to minimize incremental aesthetic impacts.
- Minimizing the magnitude of viewer exposure (for example, locating the transmission line away from residences or areas where people congregate).
- Avoiding routing through areas with high-quality, distinctive viewsheds.
- Crossing rivers and streams using the shortest distance possible (that is, perpendicular to the waterbody).
- Reducing structure heights to minimize impacts within scenic areas.
- Using structures and structure designs that minimize impacts.

In the joint certificate of need application and route permit application, the applicant committed to minimizing aesthetic impacts by avoiding removal of trees where possible, spanning natural areas when feasible, and by using existing infrastructure and roadway or transmission facility rights-of-way to the maximum practicable extent.

The sample route permit (Section 5.3.7 of Appendix H) contains the following mitigation related to aesthetics:

- "The Permittee shall consider input pertaining to visual impacts from landowners or land management agencies prior to final location of structures, rights-of-way, and other areas with the potential for visual disturbance."
- "The Permittee shall use care to preserve the natural landscape, minimize tree removal and prevent any unnecessary destruction of the natural surroundings in the vicinity of the Transmission Facility during construction and maintenance."
- "The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads."

- "The Permittee shall place structures at a distance, consistent with sound engineering principles and system reliability criteria, from intersecting roads, highways, or trail crossings."

Other minimization and mitigation measures could include:

- Placing structures to take advantage of existing natural screening to reduce the view of the line from nearby residences and roadways.
- Including specific conditions in individual easement agreements with landowners along the route (for example, requiring new plantings or landscaping).
- Using the protections of Minnesota Statute § 216E.12, subdivision 4 (commonly known as the "Buy the Farm" statute), where available, to move residents away from potential aesthetic impacts.

7.5.2 Cultural Values

The ROI for cultural values is the project area. Impacts associated with rural character and sense of place are expected to be dependent on the individual. These impacts would be localized, short- and long-term, but might diminish over time. Impacts to community unity are not anticipated to occur. Impacts are minimal and unavoidable.

7.5.2.1 Existing Conditions

Cultural values are those community beliefs and attitudes which provide a framework for community unity and animate community actions. Cultural values can be informed by history and heritage, local resources, economy, local and community events, and common experiences. The project traverses land that has been home to a variety of persons and cultures over time.

The project area was populated primarily by Dakota and Ojibwe tribes in the early to mid-1800s. Most lands in the local vicinity of the project were ceded to the U.S. government during the 1851 treaty. Existing conditions are discussed for both the pre-contact period (prior to European settlement of the project area) and the post-contact period.

Route Segment 17 would go through Blue Earth, Waseca, Steele, Dodge, Olmsted, and Goodhue counties in the southcentral/southeastern region of Minnesota, and is generally classified as Southern Minnesota. Southern Minnesota is known for its vast prairie landscapes (reference (211)). It is a national leader in agricultural production and renewable energy (reference (19)).

Segment 17 is primarily in a rural setting, where corn and soybean crop production, livestock operations, and associated industries drive the local agricultural economies. Protection of the land and ability to continue to farm are strong values in farming and agricultural communities.

Segment 17 starts in Blue Earth County in the city of Mankato. Mankato is the largest city in Blue Earth County and the county seat. Minnesota State University, Mankato is in Blue Earth County and offers four-year bachelor's degree programs and graduate programs. Blue Earth County has diverse employment with approximately 30% of the working population contributing to education, health, and social services, followed by 17% supporting retail trade, and 13% supporting the manufacturing industry (reference (212)). The County offers several community events throughout the year, including city-wide garage sales and the Blue Earth County Fair. Sporting events and performances are held at the Mayo Clinic Health System Event Center.

Waseca County, east of Blue Earth County, is primarily rural with agriculture as the primary land use. The county seat is the city of Waseca, which is located along Segment 17. Employment within the county consists of 22% contributing to education, health care, and social assistance, 22% to manufacturing, and 12% to retail trade (reference (213))). Waseca County offers outdoor recreation activities at Clear Lake, near the city of Waseca. There are also community events throughout the year, one of which is an interpretive exhibit located near the city of Waseca. Farmamerica is a hands-on center that allows students and families an opportunity to learn more about the rich agricultural history. Visitors can interact with interpretive exhibits, farm animals, and learn about crop research plots at the site. The goal of the education center is to provide all residents and visitors the opportunity to explore the evolution of agriculture in Minnesota with hands-on education, partnerships, and community engagement (reference (214)). The city of Waseca hosts events throughout the year, like the Sleigh and Cutter Festival, Lakefest Music Festival, Waseca County Fair, and Sinister Forest (reference (31)).

Steele County, located east of Waseca County in Southern Minnesota, has a similar landscape to Waseca County. Owatonna is the county seat and the most populous town in the county. The top employment industries in the county are manufacturing (21%), education, health care and social assistance (20%), and retail trade (12%) (reference (215)). Steele County is home to the Orphanage Museum and the Village of Yesteryear. The Orphanage Museum is in Owatonna and was a place for orphaned, abandoned, and abused children in Minnesota. The Village of Yesteryear is also in Owatonna and provides a glimpse into the 1800s. There are other events and attractions throughout Steele County, which include the historic downtown district in Owatonna, Cold and Bold Winter Festival, Extravaganza at Village of Yesteryear, and Steele County Fair.

Dodge County is along the same transect as Waseca and Steele Counties in Minnesota. The largest town in the county is Kasson, and the county seat is Mantorville. The county's top employment industries include education, health care and social assistance (36%), manufacturing (13%), and construction (9%) (reference (216)).

Olmsted County is the last county along the west–east transect for Segment 17. The county is home to Rochester, the third largest city in Minnesota, and is unique considering the relative urban-rural divide surrounding the city. The county's employment industries are heavily focused on education, health care, and social assistance, which make up 50% of the total employment (reference (217)). The Mayo Clinic is in Rochester and offers three health care campuses and an academic medical center.

The final county for Segment 17 is Goodhue County. The county seat and most populous town is Red Wing. The employment industry consists of education, health care, and social assistance (27%), manufacturing (15%), and retail trade (9%) (reference (218)). The communities in Goodhue County offer arts and entertainment events, museums featuring local history, and outdoor recreation activities, including canoeing the Cannon River, golfing, or fishing on the Mississippi River.

7.5.2.2 Potential Impacts

Lands within the local vicinity of the project were ceded to the U.S. government over the course of the 1851 treaty. The 1851 treaty gave its members usufructuary rights to hunt, fish, and gather on the ceded land in the treaty. While there are no wild rice lakes within one mile of the anticipated route, there are wild rice lakes within Waseca, Steele, and Blue Earth counties. (reference (219)). Best management practices (BMPs) during construction would be used to avoid degradation of water quality. While construction has the potential to occur during wild rice harvesting season, direct impacts to the production and harvest of this culturally important food are not anticipated. The project would not interfere with ongoing treaty rights to hunt and fish.

Transmission line and substation projects have the potential to impact community and regional events during construction, primarily due to the presence of equipment and supplies on local roadways and potential temporary road closures or detours. Impacts would be minor and temporary if they occur.

Impacts associated with rural character and sense of place are expected to depend on the individual. For some residents, constructing the project might change their perception of the area's character, thus potentially eroding their sense of place. This tension between infrastructure projects and rural character creates real tradeoffs. The anticipated route will follow US Highway 14 for several miles. The route deviates from the highway near Owatonna, Claremont, Dodge Center, and Kasson. For those residents that place a high value on rural character and a sense of place, impacts are anticipated to be moderate to significant. These impacts would be localized, short- and long-term, but might diminish over time depending on the individual.

7.5.2.3 Mitigation

There are no conditions included in the sample route permit that directly mitigate impacts to cultural values, sense of place, or community unity. Impacts could be minimized by sharing or paralleling existing ROW as it would minimize new routes across the landscape.

Impacts are unavoidable, and the applicant would continue to coordinate with potentially affected parties if further mitigation is requested.

7.5.3 Displacement

The ROI for displacement is the anticipated ROW. Displacement occurs when a residence or building is required to be removed for construction of the project. Residential buildings within the ROI could require removal, whereas non-residential buildings could more likely stay within the ROI if the activities taking place in these buildings are compatible with the safe operation of the line.

Potential displacement impacts are assessed by identification of buildings within the ROW which is based on the anticipated alignment. If buildings are located within the ROW, they could be subject to displacement depending upon site-specific considerations and coordination with the applicant.

7.5.3.1 Existing Conditions

Displacement is the removal of a residence or building to facilitate the operation of a transmission line. For electrical safety code and maintenance reasons, utilities generally do not allow residences or other buildings within the ROW of a transmission line. Any residences or other buildings within a proposed ROW have the potential to be removed or displaced. Displacements are relatively rare and more likely to occur in highly populated areas where avoiding all residences and businesses is not feasible.

There are no daycares, hospitals, schools, or nursing homes within the ROW of Route Segment 17. There is one church, Countryside Church, within the ROW of Route Segment 17. It is located just south of Owatonna, where the route begins to parallel SW 28th Street.

There are four residential structures within the ROW near the intersection of Minnesota Highway 22 and US Highway 14. The 4 residential structures within Route Segment 17 include structures that are a part of the Woodside Apartment Complex (Map 39-2).

There would be nine non-residential structures (for example, agricultural outbuildings or animal production structures) within the ROI of Route Segment 17.

7.5.3.2 Potential Impacts

Route Segment 17's ROW includes four residences. The applicant noted in Appendix E that if a residence is identified within the permitted route and within the required transmission line ROW, Xcel Energy would revise the alignment to avoid such impact and avoid displacement.

Non-residential structures within the ROW could be displaced by the project. Though the general rule is that buildings are not allowed within the ROW of the transmission line, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line. This is determined on a case-by-case basis.

7.5.3.3 Mitigation

The sample route permit (Section 5.3.7 of Appendix H) does not have specific statements on displacement. In the aesthetic requirements it states: "The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads."

In the safety codes and design requirements it states: "The Permittee shall design the transmission line and associated facilities to meet or exceed all relevant local and state codes, the National Electric Safety Code, and North American Electric Reliability Corporation (NERC) requirements. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, strength of materials, clearances over roadways, ROW widths, and permit requirements."

Displacement of residential and non-residential structures can be avoided by adjusting the placement of transmission line structures, using specialty structures, increasing structure height, or by modifying the ROW location or width. The applicant would work with landowners on a case-by-case basis to address potential displacement. The applicant might need to conduct a site-specific analysis to determine if the building would need to be displaced. Building owners would be compensated by the applicant for any buildings that are displaced.

7.5.4 Environmental Justice

The ROI for environmental justice (EJ) includes the census tracts that intersect the route width. Potential EJ impacts are assessed by first identifying if any census tracts meet a definition of an EJ area per its socioeconomical information. Second, census tracts meeting an EJ definition are reviewed to consider if those residents might be disproportionally affected. The project would not result in disproportionate adverse impacts to the EJ areas of concern within the ROI. Therefore, impacts are anticipated to be minimal.

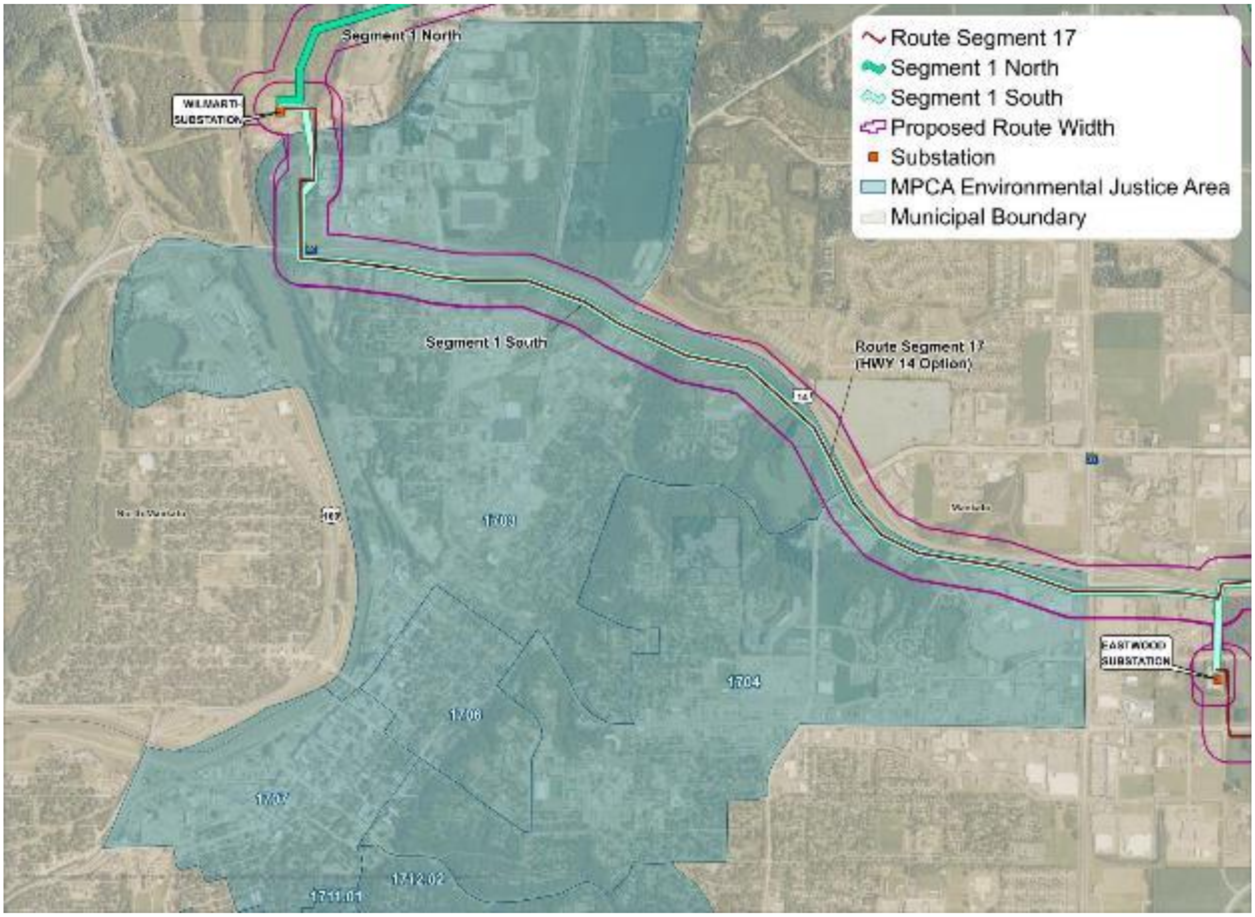
7.5.4.1 Existing Conditions

The Minnesota Pollution Control Agency's (MPCA's) EJ Proximity Analysis tool is an online mapping tool that uses census data to identify areas for meaningful community engagement and additional evaluation for disproportionate effects from pollution (reference (35)). The tool identifies EJ areas of concern using the following four criteria, which aligns with the definition of an environmental justice area in Minnesota Statutes § 216B.1691, subdivision 1(e):

1. 40 percent or more of the area's total population is nonwhite
2. 35 percent or more of households in the area have an income that is at or below 200 percent of the federal poverty level
3. 40 percent or more of the area's residents over the age of five have limited English proficiency
4. The area is located within Indian country, as defined in United States Code, title 18, section 1151

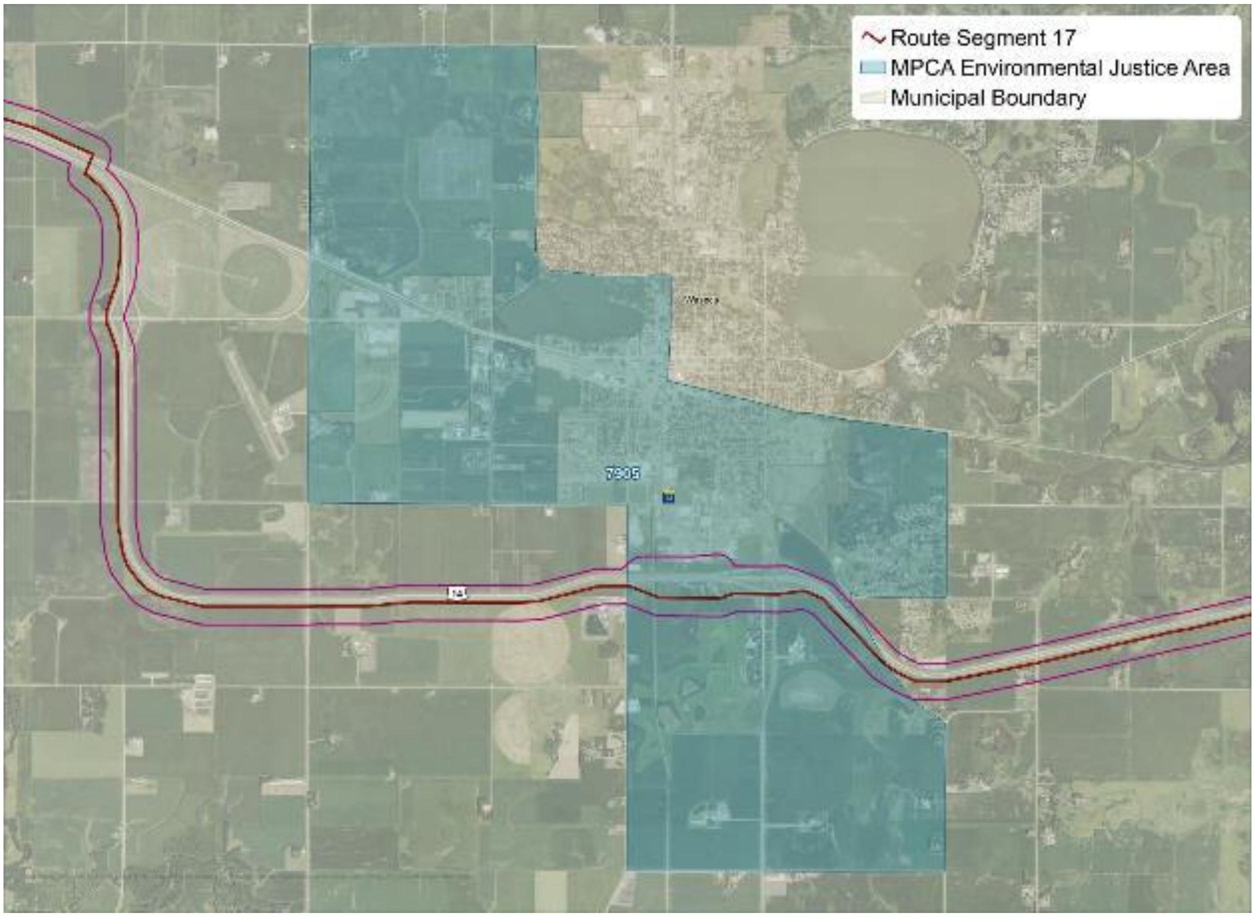
Using the above criteria, Census Tracts 1703 and 1704 (Figure 6-2) in Blue Earth County were identified as an EJ area of concern within the ROI because around 39 percent and 36 percent of the population, respectively, have a reported income that is less than 200 percent of the federal poverty level.

Figure 7-1 Census Tracts 1703 and 1704 EJ Areas of Concern



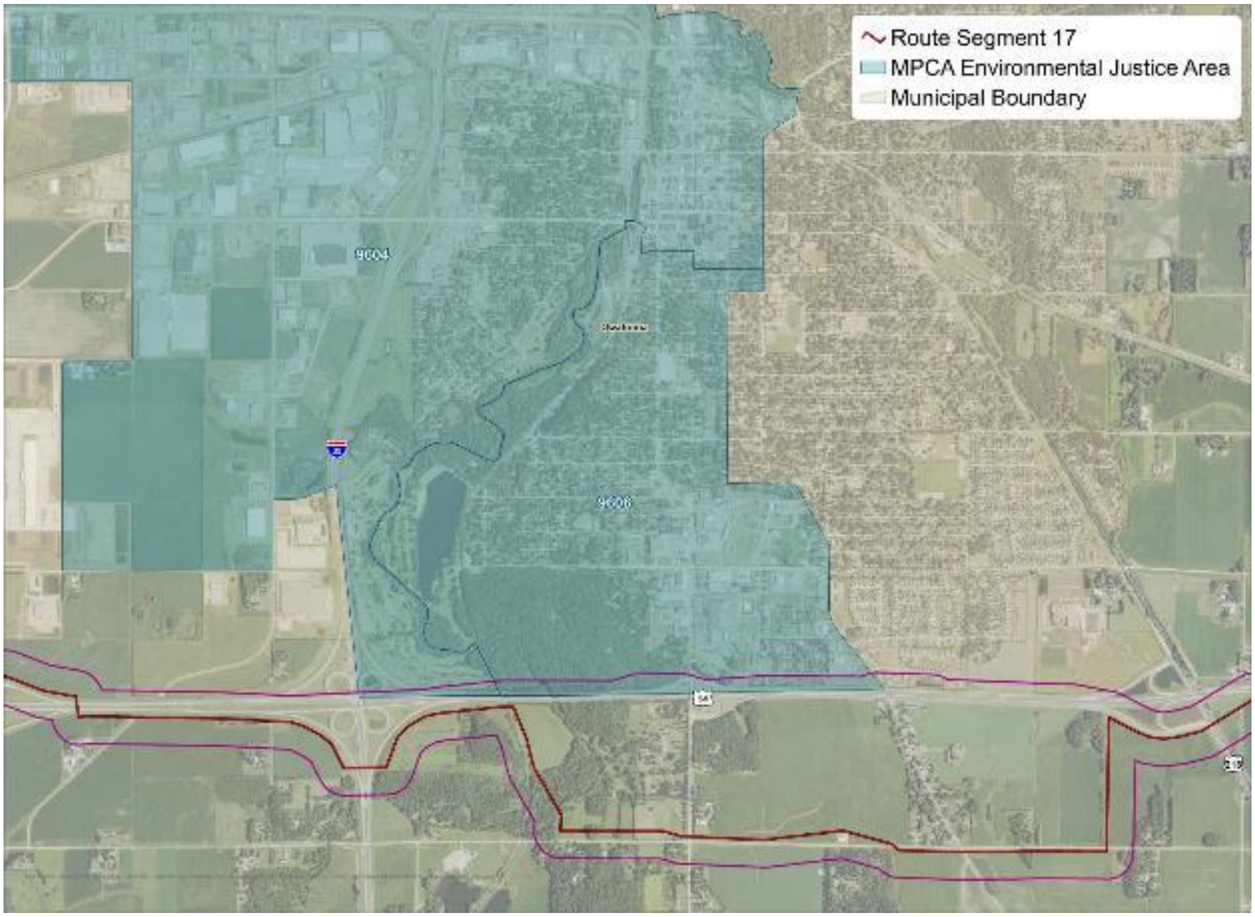
Census Tract 7905 in Waseca County (Figure 7-2) was identified as an EJ area of concern, because around 44 percent of the population reported their income as less than 200 percent of the federal poverty level.

Figure 7-2 Census Tract 7905 EJ Area of Concern



Census Tracts 9604 and 9606 in Steele County are shown in Figure 7-3. Census Tract 9604 was identified as an EJ area of concern because around 41 percent of the population reported their income as less than than 200 percent of the federal poverty level. Census Tract 9606 was identified as an EJ area of concern because around 38 percent of the population reported their income as less than 200 percent of the federal poverty level.

Figure 7-3 Census Tracts 9604 and 9606 EJ Areas of Concern



7.5.4.2 Potential Impacts

Disproportionate impacts to Census Tracts 1703, 1704, 7905, 9604, 9606 would not be anticipated. The HVTL could be double-circuited with an existing transmission line in Census Tracts 1703 and 1704. The HVTL would not be double-circuited with the existing transmission line within Census Tracts 7905, 9604, and 9606.

7.5.4.3 Mitigation

As described in Section 2.4.2, several public meetings have been held in the counties the project crosses. There are upcoming meetings scheduled to occur throughout the process. The applicant initiated an outreach campaign in 2023 to Tribal contacts and federal, state, and local agencies through in-person meetings and project notification letters. The applicant met with tribal government contacts and state and local agencies as part of the outreach program for the project.

Meetings that were held near the EJ areas of concern included a scoping meeting held on July 8, 2024, in Mankato, which is within census tracts 1703 and 1704. Scoping meetings were not held in Waseca County near Census Tract 7905 or Steele County near Census Tracts 9604 and 9606 because Route Segment 17 is an alternative that was proposed during scoping, and therefore wasn't a planned alternative prior to the scoping meetings. Potentially newly affected landowners received mailings in December 2024 notifying them of the project and were invited to participate in the process of the draft EIS comment period and in future public hearings.

No EJ impacts are anticipated; therefore, no additional mitigation outside of the resource-specific mitigation outlined above is proposed at this time.

7.5.5 Land Use and Zoning

The ROI for land use and zoning is the ROW. If a route permit is issued, it would supersede and preempt zoning restrictions, building, or land use rules. However, to assess human settlement impacts, potential land use and zoning impacts are addressed by evaluating the project against local land use and zoning ordinances. Impacts to planning and zoning are anticipated to be minimal and can be avoided through selection of alternatives.

7.5.5.1 Existing Conditions

Minnesota authorizes counties and cities to create their own zoning ordinances to implement and work in conjunction with their comprehensive plans. Zoning is a method to regulate the way land is used and create patterns in the way they are used. Zoning is a regulatory device used by local governments to geographically restrict or promote certain types of land uses. Minnesota Statutes provide local governments with zoning authority to promote public health and general welfare.

This project is subject to Minnesota's Power Plant Siting Act (Minnesota Statute § 216E.10). Under this Statute, the route permit issued for a transmission line "shall be the sole site or route approval required to be obtained by the utility. Such permit shall supersede and preempt zoning restrictions, building or land use rules, regulations or ordinances promulgated by regional, county, local and special purpose government." Therefore, the applicant is not required to seek permits or variances from local governments to comply with applicable zoning codes. Nonetheless, impacts to local zoning can clearly impact human settlements, and the Commission considers impacts to human settlements as a factor in selecting transmission line routes.

Publicly available zoning information was reviewed for each county and municipality crossed by the route alternatives. Route Segment 17 has six counties within its ROI, including: Blue Earth, Waseca, Steele, Dodge, Olmsted, and Goodhue. Map 40 shows the zoning district data that was gathered for the project.

7.5.5.1.1 Blue Earth County Plan and Ordinances Analyses

The Blue Earth County Land Use Plan was adopted in 2018. The plan states that the county's vision is to "continue to provide a high quality of life for its residents, from agricultural production to urban living. A focus on agricultural preservation, natural resource protection, recreational opportunities, and well-planned growth throughout the county will preserve and secure diverse quality-of-life options for residents" (reference (36)). The Blue Earth County Code of Ordinance was last updated in January of 2024. The zoning districts in Blue Earth County include agriculture, conservation, rural residence, rural townsite, general business, highway business, light industry, heavy industry, shoreland, planned unit development, urban fringe overlay, and orderly annexation areas (reference (37)). While following U.S. Highway 14, Route Segment 17 crosses through the cities of Mankato and Eagle Lake in Blue Earth County.

The city of Mankato is the largest city in the county, comprising around 65 percent of the population of the county. The city's goal, stated in the Land Use Plan (reference (38)), is to promote orderly growth and preserve natural areas. The Mankato City Code (reference (39)) details the zoning districts in the city, which include the residential, institutional overlay, mobile home overlay, office, business, and industrial districts.

The city of Eagle Lake's population, while just above 3,000, has been steadily growing over the past several years. The City of Eagle Lake Strategic Economic Development Plan helps to guide the city with "specific implementation components that can strengthen the local economy and guide economic development efforts toward long-term sustainability. (reference (220))" Eagle Lake's City Code details the zoning districts in the city, which include the agricultural, residential, residential transition, business, and industrial districts (reference (221)).

7.5.5.1.2 Waseca County Plan Analysis

The Waseca County Comprehensive Plan: Charting a Course for the Next 20 Years, was adopted in 2005. The plan states four key principles: strategic vision for change, community-based partnerships, sustainable community development, and economic opportunity. They also have ten vision statements that guide the plan. There are vision statements for the following categories: infrastructure, transportation, sustainable agriculture, technology, population growth, integrated services, economic, multicultural, education, positive (reference (47)). The Waseca County Unified Development Code (UDC) was adopted in August of 2009. The zoning districts within the county include agricultural protection, limited residential, urban expansion, village mixed use, highway commercial, agricultural interpretive center, and general industrial. There are several overlay districts, which include the Highway 14 overlay, shoreland overlay, floodplain overlay, and airport overlay (reference (48)). Through Waseca County, Route Segment 17 crosses through the boundaries of the cities of Janesville and Waseca.

The city of Waseca's Community Vision and Strategic Action Plan (reference (222)) was created to better unify and coordinate efforts between organizations and agencies within Waseca for a shared vision. This shared vision and the implementation actions stated in the plan are meant to give a "coherent voice to the aspirations of the community for the future (reference (222))." The Waseca Land Usage Regulations (reference (223)) chapter on zoning details the districts within the city, which include varying residential, commercial, and industrial districts. As well as floodplain management overlay, shoreland overlay, and heritage preservation overlay districts.

7.5.5.1.3 Steele County Plan Analysis

The Steele County Comprehensive Land Use Plan was adopted in 2007 (reference (224)). The plan is used as an objective study of Steele County to guide future decision-making as it relates to land use. The overall goal of the plan is to guide the growth and development of Steele County, in order to: protect, preserve, and enhance the natural environment in conjunction with development; make the most efficient and economical use of public funds and investments; and protect and preserve agricultural lands. The Steele County Zoning Ordinance (reference (225)) provides the purpose, uses, and standards for the zoning districts within the county. The zoning districts within Steele County include agricultural, interim agricultural, conservation, single-family residential, high-density residential, general business, and shoreland overlay districts. The project goes through mainly agriculturally zoned districts, with some rural residentially zoned areas. Route Segment 17 also travels along the southern municipal boundary of the city of Owatonna within Steele County.

The city of Owatonna's 2050 Comprehensive Plan's purpose is to act as both a "pragmatic, step-by-step action plan intended to accomplish specific outcomes and an aspirational vision for the community's future (reference (226))." The city of Owatonna's Code of Ordinances (reference (227)) provides information on the zoning districts, which include residential, business, industrial, agriculture-open space, floodplain, and planned unit development.

7.5.5.1.4 Dodge County Plan Analysis

The Dodge County Comprehensive Plan was adopted in 2019 (reference (228)). The plan states that it is guidance for Dodge County to take advantage of its dynamic growth opportunities, while also preserving its rural county areas. The Dodge County Zoning Ordinance (reference (229)) includes provisions for the following zoning districts: hamlet, agricultural, closed landfill restricted, urban expansion, rural residential, commercial, industrial, shoreland overlay, and floodplain overlay. The project goes through mainly agriculturally zoned areas through the county, with some residential, industrial, and shoreland overlay zoning districts. The project goes through urban expansion districts near the cities of Dodge Center and Kasson.

The city of Dodge Center's Comprehensive Land Use Plan was adopted in 2020 (reference (230)). The plan's purpose is to help guide continued growth and development through consistency and with the mindset of planning for the future. The city of Dodge Center's city code (reference (231)) details the zoning districts within the city, which include agricultural, residential, commercial, industrial, and shoreland districts.

The city of Kasson is the largest city in Dodge County. The Comprehensive Plan (Kasson Upward 2040) was adopted in 2018 (reference (232)) and is an expression of the community's vision for the future and a strategic map to reach that vision. The city of Kasson's vision statement in the plan states that "in 2040, Kasson will be a welcoming community that builds upon and preserves its small town identity while looking towards the future: innovating, collaborating, revitalizing, growing responsibly, adapting to change, and building a vibrant community." The Code of Ordinances (reference (233)) details the zoning districts in the city. The districts include residential, commercial, industrial, development holding, planned unit development, and floodway districts.

7.5.5.1.5 Olmsted County Plan Analysis

The Olmsted County General Land Use Plan was adopted in 2022 (reference (234)). The plan includes land use policies that help to define the community's vision of "how, when, and where growth, redevelopment, and preservation should occur throughout the county (reference (234))." The Olmsted County Zoning Ordinance (reference (235)) was last updated in 2024. The zoning districts that are outlined in the ordinance are as follows: agricultural protection, agricultural, agricultural urban expansion, agricultural/resource commercial district – aggregate extraction and reuse, agricultural/resource commercial district – land intensive low impact uses, agricultural residential cluster, rural service center, rural residential, low density residential, mixed low density residential, recreational commercial, commercial service, highway commercial, industrial, medical institutional. The project goes through primarily agricultural areas, with some other smaller areas like residential and commercial zoning districts when going through the city of Byron.

The city of Byron 2040 Comprehensive Plan (reference (236)) was adopted in 2022. The city promotes the principles of community, active living, complete streets, sustainability, and energy conservation throughout their plan. The plan reflects Byron's vision for growth, while maintaining its small town feel and identity, among other goals. The Byron Code of Ordinances (reference (237)) details the zoning districts. The districts include the residential, commercial, industrial, and agricultural districts as well as the greenway overlay, planned unit development, and flood prone area districts.

7.5.5.1.6 Goodhue County Plan Analysis

The Goodhue County 2016-2040 Comprehensive Plan provides general guidelines to help manage growth and land use changes, and to promote sound management of the land and water resources within the County (reference (204)). The county's shared vision includes planning for stability and modest growth, being aware of continued conversion of agricultural land to rural housing, and environmental challenges associated with intense land uses and water resources. The Goodhue County Zoning Ordinance includes provisions for the following zoning districts: agricultural, agricultural protection, urban fringe, suburban residence, mixed use hamlet, business industry, wild and scenic river, commercial recreational, floodplains, parks and trails, and conservation subdivision (reference (205)). The project goes through agriculturally zoned districts in the county. It also passes through the city of Pine Island in Goodhue County, where it travels through mainly the agricultural district.

The city of Pine Island's 2045 Comprehensive Plan (reference (238)) was last revised in January of 2025. The vision statement in the plan states that the city "is committed to working together for a better tomorrow by strategically planning for the future, providing amenities that support a high quality of life for all, and strengthening our community identity." The Pine Island City Code and Ordinance (reference (239)) details the zoning districts. The districts include the agricultural, residential, future expansion, commercial, industrial, business park, recreational, public/institutional, and parks and open space districts.

7.5.5.2 Potential Impacts

Transmission line and substation projects have the potential to be incompatible with existing land use patterns, local zoning requirements, and the future land use planning of local governments. Construction and operation of the project is not expected to have significant impact on land use within the counties crossed by the route alternatives.

Existing land uses along the HVTL would experience short-term impacts during the period of construction. When transmission line construction is complete, project workspaces would be restored as described in Section 3.4.5. Land uses which are consistent with the safe and reliable operation of the project would be allowed to continue as before.

The project crosses mostly agricultural areas within the ROI of Blue Earth County (around 58 percent), Waseca County (around 73 percent), Steele County (around 97 percent), Dodge County (around 82 percent), Olmsted County (around 98 percent), and Goodhue County (around 99 percent). Transmission lines and substations are typically either permitted or conditional use in areas zoned as agricultural, and transmission lines and substations currently exist in some of these areas.

The project passes through scenic river, shoreland, and floodplain management districts throughout the counties. Minnesota Statute § 103F defines protection of water resources, including floodplain management, wild and scenic rivers, and shoreland areas, and describes limitations on uses and locations of structures in those areas. These limitations are established through special land use provisions to maintain and restore the natural beauty and attractiveness of shoreland and to provide environmental protection for the water resources. These overlay districts were established to protect and enhance shoreland and floodplain areas by establishing additional restrictions and requirements for development and use of these resources. Currently, construction details for the project and exact locations of structures and associated facilities are not known. The project would be designed to span waterbodies and floodplains where practicable and to minimize the number of structures in surface water resources where these resources cannot be spanned. Furthermore, no impacts to the overall function of watersheds are expected. Any impacts that might occur from installation of structure foundations would be minimal and localized. The placement of transmission line structures in floodplains is not anticipated to alter the flood storage capacity of the floodplain based on the minimal size of individual transmission line structures.

A few smaller pockets of commercial and industrial zoning areas are crossed by the project, in particular where the project routes near municipalities. Transmission lines and substations are typically either permitted as conditional use in areas zoned as industrial or commercial because these facilities are similar to other infrastructure in industrial and commercial areas.

Based on review of the zoning information for the counties crossed, there is a likelihood of future residential, commercial, or industrial development along U.S. Highway 14, as it connects numerous smaller and larger cities together. Future development would be most likely in or near the incorporated areas along Route Segment 17 where it follows U.S. Highway 14. Many of the cities, like Dodge Center, Kasson, and Byron, have made clear that one of their priorities is to manage their growth and development.

Route Segment 17 would impact the urban expansion districts near the cities of Dodge Center and Kasson in Dodge County, where municipal growth is anticipated. Elsewhere, the project is not anticipated to be inconsistent with authorized uses within the affected zoning districts crossed by any route alternative or be incompatible with future land use planning goals of local governments.

7.5.5.3 Mitigation

The sample route permit does not include mitigation measures specific to land use and zoning. Section 1.1 of Appendix H states: "Pursuant to Minn. Stat. § 216E.10, this route permit shall be the sole route approval required for construction of the transmission facilities and this route permit shall supersede and preempt all zoning, building, or land use rules, regulations, or ordinances promulgated by regional, county, local and special purpose governments."

Project impacts to zoning and to current and future land uses can be mitigated by selecting routes alternatives that are compatible, to the extent possible, with community zoning and land-use plans. Land-use impacts can be mitigated by minimizing aesthetic impacts of the project, to the extent that zoning and land-use plans address aesthetics (for example, landscaping). Land-use impacts can also be mitigated by using existing ROW to the maximum extent possible. The proposed transmission line is generally compatible with local planning and zoning ordinances. Impacts to planning and zoning are anticipated to be negligible.

7.5.6 Noise

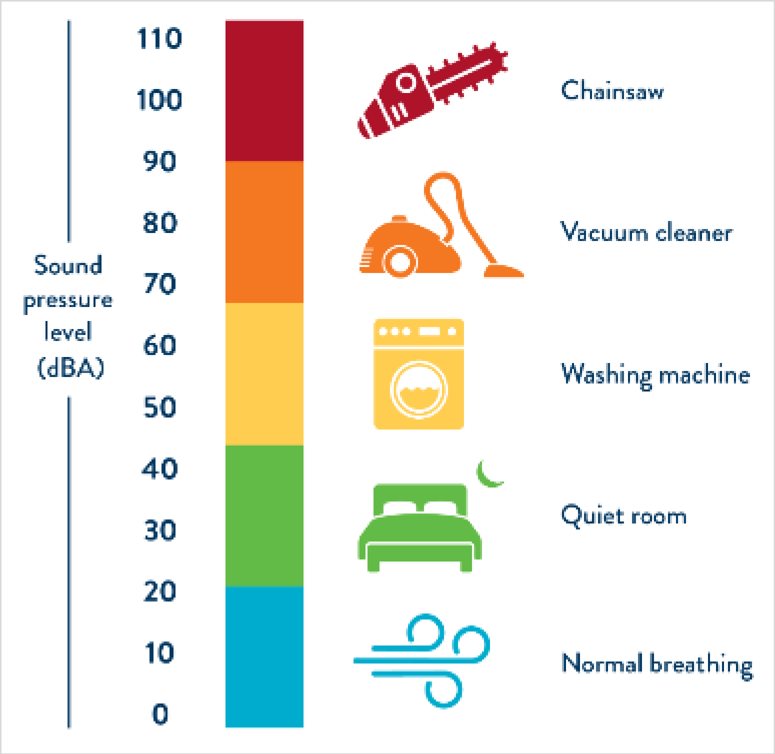
The ROI for noise is the local vicinity. Short-term noise impacts would occur during construction. Impacts would be minimal, and the applicant would be required to comply with state noise standards. Noise impacts during operation would be negligible except for perceptible noise impacts, particularly during periods of foggy, damp, or light rain conditions. Operation of the project would meet state noise standards. Impacts would be minimized by selecting the route with the fewest receptors nearby; receptors are quantified as part of the aesthetics assessment.

Noises from the project are associated with construction and operation. Noise created by construction activities is anticipated to be minimal. Construction activity would occur during a specified time during the day, and only at a specific portion of the project for a few days to weeks at a time over the course of 24 to 27 months. Impacts are expected to be compliant with state noise standards.

7.5.6.1 Existing Conditions

Noise levels are measured in units of decibel (dB) on a logarithmic scale and can be used to compare a wide range of sound intensities. Human hearing is not equally sensitive to all frequencies of sound, so certain frequencies are given more weight. The A-weighted decibel scale (dBA) accounts for the sensitivity of the human ear. It puts more weight on the range of frequencies that the average human ear perceives, and less weight on those we don't, like higher or lower frequencies. An increase of 10 dBA sounds twice as loud, due to the way that the logarithmic scale functions in compressing the measurements associated with sounds (reference (52)). Figure 5-4 illustrates common noise levels at various levels of the dBA scale.

Figure 7-4 Common Activity Noise Levels



The MPCA has the authority to adopt noise standards pursuant to Minnesota Statute § 116.07, subpart 2. The adopted noise standards are set forth in Minnesota Rule 7030, which sets noise limits for different land uses (Table 5-5). These land uses are grouped by Noise Area Classification (NAC) and are separated between the daytime and nighttime noise limits. Residences are classified as NAC -- 1 and have the lowest noise limits of the four NACs. A complete list of all land use designations assigned to the NAC categories is available at Minnesota Rule 7030.0050. All project noises must comply with the MPCA noise standards (Table 5-5). The noise standards specify the maximum allowable noise volumes that may not be exceeded for more than 10 percent of any hour (L_{10}) and 50 percent of any hour (L_{50}) (reference (52)).

Table 7-5 Minnesota Noise Standards

	Daytime Limit (dBA)	Daytime Limit (dBA)	Nighttime Limit (dBA)	Nighttime Limit (dBA)
	L_{10}	L_{50}	L_{10}	L_{50}
NAC – 1: Residential and Other Sensitive Uses	65	60	55	50
NAC – 2: Non-Residential Uses (typical Commercial)	70	65	70	65
NAC – 3: Non-Residential Uses (typical Industrial, Agricultural)	80	75	80	75
NAC – 4: Undeveloped Uses	NA	NA	NA	NA

Source: reference (1)

The project ranges through a mix of developed and rural areas. Background noise has the potential to be higher in the more populated areas of the project. Rural areas without significant noise might be in the 30 to 40 dBA range, while noise could be in the 40 to 50 dBA range in more developed portions of the project (reference(53)). A significant portion of the route parallels US-14, which may further elevate near-field noise levels depending on traffic load. The primary noise receptors within the project area are residences and farmsteads, which are classified as NAC – 1.

For most of the project, ambient noise levels are in the range of 30 to 50 dBA, with temporary, higher noise levels associated with wind, vehicular traffic, and the use of gas-powered equipment (for example, tractors or chain saws). Community noise levels are usually closely related to the intensity of human activity. Noise levels are generally considered low when below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. In rural areas, noise levels can be below 35 dBA. In small towns or wooded and lightly used residential areas, noise levels are more likely to range from 40 to 50 dBA. Levels around 75 dBA are more common in busy urban areas, and levels up to 85 dBA occur near major freeways and airports.

7.5.6.2 Potential Impacts

7.5.6.2.1 Construction Noise

During project construction, temporary, localized noise from heavy equipment and increased vehicle traffic is expected to occur along the ROW during daytime hours during implementation of the project. HVTL 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. Substation noise would be localized and present at a particular location from start to end. Major noise producing activities are associated with clearing and grading, material delivery, augering foundation holes, setting structures, and stringing conductors.

Noise associated with heavy equipment can range between 80 and 90 dBA when operating at full power 50 feet from the source (reference (54)). Heavy equipment generally runs at full power up to 50 percent of the time. Point source sounds decrease six dBA at each doubling of distance (reference (52));

therefore, a 90 dBA sound at 50 feet is perceived as a 72 dBA sound at 400 feet and a 60 dBA sound at 1,600 feet.

Construction noise could reach levels above the state thresholds for short intervals at select times and locations. Any periods of sufficient duration to exceed the MPCA daytime noise limits would be temporary in nature and no exceedances of the MPCA nighttime noise limits are expected for the project. Construction noise could temporarily affect residences, schools, businesses, libraries, parks, recreational areas, and related public spaces that are close to the ROW. An exceedance of noise standards need not occur for a negative impact to occur. For example, interference with conversational speech typically begins at about 60 dBA (reference (55)). A 70 dBA sound interferes with telephone conversations, and an 80 dBA sound interferes with normal conversation. Distinct noise impacts during construction are anticipated to be minimal to moderate depending on proximity to receptors, the activity occurring and equipment being used. Construction noise impacts will be temporary, localized, and intermittent.

7.5.6.2.2 Transmission Line Noise

Noise from transmission lines (electrical conductors) is due to small electrical discharges which ionize surrounding air molecules. The level of noise from these discharges depends on conductor conditions, voltage levels, and weather conditions. Noise emissions are greatest during heavy rain events when the conductors are consistently wet. However, during heavy rains, the background noise level is usually greater than the noise from the transmission line. As a result, audible noise is typically not noticeable during heavy rains. In foggy, damp, or light rain conditions, transmission lines might produce audible noise higher than background levels. During dry weather, noise from transmission lines is a perceptible hum and sporadic crackling sound. The noise modeling for the proposed transmission line indicates that the noise generated by the project will not exceed the most stringent MPCA noise standards of NAC-1 at the edge of the ROW. Therefore, no mitigation is proposed.

7.5.6.2.3 Substation Noise

Transformers and switchgear operation are the common noises associated with a substation. Noise emissions from this equipment have a tonal character that often sounds like a hum or a buzz that corresponds to the frequency of the alternating current (AC). Transformers produce a consistent humming sound, resulting from magnetic forces within the transformer core. This sound does not vary with transformer load. Switchgear produces short-term noises during activation of circuit breakers; these activations are infrequent. The applicant indicates that the substations will be designed such that noise levels would be compliant with Minnesota noise standards at the substation boundary. Accordingly, substation noise levels are anticipated to be within Minnesota noise standards (that is, < 50 dBA and NAC-1) at the nearest receptor(s).

7.5.6.3 Mitigation

The sample route permit (Section 5.3.6 of Appendix H) contains the following mitigation related to noise: “The Permittee shall comply with noise standards established under Minnesota Rules 7030.0010 to 7030.0080. The Permittee shall limit construction and maintenance activities to daytime working hours to the extent practicable."

Sound control devices on vehicles and equipment, for example, mufflers; conducting construction activities during daylight hours, and, to the greatest extent possible, during normal business hours; and running vehicles and equipment only when necessary are common ways to mitigate noise impacts. Impacts to state noise standards can be mitigated by timing restrictions if needed. During operation, permittees are required to adhere to noise standards. No additional mitigation is proposed.

7.5.7 Property Values

The ROI for property values is the local vicinity. Property values are impacted by many interconnected factors. If effects do occur due to transmission lines and substations, research has shown these effects to be almost always less than 10 percent. Impacts are anticipated to be minimal. However, it is acknowledged that every landowner has a unique relationship and sense of value associated with their property and impacts. Impacts of the project would be minimized by selecting the route with the fewest residences nearby; residences are quantified as part of the aesthetics assessment.

7.5.7.1 Existing Conditions

The ROI for property values is the local vicinity. Residences located within the local vicinity of Route Segment 17 are summarized in the aesthetics impact analysis (Section 7.5.1). Map 41 includes residence locations within the route width of the route alternatives; they are also shown in Map 39. For a general sense of the number of residences within the ROI, there are 254 residences within the local vicinity of Route Segment 17 (Figure 5-1).

7.5.7.2 Potential Impacts

Potential impacts of overhead transmission lines on property values are generally connected to three main factors. First, how the transmission line affects the viewshed and aesthetics of a property. Second, the real or perceived risks that buyers have of electric magnetic fields (EMF). Third, the effects to agricultural production on properties that are used for farming operations. The aforementioned factors are only some of the many interconnecting factors that affect property values. Because of this, it is difficult to measure how much and the numerous ways that transmission lines and property values are correlated.

A variety of methodologies have been used to research the relationship between transmission lines and property values. Some general conclusions can be drawn from this body of literature. This discussion highlights relevant outcomes of property value research, with additional detail provided in Appendix I.

Research does not support a clear cause-and-effect relationship between property values and proximity to transmission lines, but has revealed trends that are generally applicable to properties near transmission lines:

- When negative impacts on property values occur, the potential reduction in value is in the range of one to 10 percent.
- Property value impacts decrease with distance from the line; thus, impacts are usually greater on smaller properties than on larger ones.
- Negative impacts 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 greater effect on sale price than the presence of a transmission line.
- The value of agricultural property decreases when transmission line structures interfere with farming operations.

Every landowner has a unique relationship and sense of value associated with their property. Thus, a landowner’s assessment of potential impacts to their property’s value is often a deeply personal comparison of the property “before” and “after” a proposed project is constructed. These judgments, however, do not necessarily influence the market value of a property. Rather, appraisers assess a property’s value by looking at the property “after” a project is constructed. Moreover, potential market participants likely see the property independent of the changes brought about by a project; therefore, they do not take the “before” and “after” into account the same way a current landowner might.

7.5.7.3 Mitigation

The sample route permit does not include any specificity around mitigation required for property values.

The applicant would be responsible for any construction-related damages and for returning affected property to its original condition, which would help maintain property value. As discussed in Section 3.3.2.2, for properties crossed by the ROW, the applicant would develop a fair market value offer and, once the ROW is acquired, would contact the landowner to discuss any special considerations that might be needed (for example, for fences, crops, or livestock). Impacts could also be mitigated by using the protections offered through Minnesota Statute § 216E.12 (commonly known as the “Buy the Farm” statute), where available, to move away from potential property value impacts.

7.5.8 Recreation

The ROI for recreation is the route width. Impacts to recreation are assessed through identification of recreational resources within the ROI and reviewing their use and proximity to the anticipated alignment in comparison to other features that are a part of the natural or built environment. Recreational resources that are present include public watercourses (including designated state water trails) and snowmobile trails. The project also crosses a scenic byway. Intermittent and localized indirect impacts could occur during construction (for example, increased noise levels); long-term impacts during operation could occur in the form of aesthetic impacts (Section 7.5.1). Given that direct long-term effects are predominantly related to aesthetics, the indirect long-term repercussions on recreation are anticipated to be subjective, meaning that responses vary based on individual perspectives and experiences.

7.5.8.1 Existing Conditions

Recreation within Route Segment 17 Hwy 14 Option's ROI consists primarily of outdoor recreational opportunities including picnicking, hiking, cross country skiing, biking, bird watching, fishing, hunting, canoeing/kayaking, and snowmobiling. Publicly accessible recreational areas within the ROI are summarized in Table 7-6, shown in Map 36, and further discussed below. Publicly accessible lands that may be used for recreational purposes but also serve to provide wildlife habitat are discussed further in Section 7.9.12. Within the ROI of Route Segment 17 Hwy 14 Option, this includes a state game refuge.

Table 7-6 Recreational Resources within the ROI

Recreational Resource Type	Recreational Resource	Unit	Route Segment 17 Hwy 14 Option
State Water Trails	Straight River	crossing count	1
		linear feet	4,366
	Zumbro River	crossing count	3
		linear feet	6,186
Scenic Byway	Minnesota River Valley Scenic Byway	miles	0.4
Snowmobile Trails	Dodge County Trails	miles	1.1
	Kasson-Mantorville Trails	miles	3.4
	Steele County Trails	miles	3.2
	Tiger Bear I Trails	miles	0.3
	Waseca County Trails	miles	2.1
	Total snowmobile trails	miles	10.1

Watercourses provide opportunities for recreation throughout the project area. Some watercourses hold special designations, such as state water trails and national or state wild and scenic rivers. State water trails are miles of waters publicized for canoeing, kayaking, and camping (reference (60)). Route Segment 17 crosses two state water trails, the Straight River and the Zumbro River. The Straight River is located directly east of the West Faribault Substation. Route Segment 17 crosses the Straight River once in a location where there are no existing transmission lines (Map 36-5). The Zumbro River is crossed by Route Segment 17 in three locations (Map 36-7, Map 36-8, and Map 36-9). There is an existing transmission line at all three crossings.

Route Segment 17 crosses the Minnesota River Valley Scenic Byway (Map 36-1). National and state scenic byways are alternative road ROWs to major highways that have regionally outstanding scenic, natural, recreational, cultural, historic, or archaeological significance (reference (62)). The Minnesota River Valley Scenic Byway follows the Minnesota River through central Minnesota between the city of Browns Valley, on the border of South Dakota and Minnesota, and the city of Belle Plaine (reference (63)).

Several snowmobile trails are located within the ROI (Table 7-6; Map 36). The trails are maintained by the DC Snow Seekers, Faribo Sno-Go Club, K-M Snow Drifters, Le Sueur County Snowmobile Trails

Association, Steele County Trail Association, Tiger Bear I, Waseca County Trail Association, and Zumbrota Covered Bridge Riders.

7.5.8.2 Potential Impacts

Effects on recreation due to construction of the project are anticipated to be minimal and temporary in nature, lasting only for the duration of construction, and are anticipated to include short-term disturbances, such as increased noise and dust, as well as visual impacts. Construction activities also could, depending on the timing, affect nearby hunting or wildlife viewing opportunities in public spaces by temporarily displacing wildlife. Wildlife, however, is expected to return to the area once construction has been completed.

Once constructed, the project would result in modified viewsheds or new visual impacts caused by new built features introduced to the landscape which could change the aesthetic of a recreational destination in a way that changes the experience or reduces visitor use. Because direct long-term impacts are primarily aesthetic in nature, indirect long-term impacts to recreation are expected to be subjective and unique to the individual. These unavoidable impacts might affect unique resources. Potential impacts can be minimized through prudent routing. Visual impacts are discussed in Section 7.5.1. In some cases, the project would cross recreational resources (e.g., the scenic byway and Zumbro River state water trail) where transmission lines are already present. While visual impacts would occur, the project is not anticipated to impede recreational activities, such as snowmobiling, golfing, canoeing, hunting, or fishing.

7.5.8.3 Mitigation

Impacts to recreation can be mitigated by prudent routing and/or selecting route alternatives that avoid resources used for recreational purposes. The applicant committed to installing appropriate signage along recreational areas to warn trail users of ongoing construction.

Impacts can also be mitigated by reducing impacts to natural landscapes. Specifically, impacts could be reduced by paralleling existing infrastructure and/or sharing existing ROW. The applicant committed to coordinating with the DNR to ensure construction of the project will not significantly impact nearby natural resources that could influence recreation.

7.5.9 Socioeconomics

The ROI for socioeconomics is the six-county area. Impacts are qualitatively assessed based on the influx of workers during construction activities. Economic factors related to construction and operation of the project are anticipated to be short-term and positive, but minimal. Positive impacts come from increased expenditures at local businesses during construction, the potential for some materials to be purchased locally, and the use of local labor.

7.5.9.1 Existing Conditions

Route Segment 17 is in southeastern Minnesota. Labor force and unemployment data were used from the 2019-2023 American Community Survey, 5-Year Estimates from the US Census Bureau, and the Minnesota Department of Employment and Economic Development. Table 7-7 shows the compiled population and economic data on Minnesota and the counties that Route Segment 17 intersect, including Blue Earth, Waseca, Steele, Dodge, Olmsted, and Goodhue Counties.

Table 7-7 Population, Income, and Employment

County	Population	Population Density (population/ sq. miles)	Labor Force Participation (%)	Labor Force	Labor Force Unemployment Rate (%)	Per Capita Income	Median Household Income
Minnesota	5,024,279	71.7	68.7	4,537,247	4.0	$44,947	$84,313
Blue Earth	70,006	91.6	64.3	38,413	2.5	$34,010	$66,249
Waseca	18,953	43.8	64.2	11,438	1.5	$40,471	$75,063
Steele	37,413	87.0	66.6	19,502	2.0	$41,392	$83,448
Dodge	20,962	48.0	71.0	11,642	2.2	$43,903	$92,943
Olmsted	164,784	252.1	69.2	90,174	2.1	$51,880	$87,856
Goodhue	47,844	63.4	64.9	25,038	2.3	$42,254	$82,749

County populations within Route Segment 17 range from around 18,000 to 164,000. The highest populations and population densities within Route Segment 17 are where the project is closer to the metropolitan areas of Mankato and Rochester, which include Blue Earth and Olmsted Counties. At the county level, change in population between the 2010 and 2020 census saw the largest percent increase in Olmsted County (12.7 percent), with Blue Earth County having the second largest increase (8 percent). Steele, Dodge, and Goodhue Counties had a more modest increase (2.5 percent, 3.9 percent, and 2.9 percent, respectively). Waseca County was the only county with a decline in the population (0.9 percent).

The labor force unemployment rate in Route Segment 17 ranges from 1.5 percent in Waseca County to 2.5 in Blue Earth County. All counties in Route Segment 17 have an unemployment rate below the state of Minnesota. Per capita incomes for counties crossed by Route Segment 17 range from $34,010 to $51,880. The highest per capita income is in Olmsted County.

The median household income ranges from $66,249 in Blue Earth County to $92,943 in Olmsted County. All of the counties, besides Dodge and Olmsted, had a median income lower than the state of Minnesota, which has a median income of $84,000.

According to the 2018-2022 American Community Survey, 5-Year Estimates from the US Census Bureau, Waseca, Dodge, Olmsted, and Goodhue County’s largest industry in terms of employment is “Educational services, health care, and social assistance.” The largest industry in terms of employment in

Steele County was “Manufacturing.” The second largest industry in terms of employment for all counties was “Manufacturing,” except for Blue Earth County, where the largest industry in terms of employment is “Retail Trade” and Steele County, where it was “Educational services, health care, and social assistance.”

7.5.9.2 Potential Impacts

Potential socioeconomic impacts would be short-term due to the time frame of construction (2-3 years). An influx of construction jobs and personnel, delivery of construction material, temporary housing, and other purchases from local businesses will occur during that time. Slight increases in retail sales in the project area are expected. These would include purchases of lodging, food, fuel, construction materials, and other merchandise. No long-term impacts are expected in transmission line and substation projects.

Construction of the transmission line would employ approximately 50-100 workers over the 2-3 years of the project, per the joint certificate of need application and route permit application. The applicant committed in the joint certificate of need application and route permit application to pay prevailing wages for applicable construction jobs. Local construction crew expenditures would result in temporary, positive impacts on local economies.

Workers would likely be commuting to the area instead of relocating to the project area. Construction workers traveling to the area might find temporary housing over the span of the project, but this might move with construction along the project area. The construction and operation of the project is not anticipated to create or remove jobs over the long-term or result in the permanent relocation of individuals to the area.

7.5.9.3 Mitigation

Adverse impacts are not expected; therefore, mitigation is not proposed.

7.5.10 Transportation and Public Services

The ROI for transportation and public services varies. For roadways and rail, the ROI is the local vicinity. For public utilities, the ROI is the ROW. For emergency services, the ROI is the six-county area. For airports, the ROI is within 3.78 miles. Impacts are expected to primarily be related to construction activities and would be short-term and minimal. Negative impacts, such as traffic delays, should be negligible. Long-term impacts to public services are also anticipated to be minimal. Impacts are unavoidable but can be minimized and mitigated.

7.5.10.1 Roadways and Railways Existing Conditions

Segment 17 crosses several county, city, and township roads. The alternative was proposed during scoping to follow U.S. Highway 14 and to avoid agricultural land and natural resources. It parallels U.S. Highway 14 for 56.8 miles and 59.7% of its length. Route Segment 17 also crosses each of the following other U.S. and MN highways:

- MN State Highway 22
- MN State Highway 60
- MN State Highway 13
- MN State Highway 56
- Interstate Highway 35
- U.S. Highway 218

Route Segment 17 also crosses the Chicago and North Western Railroad in several locations. The Chicago and North Western Railroad parallels U.S. Highway 14 for several miles (Map 38).

7.5.10.2 Public Utilities Existing Conditions

Electric utilities near the project are provided by numerous entities (reference (64)), including:

- Benco Electric Cooperative
- Northern States Power Company
- Steele Waseca Cooperative Electric
- People's Cooperative Services
- Rochester Public Utilities
- Dakota States Power Company

Natural gas services in the project area are provided by CenterPoint Energy, Greater Minnesota Gas, Great Plains Natural Gas Company, Minnesota Energy Resources Corporation, and Xcel Energy.

Potable water in Segment 17 is largely supplied by local wells. Near urban areas, primarily within municipalities, water mains and other public utilities are provided. Blue Earth, Waseca, Steele, Dodge, Olmsted, and Goodhue Counties have septic programs that conduct inspection services, issue permits, and oversee installation and maintenance of private septic systems and wells. Public works and utility departments design, construct, and maintain sanitary sewers, streets and sidewalks, storm sewers, and water mains.

7.5.10.3 Emergency Services Existing Conditions

Emergency services in Segment 17's ROI are provided by local law enforcement and emergency response entities, fire departments, and ambulance services of various counties and communities. Sheriffs' offices and municipal police departments provide regional law enforcement to Blue Earth, Waseca, Steele, Dodge, Olmsted, and Goodhue counties and their respective cities of Mankato, Eagle Lake, Janesville, Waseca, Owatonna, Claremont, Dodge Center, Kasson, Byron, and Pine Island. Fire services are provided by city and community fire departments in Mankato, Owatonna, Waseca, Dodge Center, and Rochester. The rest of the cities have volunteer fire departments. Ambulance districts provide emergency medical response services throughout Route Segment 17's ROI. Emergency medical response is available from local hospitals. The Mayo Medair Ambulance Service in Mankato provides emergency helicopter transport for patients in areas surrounding Mankato Regional Airport. Emergency services within the ROI are provided by:

- North Mankato Police Department
- Pine Island Police Department
- Eagle Lake Police Department
- Janesville Police Department
- Waseca Police Department
- Kasson Police Department
- Owatonna Police Department
- Blue Earth County Sheriff Department
- Waseca County Sheriff Department
- Steele County Sheriff Department
- Goodhue County Sheriff Department
- Olmsted County Sheriff Department
- North Mankato Fire Department
- Mankato Fire Stations 1, 2, and 3
- Janesville Fire
- Mantorville Fire
- Waseca Fire
- Owatonna Fire
- Claremont Fire
- Dodge Center Fire
- Kasson Fire
- Byron Fire
- Rochester Fire
- Zumbrota Volunteer Fire Department
- Pine Island Fire Department
- St. Francis Regional Medical Center Hospital
- Mayo Clinic Hospital and Urgent Care
- Mankato Clinic Urgency Care
- Mayo Clinic Health System Waseca
- Owatonna Hospital
- Mayo Clinic Hospital - Rochester
- Olmsted Medical Center – Wanamingo

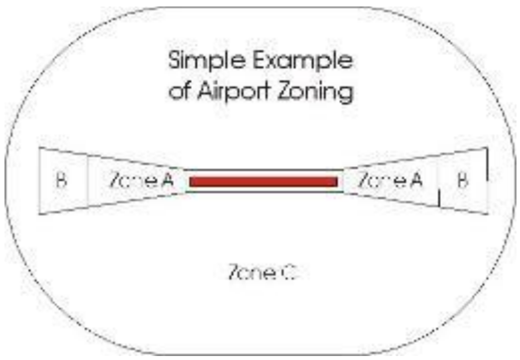
7.5.10.4 Airports Existing Conditions

Transmission line structures and conductors can conflict with the safe operation of an airport if they are located within applicable safety zones. Airports are defined by the state and the Federal Aviation Administration (FAA) as areas of land or water that are used or intended to be used for the landing and takeoff of aircraft, and includes the surrounding area used or intended to be used for airport buildings and facilities (14 C.F.R. Part 1, § 1.1 and Minnesota Rules 8800.0100, subpart 3). Different classes of airports have different safety zones depending on several characteristics, including runway dimensions, classes of aircraft they can accommodate, and navigation and communication systems (reference (65)). These factors determine the necessary take-off and landing glide slopes, which in turn determine the setback distance of transmission line structures.

The FAA and MnDOT have each established development guidelines on the proximity of tall structures to public-use airports. Transmission lines near public airports are limited by FAA height restrictions, which prohibit transmission line structures above a certain height, depending on the distance from the specific airport. Federal Aviation Regulation (FAR) Part 77 and Minnesota Rules 8800.1200 establish guidelines on heights for any structures that could endanger aircraft, which includes either structures exceeding 200 feet or the airport elevation, whichever is greater. These guidelines impose stricter regulations for structures within a maximum distance of 20,000 ft (3.78 miles) of a public use or military airport. Regulatory obstruction standards only apply to those airports that are available for public use and are listed in the FAA airport directory. Per Minnesota Rules 8800.2400, private airstrips and personal use airstrips cannot be used in commercial transportation or by the public and are not subject to FAA regulatory obstruction standards.

In addition, MnDOT has established separate zoning areas around airports as shown in Figure 7-5. The most restrictive safety zones are safety zone A, which does not allow any buildings, temporary structures, places of public assembly, or transmission lines, and safety zone B, which does not allow places of public or semi-public assembly such as churches, hospitals, or schools. Permitted land uses in both zones include agricultural uses, cemeteries, and parking lots. Safety zone C, the horizontal airspace obstruction zone, encompasses all land enclosed within the perimeter of the imaginary horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs of specified radii (5,000 to 10,000 feet) from the center of each end of the primary surface of each runway, and which is not included in zone A or zone B. As with FAA regulations and per Minnesota Rules 8800.2400 subpart 1, MnDOT zoning requirements only apply to public airports and are recommended for private airports (reference (66)).

Figure 7-5 MnDOT Example of Airport Zoning



Source: reference (67))

There are three public airports within 20,000 feet (3.78 miles) of Route Segment 17: Mankato Regional Airport, Waseca Municipal Airport, and Dodge Center Airport. The Mankato Regional Airport's airstrips are located 14,790 feet (2.78 miles) north of Route Segment 17 (Map 38-1). It is at an elevation of 1,021 feet Above Sea Level (ASL). The Waseca Municipal Airport's airstrips are located 3,300 feet (0.62 miles) east of Route Segment 17. The Dodge Center Airport's airstrips are located 3,200 (0.61 miles) feet east and west of Route Segment 17. The anticipated alignment deviates from U.S. Highway 14 to avoid the airstrips.

In addition to the FAA and MnDOT, the area surrounding the Mankato Regional Airport is subject to the Mankato Regional Airport Zoning Ordinance (reference (68)). Dodge Center Airport is subject to the Airport Safety Zoning Ordinance (reference (240)). Each ordinance also notes the establishment of airport specific joint zoning boards made up of township, city and county representatives.

7.5.10.5 Potential Impacts

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

Construction could cause moderate, localized impacts to roadways that would be short-term in nature. Construction activities occasionally cause lanes or roadways to be closed. These closures would only last for the duration of the construction activity in a given area. Construction equipment and delivery vehicles would increase traffic along roadways throughout project construction, with effects lasting from a few minutes to a few hours, depending upon the complexity and duration of the construction activities. Drivers could experience increased travel times as a result. Construction vehicles could temporarily block or alter public access to streets and businesses. Lane closures and traffic management might pose safety concerns to workers and the public as active traffic and workers move throughout the construction space. Additionally, construction along roadways can increase dust as grading occurs, which can obscure road lines or vision.

The transmission line would be constructed within or parallel to the MnDOT ROW. With the construction of the anticipated route, MnDOT may require additional design features to minimize or mitigate impacts to existing snow fencing or drainage systems.

Vehicles and equipment that would be used for construction of the transmission line (for example, overhead line cranes, concrete trucks, construction equipment, and material delivery trucks) are generally heavy load vehicles and can cause more damage to road surfaces. Oversized/overweight load permits must be obtained from MnDOT and county road authorities when size and/or weight limits would be exceeded.

During operation, severe weather, including high winds, ice, snowstorms, and tornadoes, could result in structure damage. If structures and lines fall over or otherwise reach the ground, they would create safety hazards on any roadways located within the designed fall distance of an overhead transmission line parallel to existing roadways. Snow and ice accumulation and high winds could make the transmission line more susceptible to failure or collapse.

The applicant indicated that its design standards would meet or surpass NESC requirements for the safe design and operation of transmission lines. These standards include designing transmission lines to withstand severe winds from summer storms and the combination of ice and strong winds from winter weather.

Potential impacts to railways would be limited to short-term construction impacts and would be coordinated directly with the railroad operator. Impacts of stringing HVTL lines and maintenance of structures can include delays and safety concerns as trains are temporarily rerouted or crossings are postponed. Safety measures would be implemented during active construction around railroads. Construction workers would maintain regular contact with railroad personnel as electrical conductor stringing occurs over spanned rail lines to ensure appropriate safety standards are maintained throughout construction and operation. Negligible impacts during operation would be anticipated to railroads.

Potential impacts to the electrical grid and other utilities during construction are anticipated to be short-term, intermittent, and localized. In some areas, the project could cross over existing transmission lines, follow existing transmission line ROW, or cross or parallel electric distribution lines. An overarching project objective is to provide additional transmission capacity to reduce congestion and to improve electric system reliability throughout the region as more renewable energy resources are added to the high voltage transmission system. Project operations would, therefore, have long-term beneficial impacts by providing additional transmission line capacity in the project area.

The project crosses pipeline ROWs in multiple locations along Segment 17. Potential pipeline impacts are expected to be avoided and mitigated by coordinating with the appropriate pipeline companies. The applicant indicated that they would use the Gopher State One-Call system to locate and mark underground utilities prior to ground-disturbing activities. Transmission lines have the ability to cause

AC interference on pipelines. Engineering analysis and induction study can be done to determine the extent of possible impacts and determine if co-location is feasible and reasonable.

Potential airport impacts, as they exist today, are anticipated to be minimal as there are mitigation measures that can be employed to avoid these impacts, such as routing away from the airport, the use of appropriate height structures to avoid impact to glide or approach slopes, and structure marking or lighting. Potential impacts to public airports would occur if the project is of a certain height and located within close proximity, thereby limiting the potential for safe operations, including aircraft takeoff and landing. Potential impacts to public airports would be determined in relation to safety zones and through adherence to FAA design criteria and recommended setbacks. Height restrictions would apply if/when the airport's airstrips are within 3.78 miles.

The Mankato Regional Airport, Waseca Municipal Airport, and Dodge Center Airport airstrips are located within 3.78 miles of Segment 17. Transmission line structures would be less than 200 feet AGL.

7.5.10.6 Mitigation

As described in Section 2.7.3, MnDOT required a two-step process for constructing transmission lines within a Minnesota truck highway ROW. The applicant filed the Early Notification Memo (ENM) in November 2024. Comments were provided to the applicant by MnDOT on March 10, 2025 (Appendix F). As noted in MnDOT's comments, within state highway ROW, snow fencing may need to be replaced or constructed along trunk highways to prevent blowing snow across roads per MnDOT. The snow fences trap snow and limit drifting over road surfaces in hazardous winter weather conditions. The snow fences could consist of rolled fencing, panels, or a living fence made of vegetation. MnDOT may also require the applicant to consider modifications to highway drainage systems. If drainage systems are impacted by the project, the applicant may be required to modify the design to accommodate existing drainage features[14].

The sample route permit (Sections 5.3.4 and 5.3.14 of Appendix H) contains the following mitigation related to transportation:

> *"The Permittee shall cooperate with county and city road authorities to develop appropriate signage and traffic management during construction."*
>
> *"The Permittee shall keep records of compliance with this section and provide them upon the request of Commerce or Commission staff."*
>
> *"The Permittee shall advise the appropriate governing bodies having jurisdiction over all state, county, city, or township roads that will be used during the construction phase of the Transmission Facility. Where practical, existing roadways shall be used for all activities*

[14] MnDOT: In the Matter of the Application of Xcel Energy Route Permit for the Mankato – Mississippi River 345 kV Transmission Line Project Route Alternatives in Southeast Minnesota PUC Docket Number: E002/CN-22-532, E002/TL-23-157, March 10, 2025 letter, Docket No. 20253-216973-01.

associated with construction of the Transmission Facility. Oversize or overweight loads associated with the Transmission Facility shall not be hauled across public roads without required permits and approvals."

"The Permittee shall promptly repair private roads or lanes damaged when moving equipment or when accessing construction workspace, unless otherwise negotiated with the affected landowner."

The applicant committed to attempt to avoid or limit roadway closures to the maximum extent practicable and use conductor safety guides over roads or utilize helicopters for stringing activities where possible. The applicant also noted impacts to traffic would be mitigated by limiting construction traffic to the project right-of-way and existing access points to the maximum extent feasible and minimizing impacts related to dust by proper use of BMPs (e.g., soil matting, wetting) to reduce the potential for dust. The applicant also committed to utilizing appropriate safety measures such as use of safety signage, installation of temporary barrier structures, and employing spotters during clearing or stringing activities. Finally, the applicant would meet with MnDOT, county highway departments, township road supervisors, and/or city road personnel to address any issues that occur during roadway construction.

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to public services and utilities: "During Transmission Facility construction, the Permittee shall minimize any disruption to public services or public utilities. To the extent disruptions to public services or public utilities occur, these shall be temporary, and the Permittee shall restore service promptly. Where any impacts to utilities have the potential to occur, the Permittee would work with both landowners and local entities to determine the most appropriate mitigation measures if not already considered as part of this route permit."

In the joint certificate of need application and route permit application, the applicant committed to ongoing coordination with MnDOT, local and county road authorities, railroad companies, and the FAA.

MnDOT and rail operator design guidelines would need to be met for any utility occupation of road and railroad ROW, and a permit from MnDOT would be required to use any state highway ROWs. MnDOT has a formal policy and procedures for accommodating utilities within or as near as feasible to highway ROWs. The applicant would continue to work with MnDOT and, as noted in Section 2.7.3, has completed ENMs and will be required to complete a constructability report. Additionally, the applicant has committed to coordinating with county and township road departments to minimize impacts on local roads and highways.

If issued a route permit, the applicant would need to file notice with the FAA and work with both FAA and MnDOT for compatibility between the transmission line and any airport and to identify appropriate mitigation measures. If it was determined necessary to construct any structures with a height greater than 200 feet AGL, those structures would be marked and lighted in accordance with FAA Advisory Circular 70/7460-1K, Obstruction Marking and Lighting.

Where the project crosses pipeline ROWs, mitigation might be required. If induction mitigation is necessary, the pipeline company would have to approve the mitigation being installed and the applicant would be responsible for the added project costs.

The applicant committed to coordinating with local emergency services to ensure that emergency access to areas near construction activities is maintained.

7.6 Human Health and Safety

The ROI for electric and magnetic fields (EMF) is the ROW. Impacts to human health from possible exposure to EMFs are not anticipated. The HVTL would be constructed to maintain proper safety clearances. EMF associated with the project are below Commission permit requirements, and state and international guidelines. Potential impacts would be long-term and localized. These unavoidable impacts would be of a small size and can be mitigated. Impacts would be minimized by appropriate placement and adhering to electric field standards for transmission lines.

7.6.1 Electric and Magnetic Fields (EMF)

The ROI for electric and magnetic fields (EMF) is the ROW. Impacts to human health from possible exposure to EMFs are not anticipated. The HVTL would be constructed to maintain proper safety clearances. EMF associated with the project are below Commission permit requirements, and state and international guidelines. Potential impacts would be long-term and localized. These unavoidable impacts would be of a small size and can be mitigated. Impacts would be minimized by appropriate placement and adhering to electric field standards for transmission lines.

7.6.1.1 Existing Conditions

The term "EMF" is typically used to refer to electric and magnetic fields that are coupled together. EMF is associated with natural sources such as lightning and sunlight. EMFs are also invisible lines of force that surround electrical devices (for example, power lines, electrical wiring, and electrical equipment) which are produced through the generation, transmission, and use of electric power (reference (70)). However, for lower EMF frequencies associated with power lines, electric and magnetic fields are relatively decoupled. Generally, electric fields are dependent on the voltage of a transmission line and magnetic fields are dependent on the current carried by a transmission line.

Electric fields are the result of electric charge, or voltage, on a conductor. Using a garden hose as an analogy, voltage is equivalent to the pressure of the water moving through the hose. The intensity of an electric field is related to the magnitude of the voltage on the conductor and is measured in kV per meter (kV/m). Magnetic fields are created and increase from the strength of the flow of current through wires or electrical devices. Using the same analogy, current is equivalent to the amount of water moving through the garden hose. The intensity of a magnetic field is related to the magnitude of the current flow through the conductor and is measured in units of Gauss (G) or milliGauss (mG).

Because the EMF associated with a transmission line is proportional to the amount of electrical current passing through the power line, it will decrease as distance from the line increases (reference (71)). This means that the strength of EMF that reaches a house adjacent to a transmission line ROW will be significantly weaker than it would be directly under the transmission line. Electric fields are easily shielded by conducting objects, such as trees and buildings, further shielding electric fields.

Magnetic fields, unlike electric fields, are not shielded or weakened by materials that conduct electricity (for example, trees, buildings, and human skin). Rather, they pass through most materials. Both magnetic and electric fields decrease rapidly with increased distance from the source. Electric and magnetic fields are invisible, just like radio, television, and cellular phone signals, all of which are part of the electromagnetic spectrum (reference (70)).

Electric and magnetic fields are found anywhere there are energized, current-carrying conductors, such as near transmission lines, local distribution lines, substation transformers, household electrical wiring, and common household appliances. The frequency from transmission lines is considered "non-ionizing, low-level radiation which is generally perceived as harmless to humans" (reference (70)). Table 7-8 illustrates the typical ranges of electric and magnetic fields of frequently and commonly used appliances that would be in a home (reference (70)).

Table 7-8 Electric and Magnetic Field Ranges for Common Household Appliances

Electric Field [1]		Magnetic Field [2]			
Appliance	kV/m	Appliance	mG		
	1 foot		1 inch	1 foot	3 feet
Stereo	0.18	Circular saw	2,100 to 10,000	9 to 210	0.2 to 10
Iron	0.12	Drill	4,000 to 8,000	22 to 31	0.8 to 2
Refrigerator	0.12	Microwave	750 to 2,000	40 to 80	3 to 8
Mixer	0.10	Blender	200 to 1,200	5.2 to 17	0.3 to 1.1
Toaster	0.08	Toaster	70 to 150	0.6 to 7	< 0.1 to 0.11
Hair Dryer	0.08	Hair dryer	60 to 200	< 0.1 to 1.5	< 0.1
Television	0.06	Television	25 to 500	0.4 to 20	< 0.1 to 1.5
Vacuum	0.05	Coffee maker	15 to 250	0.9 to 1.2	< 0.1

[1] German Federal Office for Radiation Safety
[2] Long Island Power Institute

Research on whether exposure to magnetic fields causes biological responses and health effects has been performed since the 1970s. The U.S. National Institute of Environmental Health Sciences and the World Health Organization's research does not support a relationship or association between exposure to electric power EMF and adverse health effects. The U.S. National Institute of Environmental Health Science evaluated numerous epidemiologic studies and comprehensive reviews of scientific literature regarding association of cancers with living near power lines, with magnetic fields in the home, and with exposure of parents to high levels of magnetic fields in the workplace. They concluded that "no consistent evidence for an association between any source of non-ionizing EMF and cancer has been found" (reference (72)).

Minnesota, Wisconsin, and California have performed literature reviews and research examining EMF. In 2002, Minnesota formed an Interagency Working Group to evaluate EMF research and develop public health policy recommendations for any potential problems arising from EMF effects associated with high-voltage transmission lines. The Working Group included staff from a number of state agencies and published its findings in a White Paper titled *EMF Policy and Mitigation Options*. Their research found that some epidemiological studies have shown no statistically significant association between exposure to EMF or health effects, and some have shown a weak association. Studies have not been able to establish a biological mechanism for how magnetic fields could cause cancer (reference (73)).

There is no federal standard for transmission line electric fields. The Commission has imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground (reference (74)). The Commission has not adopted a magnetic field standard for transmission lines. Appendix J provides detailed background on EMF health impact research.

7.6.1.2 Potential Impacts

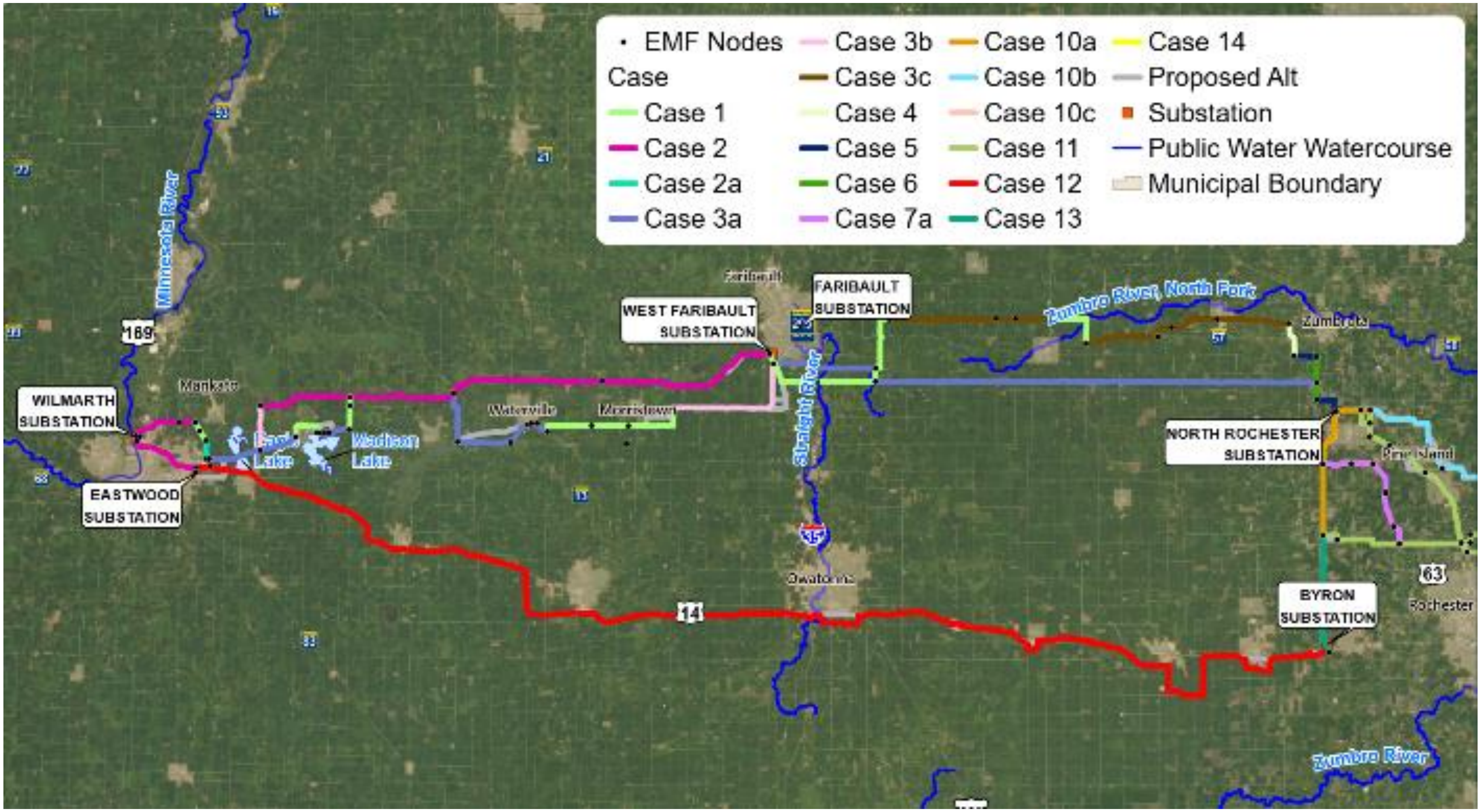
The magnitude of the voltage on a transmission line is near-constant and ideally within plus or minus five percent of the designed voltage. Because of this, the magnitude of the electric field will also be near constant regardless of the power flowing down the line. The maximum electric field associated with the project and measured at one meter (3.28 feet) above the ground, is calculated to be 6.9 kV/m. The strength of electric fields diminishes rapidly as the distance from the conductor increases. The maximum electric field values are provided in Table 7-9 and the corresponding case number is shown in Figure 7-6.

Table 7-9 Electric Field Calculations

Structure Type	Circuits Present	Case	Maximum within ROW
Single Pole, Davit Arm, 345 kV Single Circuit	Wilmarth – North Rochester 345 kV	Case 1	6.2 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild	Wilmarth – North Rochester 345 kV & Line 832 115 kV	Case 2	2 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild	Wilmarth – North Rochester 345 kV & Line 706, 707 or 708 69 kV	Case 3a, Case 3b, Case 3c	1.5 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit	Wilmarth – North Rochester 345 kV / Line 964 345 kV	Case 4	6.4 kV/m
Single Pole, Tangent/Dav it Arm, 345 kV Double Circuit	Wilmarth – North Rochester 345 kV & Line 964 345 kV	Case 5	5.2 kV/m
Single Pole, Tangent/Dav it Arm, 345 kV Double Circuit with 69 kV Underbuild	Wilmarth – North Rochester 345 kV , Line 964 345 kV & Line 739 69 kV	Case 6	1.2 kV/m

Structure Type	Circuits Present	Case	Maximum within ROW
Single Pole, Davit, 161/69 kV Double Circuit	North Rochester – Chester 161 kV & Peoples Line 69 kV	Case 7	1.5 kV/m
Single Pole, Tangent, 345 kV Double Circuit	North Rochester – Tremval 345 kV, Line 965 345 kV	Case 8	6.3 kV/m
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 9	1.3 kV/m
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit	North Rochester – Chester 161 kV & Line 979 345 kV	Case 10a	6.9 kV/m
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit	North Rochester – Chester 161 kV / Line 965 345 kV, North Rochester – River 345 kV	Case 10b	6.2 kV/m
Single Pole, Davit, 161 kV Single Circuit	North Rochester – Chester 161 kV	Case 11	2.7 kV/m
Single Pole, Tangent, 345 kV Double Circuit Single Circuit	Wilmarth – North Rochester 345 kV	Case 12	6.2 kV/m
Single Pole, Tangent, 345 kV Double Circuit	Wilmarth – North Rochester 345 kV, Line 979 345 kV	Case 13	4.9 kV/m
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit	North Rochester –Chester 161 kV, Line 5310 161 kV / Wilmarth –North Rochester 345 kV, Line 979 345 kV	Case 14	5.0 kV/m

Figure 7-6 Route Segment 17, EMF Nodes



The projected magnetic fields are provided in Table 7-10 and the corresponding case number is shown in Figure 7-6. Because magnetic fields are dependent on the current flowing on the line, calculations were based on two typical system conditions that are likely to occur during the project's first year in service. The two scenarios are system peak energy demand and system average energy demand.

Table 7-10 Calculated Magnetic Flux Density (mG)

Structure Type	Circuits Present	Case	Maximum within ROW (mG)
Single Pole, Davit Arm, 345 kV Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV	Case 1	77
Single Pole, Davit Arm, 345 kV Single Circuit (Max Loading)		Case 1	167
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 832 115 kV	Case 2	65
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild (Max Loading)		Case 2	114
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 708 69 kV	Case 3a	55
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3a	96
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 707 69 kV	Case 3b	27
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3b	59
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 706 69 kV	Case 3c	31
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3c	62
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV /Line 964 345 kV	Case 4	78
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit (Max Loading)		Case 4	246

Structure Type	Circuits Present	Case	Maximum within ROW (mG)
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit (Average Loading)	Wilmarth – North Rochester 345 kV & Line 964 345 kV	Case 5	74
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit (Max Loading)		Case 5	224
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV , Line 964 345 kV & Line 739 69 kV	Case 6	19
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit with 69 kV Underbuild (Max Loading)		Case 6	59
Single Pole, Davit, 161/69 kV Double Circuit (Average Loading)	North Rochester – Chester 161 kV & Peoples Line 69 kV	Case 7	5 mG
Single Pole, Davit, 161/69 kV Double Circuit (Max Loading)			21 mG
Single Pole, Tangent, 345 kV Double Circuit with 69 kV Underbuild (Average Loading)	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 8	105 mG
Single Pole, Tangent, 345 kV Double Circuit with 69 kV Underbuild (Max Loading)			190 mG
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild (Average Loading)	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 9	23 mG
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild (Max Loading)			41 mG
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit (Average Loading)	North Rochester – Chester 161 kV & Line 979 345 kV	Case 10a	150 mG
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit (Max Loading)			400 mG
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit (Average Loading)	North Rochester – Chester 161 kV / Line 965 345kV, North Rochester – River 345 kV	Case 10b	111 mG
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit (Max Loading)	North Rochester – Chester 161 kV / Line 965 345kV, North Rochester – River 345 kV		205 mG

Structure Type	Circuits Present	Case	Maximum within ROW (mG)
Single Pole, Davit, 161 kV Single Circuit (Average Loading)	North Rochester – Chester 161 kV	Case 11	8 mG
Single Pole, Davit, 161 kV Single Circuit (Max Loading)	North Rochester – Chester 161 kV		27 mG
Single Pole, Tangent, 345 kV Double Circuit Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV	Case 12	76 mG
Single Pole, Tangent, 345 kV Double Circuit Single Circuit (Max Loading)			164 mG
Single Pole, Tangent, 345 kV Double Circuit (Average Loading)	Wilmarth – North Rochester 345 kV, Line 979 345 kV	Case 13	85 mG
Single Pole, Tangent, 345 kV Double Circuit (Max Loading)			222 mG
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Average Loading)	North Rochester –Chester 161 kV, Line 5310 161 kV / Wilmarth –North Rochester 345 kV, Line 979 345 kV	Case 14	85 mG
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Max Loading)			222 mG

System peak energy demand represents the current flow on the line during the peak hour of system-wide energy demand. Peak demand is 1,200 amps on both conductors. Whereas system average energy demand represents the current flow on the line during a non-peak time, average demand is 560 amps on both conductors. For both scenarios, the magnetic field values were calculated at a point where the conductor is closest to the ground. Like electric fields, magnetic field levels decrease rapidly as the distance from the centerline increases. In addition, because the magnetic field produced by the transmission lines is dependent on the current flow, the actual magnetic fields when the project is placed in service would vary as the current flow on the line changes throughout the day.

7.6.1.3 Mitigation

The sample route permit (Section 5.4.2 of Appendix H) states: "The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms."

Mitigation of magnetic field strength would be achieved by increasing distance from the HVTL to the receptor. The Commission has, however, 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.

7.6.2 Implantable Medical Devices

The ROI for implantable medical devices is the ROW. Potential impacts associated with the project are anticipated to be negligible. If impacts occur, they can be mitigated. Impacts would be minimized by appropriate grounding and adherence to electric field standards for transmission lines.

7.6.2.1 Existing Conditions

Implantable medical devices, such as an implantable cardioverter defibrillator (ICD) or a pacemaker, are battery-powered devices that help keep a person's heartbeat in a regular rhythm. These devices are implanted into the heart tissue and can deliver electrical shocks to correct the heart's rhythm to prevent sudden cardiac issues and help people at risk for recurrent, sustained ventricular tachycardia or ventricular fibrillation (reference (75)). Instances of interference attributed to EMF are recognized, commonly referred to as electromagnetic interference (EMI). EMF exposure produced by transmission lines generally does not affect implantable devices.

Electromechanical implantable medical devices, such as cardiac pacemakers, ICDs, neurostimulators, and insulin pumps could be subject to interference from EMF, which could mistakenly trigger a device or inhibit it from responding appropriately (reference (76)). While EMI can result in either inappropriate triggering or inhibition of a device from responding properly, only a small percentage of these occurrences are caused by external EMI. Electrical interference at levels above 1.5 kV/m have the potential to interfere with modern, bipolar pacemaker behavior, but some models have been unaffected at as high as 20 kV/m (reference (77)). There is the potential for interference at lower levels, as differing manufacturers vary in susceptibility to EMI (reference (78)). During the peak hour of system-wide energy demand, the maximum electric field within the ROW was calculated to be 6.9 kV/m.

Workers who have cardiac pacemakers have separate guidelines for EMF exposure. The American Conference of Governmental Industrial Hygienists (ACGIH) recommended magnetic and electric field exposure limits for workers who have ICDs are 1 G and 1 kV/m, respectively (reference (79)). While ICD's vary and questions and concerns should be directed to the specific manufacturer, ICD manufacturers' recommended threshold for modulated magnetic fields is 1 G (reference (76)). One gauss is five to 10 times greater than the magnetic field likely to be produced by a high-voltage transmission line (references (76); (80)). During the peak hour of system-wide energy demand, the maximum magnetic field was calculated to be 0.246 G.

It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line, inducing a voltage on the object. Induced voltage is further discussed in Section 7.6.5.

7.6.2.2 Potential Impacts

While EMI can result in either inappropriate triggering or inhibition of a device from responding properly, only a small percentage of these occurrences are caused by external EMI. The project is under ACGIH and ICD manufacturers' recommended threshold for magnetic fields. Additionally, shocks from induced voltage from transmission lines are considered more of a nuisance than a danger. Impacts of induced voltage are further discussed in Section 7.6.5.

In the event ICDs are impacted by EMF, it generally results in a temporary asynchronous pacing (reference (76)). Therefore, health impacts or permanent impacts on implantable medical devices could be possible.

7.6.2.3 Mitigation

The sample route permit (Section 5.4.1 of Appendix H) contains the following mitigation related to grounding, electric field, and electronic interference: “The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the National Electric Safety Code. The Permittee shall address and rectify any induced current problems that arise during transmission line operation.”

“The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms.”

Electric and magnetic field strength is mitigated by increasing the distance from the transmission line and structures. Workers with ICDs should consult with their doctors directly with concerns about work in electrical or magnetic environments (references (81); (82)). Medical devices will return to normal operation when the person moves away from the source of the EMF (reference (76)). Transmission lines will not be energized during construction; therefore, construction workers would not be at risk of EMF or magnetic field exposure. The project would be designed in accordance with applicable NESC standard and to keep electric fields below the 8 kV/m standard set by the Commission. Individuals are expected to follow the recommendations of their medical provider.

7.6.3 Public and Worker Safety

The ROI for public and worker safety is the ROW. Any construction project has potential risks, which can include potential injury from falls, equipment and vehicle use, and electrical accidents. Risks for the public involve electrocution. Substations have potential electrocution risks if there is unauthorized entry. Potential impacts are anticipated to be minimal, short- and long-term, and can be mitigated. Impacts would be minimized by appropriate adherence to relevant local and state codes, the NESC, and NERC requirements.

7.6.3.1 Existing Conditions

The most recent data from the Bureau of Labor Statistics for injuries and illnesses was used to find the recent number of injuries and illnesses for Power and Communication Line and Related Structures Construction (North American Industry Classification System Code No. 237130). From 2021 to 2022 there were a total of 4,520 nonfatal occupational injuries and illnesses, with around four percent of them being classified as traumatic. From 2021 to 2022 there were 18 fatal injuries, 10 fatal transportation incidents (roadway accident or being struck by a vehicle), and four fatal incidents from coming into contact with an object or equipment (being hit, crushed, caught, struck, etc. by an object or equipment) associated with Power and Communication Line and Related Structures Construction (reference (83)).

7.6.3.2 Potential Impacts

As with any construction project, there are construction related risks. These could include potential injury from falls, equipment and vehicle use, and electrical accidents. There is potential for construction to disturb existing environmental hazards.

Electrocution is a risk that could occur with direct contact to lines. Between 2011 and 2015 power-line installers in the U.S. had 32 deaths related to electrocution, a rate of 29.7 deaths per 100,000 full-time workers (reference (84)). It could also happen when working near power lines, like when using heavy equipment. Electrocution could occur when there is electrical contact between an object on the ground and an energized conductor, but this situation is most likely with distribution lines (reference (76)). There is also electrocution risk from unauthorized entry into the substation.

Any accidents that might occur during construction of the project would be handled through local emergency services. Existing emergency services should have sufficient capacity to respond to any emergencies.

7.6.3.3 Mitigation

The sample route permit (Section 5.5.1 of Appendix H) contains the following mitigation related to safety: “The Permittee shall design the transmission line and associated facilities to meet or exceed all relevant local and state codes, the National Electric Safety Code, and NERC requirements. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, strength of materials, clearances over roadways, ROW widths, and permit requirements.”

Proper safeguards would be implemented for construction and operation of the transmission line and substation. The project would be designed to meet or exceed local, state, and the applicant’s standards regarding clearance to the ground, clearance to crossing utilities, strength of materials, and ROW distances.

The project must comply with the NESC.89 and Occupational Safety and Health Administration standards (reference (85)). Construction crews and contract crews would also comply with local, state, and NESC standards for installation and construction practices. The applicant would use their established safety procedures, as well as industry safety procedures, during and after installation of the transmission line, including appropriate signage during construction.

The substations would be fenced to restrict access. Appropriate signage would be posted that identifies the hazards associated with the substation.

7.6.4 Stray Voltage

The ROI for stray voltage is the ROW. Potential impacts to residences and farming operations from stray voltage are not anticipated. Transmission lines do not produce stray voltage during normal operation, as they are not directly connected to businesses, residences, or farms. The project would be constructed to NESC standards and therefore impacts are anticipated to be minimal. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

7.6.4.1 Existing Conditions

"Stray voltage" is a condition that can potentially occur on a property or on the electric service entrances to structures from distribution lines connected to these structures. The term generally describes a voltage between two objects where no voltage difference should exist. The source of stray voltage is a voltage that is developed on the grounded neutral wiring network of a building and/or the electric power distribution system. Stray voltage is not created by transmission lines, as they do not directly connect to businesses or residences (reference (86)).

Where utility distribution systems are grounded, a small amount of current will flow through the earth at those points. This is called neutral-to-earth voltage (NEV), which is voltage that is associated with distribution lines and electrical wiring within buildings and other structures (reference (87)). Electrical systems that deliver power to end-users and electrical systems within the end-user's business, home, farm, or other buildings are grounded to the earth for safety and reliability reasons. Stray voltage could arise from neutral currents flowing through the earth via ground rods, pipes, or other conducting objects, or from faulty wiring or faulty grounding of conducting objects in a facility. Thus, stray voltage could exist at any business, house, or farm which uses electricity, independent of whether there is a transmission line nearby. Site-specific mitigation measures are required to address potential stray voltage impacts.

Stray voltage is a natural phenomenon that can be found at low levels between two contact points at any property where electricity is grounded; it is measured between two points that livestock can simultaneously touch (reference (87)). Stray voltage and its effects on farms have been studied for nearly 30 years. Numerous studies have found that though it is likely to exist on farms, it is rarely strong enough to affect the behavior or production of dairy cattle (reference (88)). The Commission issued a report in 1998 supporting the conclusion that no credible scientific evidence has been found to show that currents in the earth or associated electrical parameters such as voltages, magnetic fields, and electric currents, are causes of poor health and milk production in dairy herds (reference (88)).

7.6.4.2 Potential Impacts

Stray voltage is, generally, an issue associated with electrical distribution lines and electrical service at a residence or on a farm. Under normal operating conditions, transmission lines do not create stray voltage as they do not directly connect to businesses, residences, or farms. The project would not directly connect to businesses or residences in the area and would not change local electrical service. Accordingly, impacts due to stray voltage are anticipated to be negligible.

Transmission lines, however, can induce voltage on a distribution circuit that is parallel and immediately under the transmission line.

7.6.4.3 Mitigation

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to grounding, electric field and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between the ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the NESC. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

The sample route permit (Section 5.4.2 of Appendix H) contains the following mitigation related to electric fields: "The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms." The applicant has committed to working with landowners that have issues with stray voltage following construction of the project.

7.6.5 Induced Voltage

The ROI for induced voltage is the ROW. It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line. This could induce a voltage on the object. Smaller conductive objects near the line could cause a nuisance shock to a person, but it is not a potential safety hazard. Metal buildings within the ROW might require grounding. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

7.6.5.1 Existing Conditions

It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line. Conductive objects include vehicles, including tractors and automobiles, in part because tires are made electrically conductive to eliminate static discharge building up when moving (reference (89)). This might induce a voltage on the object; the magnitude of the voltage depends on several factors, such as the size, shape, and orientation of the object along the ROW. Smaller conductive objects near the transmission line that are insulated or semi-insulated from the ground could cause a nuisance shock to a person from a small current passing through the person's body to the ground. If there were insulated pipelines, electric fences, telecommunication lines, or other conductive objects such as tractors or automobiles with greater lengths and sizes, induced voltage from a transmission line could produce a larger shock. This larger shock has not been found to be a health safety hazard (reference (90)). Similar to stray voltage, transmission lines could cause additional current on distribution lines where they parallel. If the distribution lines are not properly wired or grounded, induced voltage could be created.

7.6.5.2 Potential Impacts

Shocks from induced voltage from transmission lines are considered more of a nuisance than a danger. The transmission line would follow NESC standards, which require the steady-state (continuous) current between the earth and an insulated object located near a transmission line to be below 5 milliamps (mA). A shock at 5 mA is considered unpleasant, not dangerous, and allows for a person to still release the energized object that they are holding that is causing the shock (reference (91)). In addition, the Commission imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground. The standard is designed to prevent serious hazards from shocks when touching large objects parked under AC transmission lines of 500 kV or greater (reference (73)). In the Brookings County to Hampton 345 kV transmission line project (Commission docket number TL-08-1474), the ALJ and Commission determined that Minnesota's current electric field exposure standard of 8 kV/m is adequately protective of human health and safety (references (92); (93)).

7.6.5.3 Mitigation

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to grounding, electric field, and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the NESC. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

The applicant committed to meeting electrical performance standards. Appropriate measures would be taken to prevent induced voltage problems when the project parallels or crosses objects. Metal buildings might have unique issues due to induction concerns. For example, conductive buildings near power lines of 200 kV or greater must be properly grounded. Any person with questions about a new or existing metal structure can contact the applicant for further information about proper grounding requirements.

7.6.6 Electronic Interference

The ROI for electronic interference is the ROW. Transmission lines do not generally cause interference and impacts. If electronic interference does occur, in most cases it can be mitigated by either increasing the distance or adjusting the placement of the device to the transmission line or other transmission line structure. If ongoing interference due to a transmission line does occur, the applicant would be required to take feasible actions to restore electronic reception to pre-project quality. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

7.6.6.1 Existing Conditions

Electronic Interference refers to the disturbance of electrical circuits or equipment caused by electromagnetic radiation emitted from external sources, in this case, high-voltage transmission lines. Transmission lines generate EMFs depending on the distance from sources and the type of line configuration. The EMFs decrease as the distance increases from the conductors (reference (94)).

There are a number of FM and AM radio broadcasting stations that operate or can be heard within the project area, such as KXAC (100.5) FM, KDOG (96.7) FM, KTOE (98.7) FM, KXLP (94.1) FM, KATO (93.1) FM, KRRW (105.9) FM, KRUE (100.9) FM, KCJL (95.1) FM, KFSP (1230) AM, and KRFO (1390) AM.

There are also many television channels that broadcast throughout the project area. These channels are received from cable, satellite providers, and/or digital antennas.

Wireless internet and cellular phones use frequencies in the 900 MHz ultra-high frequency (UHF) range—a range for which impacts from corona-generated noise are anticipated to be negligible.

GPS is used in daily life, aviation, vehicle navigation, surveying, aerial drones, and agricultural activities. GPS works by sending radio-frequency signals from a network of satellites to the receiver. Because of this, buildings, trees, and other physical structures have the potential to interfere with a GPS signal. GPS provides locational information for navigation between endpoints, as well as geographic orientation for farm and other equipment. GPS is used throughout the project area.

The Continuously Operating Reference Station (CORS) Network is a cooperative effort between MnDOT, other state agencies and institutions, counties, cities, and private enterprises, with the goal of providing Global Navigation Satellite System (GNSS) corrections statewide. Using signals from all available GNSS satellites and receivers at over 140 known positions, MnCORS is able to continuously provide survey grade positioning corrections via the internet. Users with Real-Time Kinematic (RTK) capable equipment can receive real-time corrections to their geospatial positions, yielding a more accurate horizontal and vertical measurement.

7.6.6.2 Potential Impacts

No impacts to electronic devices are anticipated. No GPS impacts are expected from the construction or operation of the project. Research evaluating the potential for interference in the use of GPS satellite-based microwave signals under or near power line conductors indicates it is unlikely that there would be electronic interference while using GPS (reference (95)). Interference would be more likely near a transmission line structure, and unlikely under a transmission line (reference (96)) due to shadow effects.

Electronic interference from HVTLs can impact electronic communications like radios, television, and microwave communications in three ways: corona noise, shadowing effect, and gap discharge.

Corona “noise” primarily occurs in the radio frequency range of amplitude modulated (AM) signals. This generated noise typically occurs underneath a transmission line. It dissipates rapidly as the distance increases from the transmission line. FM radio receivers usually do not pick up interference from transmission lines because corona-generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (reference (97)). In most cases, the strength of the radio or television broadcast signal within a broadcaster’s primary coverage area is great enough to prevent interference. Additionally, due to the higher frequencies of television broadcast signals (54 MHz and above), a transmission line seldom causes reception problems within a station’s primary coverage area. Anticipated electric fields are below levels expected to produce significant levels of corona.

Shadowing effect comes from physically blocking communication signals. This primarily can impact two-way mobile radio communications and television signals. Digital and satellite television transmissions are more likely to be affected by shadowing generated by nearby towers. Interference could occur if the device was located immediately adjacent to a tower structure, blocking its signal. While television interference is rare, it can happen when a structure is aligned between a receiver and a weak, distant signal. Telecommunication towers can be susceptible to the shadowing effect.

Gap discharge interference is the most noticeable form of power line interference with radio and television signals, and typically the most easily fixed. Gap discharges are usually caused by hardware defects or abnormalities on a transmission or distribution line, causing small gaps to develop between mechanically connected metal parts. As sparks discharge across a gap, they create the potential for electrical noise, which, in addition to audible noise, can cause interference with radio and television signals. The degree of interference depends on the quality and strength of the transmitted communication signal, the quality of the receiving antenna system, and the distance between the receiver and the power line. Because gap discharges are a hardware issue, they can be repaired relatively quickly once the issue has been identified.

7.6.6.3 Mitigation

The sample route permit (Section 5.4.3 of Appendix H) contains the following mitigation related to electronic interference: “If interference with radio or television, satellite, wireless internet, GPS-based agriculture navigation systems or other communication devices is caused by the presence or operation of the Transmission Facility, the Permittee shall take whatever action is necessary to restore or provide reception equivalent to reception levels in the immediate area just prior to the construction of the

Transmission Facility. The Permittee shall keep records of compliance with this section and provide them upon the request of Commerce or Commission staff."

The applicant committed to taking feasible action to restore electronic reception to pre-project quality in the case of electronic interference. Interference could be due to line-of-sight obstruction (shadowing) in select areas but could be mitigated by either increasing the distance or adjusting the placement of transmission line structures and electronic antennas. For example, if interference occurs for an AM radio station within a station's primary coverage area where good reception existed before the project was built, reception can be regained by adjusting or moving the receiving antenna system. This is unlikely to occur with AM radio frequency, except for immediately under a transmission line, and interference would dissipate rapidly with increasing distance from the line.

7.7 Land-Based Economies

The ROI for land-based economies is the route width, except for tourism, which is the local vicinity. The ROI for recreation is more localized (the route width) as potential impacts to the tourism economy would be experienced at a broader scale. The short and long-term impacts of land-based economies are assessed for agriculture, forestry, mining, and tourism.

Constructing and operating the project could potentially affect land-based economies in the project area. Transmission lines are a physical, long-term presence on the landscape which could prevent or otherwise limit use of land for other purposes. The primary land-based economic activity in the project area is agriculture. Other potential economic activities connected to land usage in the project area include forestry, mining, and tourism. The primary means of mitigating impacts to land-based economies is prudent routing (that is, by choosing route alternatives that avoid such economies).

7.7.1 Agriculture

Agriculture is the predominant land-use within the ROI and when structures are placed within an agricultural field they would interfere with farming operations. Potential impacts are assessed through consideration of total agricultural land use, presence of prime farmlands, and agricultural practices. The footprint of the transmission line structures is land that can no longer be used for agricultural production and could adversely impact farms based on a variety of other factors. Impacts to agriculture would be mitigated through implementation of the Agricultural Impact Mitigation Plan and prudent routing.

7.7.1.1 Existing Conditions

Route Segment 17's predominant land cover (approximately 63% of its ROI) is agriculture (Map 34). In each of the counties within the ROI, crops account for more than half of the share of sales by type, and the average farm size is less than 470 acres (Table 5-11). Principal crops include grain, soybeans, hay/haylage, sweet corn, corn for silage, green peas, corn for grain, and oats for grain. Farmers in the area also raise livestock, including hogs and pigs, dairy cows, beef cattle, and poultry.

Table 7-11 Segment 1 Agricultural Products Sold and Average Size of Farm

County	Market Value of Agricultural Products Sold (percent)		Average size of farm (acres)
	Crops	Livestock	
Blue Earth [1]	55	45	469
Waseca [2]	67	33	429
Steele [3]	68	32	341
Dodge [4]	66	34	457
Olmsted [5]	67	33	279
Goodhue [6]	57	43	300

[1] Source: reference (98)
[2] Source: reference (30)
[3] Source: reference (241)
[4] Source: reference (242)
[5] Source: reference (243)
[6] Source: reference (209)

There are no apiaries or private airstrips used for agricultural purposes in Route Segment 17 (Hwy 14 Option)'s ROI.

Three categories of soils identified by the SSURGO database are subject to protection under the Farmland Protection Policy Act (FPPA): prime farmland, prime farmland when drained, and farmland of statewide importance. Prime farmland is defined by the NRCS as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Prime farmland, when drained, includes soils that have the potential to be prime farmland but require drainage or hydrologic alteration to achieve high productivity. Farmland of statewide importance includes soils that are nearly prime, but are not as productive due to permeability, slope, erosion potential, or some other soil property.

The ROI includes areas of prime farmland, prime farmland if drained, and farmland of statewide importance (Map 42). Approximately 83% of Route Segment 17's ROI is designated prime farmland (Appendix G).

There is one center pivot irrigation systems along Segment 17. The center pivot irrigation system appears to correspond to an area of alfalfa or grassland.

The 2024 directory of Minnesota organic farms from the Minnesota Department of Agriculture (MDA) lists 29 potential organic farms in the six-county area (reference (100)). However, because organic farmers are not required to register with the MDA, there could be additional, unregistered organic farms within the project area. In addition, organic farm registration does not give the precise location of organic fields, only the registrant's mailing address.

Agriculture in this area also includes precision farming practices. Precision farming involves the use of c (GPS) to guide farming equipment. One of the most precise types of GPS systems is known as real-time kinematic GPS (RTK GPS). Precision farming minimizes the potential for waste from, for example, duplicate row seeding or overlap in fertilizer or pesticide application.

7.7.1.2 Potential Impacts

Transmission lines have the potential to impact agriculture both temporarily and permanently. Temporary impacts result from transmission line construction, the extent of which are limited to the duration of construction, and annual transmission line inspections, the extent of which are temporary and periodic during operation. Impacts could include limiting the use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Temporary impacts from annual transmission line inspections might include pedestrian or light vehicle access, which would be limited to the ROW and areas where obstructions might require access from off the ROW. Impacts associated with annual transmission line inspections would be coordinated as part of easement negotiations between the applicant and the landowner before construction of the project.

Permanent transmission line impacts result from the placement of transmission line structures within crop, pasture, and other agricultural lands. The footprint of the transmission line structures is land that can no longer be used for agricultural production. This footprint can adversely impact farm income and property values depending on placement, structure type, and a variety of other factors. Permanent structures can have varying sized footprints due to the structure design and distance from each other. The project anticipates using steel monopole structures with concrete pier foundations ranging from 7 to 12 feet in diameter and a typical span of 1,000 feet between structures (Section 3.2.1). Single-circuit and double-circuit structures are anticipated to have similar impacts to agriculture because farming can occur around both types.

Structures can impede the efficient use of farm equipment and can significantly limit the management options for agricultural operations. Presence of structures can also impede efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields. Transmission line structures in agricultural fields could also potentially impede the use of irrigation systems such as center pivot 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 using the same practice.

While the presence of the project on or near an unregistered 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. For example, construction vehicles would need to be cleaned prior to entering organic farms to prevent tracking offsite soil or plant material onto the farm, and throughout operational maintenance of the ROW, certain herbicides or pesticides could not be used on or near the organic farm. These measures would need to be coordinated on an individual basis between the applicant and the affected organic farm owner.

Apiaries could be affected by EMF changes due to power lines. Studies have found that EMF negatively affects honey bees, including their ability to learn, fly, and forage, their sense of balance, memory, and pollination behavior, increasing aggression, and changes in metabolism (references (101), (102), (103), (104),(105)). Decreases in energy metabolism could result in lower honey production.

Livestock operations are present within the project area and could be temporarily affected during construction of the project. Construction activities could temporarily disrupt livestock access to pasture lands, and construction noise might disturb livestock. In addition, poultry could be sensitive to disease caused by pathogens introduced by offsite soils tracked on-site during construction.

Though stray voltage impacts are not anticipated to be caused by the project, stray voltage could be of concern to livestock farmers, particularly on dairy farms. NEV is by and large an issue associated with distribution lines and electrical service at a residence or on a farm (Section 7.6.4). Transmission lines do not create NEV stray voltage as they do not directly connect to businesses, residences, or farms (Section 7.6.4).

Transmission lines have the potential to interfere with RTK and standard GPS used for precision farming in two ways: (1) electromagnetic noise from a transmission line could potentially interfere with the frequencies used for RTK and standard GPS signals and (2) transmission line structures could cause line-of-site obstructions or create multi-path reflections such that sending and receiving of signals would be compromised. Interference could occur where the spectrum of transmission line electromagnetic noise overlaps the frequency spectrum used by RTK or standard GPS systems. As discussed earlier in this chapter, no GPS impacts are expected from the construction or operation of the project (Section 7.6.5).

Interference due to line-of-sight obstruction or multi-path reflection could occur in two ways: (1) obstruction of, or other reflection interference with, a GPS satellite signal and (2) obstruction of radio transmissions from an RTK base station to a mobile receiving unit. GPS uses information from multiple satellite signals to determine specific locations. Interference with one signal would not cause inaccurate navigation; however, simultaneous interference with two signals could lead to inaccurate navigation. Because simultaneous interference with two signals is relatively unlikely and any line-of-sight obstruction would be resolved with movement of the GPS receiver (for example, tractor) such that proper GPS reception would be quickly restored, line-of-sight obstruction impacts to precision farming systems are anticipated to be minimal and temporary.

A transmission line structure located very near an RTK base station could cause a line-of-sight obstruction in the signal from a base station. A transmission line structure near an RTK base station (within 100 feet) could also cause multi-path reflections that interfere in the signal from a base station. An RTK base station would need to be at least outside of the transmission line ROW, or 75 feet away. Multi-path reflections can also be caused by other structures and landscape features, including homes, trees, sheds, and sudden changes in ground elevation.

7.7.1.3 Mitigation

Mitigation and restoration measures for vegetation on landowner property are standard Commission route permit conditions. The sample route permit (Section 5.3.7 of Appendix H) contains the following mitigation related to land-based economies: “The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads.”

The applicant would implement an Agricultural Impact Mitigation Plan (AIMP) and reasonably restore and/or compensate landowners, as appropriate, for damages caused by the applicant as a result of transmission line construction. A draft version of the AIMP is provided in Appendix K. The applicant would work with landowners to determine whether to restore land and/or compensate landowners after discussions with them. The applicant would also implement a vegetation management plan to reduce impacts to agriculture, as appropriate.

To further mitigate impacts to agriculture and as described in the AIMP (Appendix K), the applicant would implement measures to reduce compaction, soil erosion, and sedimentation and would compensate producers for crop or livestock loss or damage. Post-construction restoration efforts would include restoration of any temporary access modifications and deep plowing to remove compaction. Both crop and livestock activities would be able to continue around project structures and facilities after construction.

The applicant notes in the joint certificate of need application and route permit application that no impacts are anticipated to affect agricultural activities during winter, as the crop fields are unplanted and the ground is frozen. Construction is anticipated to occur year-round and impacts to agriculture could be avoided in winter months.

Impacts to agricultural operations could also be mitigated by prudent routing. Specifically, prudent routing could include selecting route alternatives that prioritize paralleling existing infrastructure (including roads and transmission lines) to maximize potential opportunity for ROW sharing and minimize potential interruptions or impediments of the use of farm equipment. Prudent routing would secondarily prioritize following existing division lines (including field, parcel, and section lines) where paralleling existing infrastructure is not an option. Following existing division lines could minimize impacts to the use of farm equipment if, for example, row crops start and stop along the division lines. Opportunities for paralleling existing infrastructure and division lines are summarized in Table 7-3.

7.7.2 Forestry

The ROI for the land-based economy of forestry is the route width. No notable forestry resources within Segment 17’s ROI were identified and potential impacts to forestry resources or operations are not anticipated.

7.7.2.1 Existing Conditions

None of the following resources were identified within the ROI:

- DNR forestry lands
- State forests
- Forests for the Future state conservation easement areas
- Sustainable Forest Incentive Act land
- School Trust land

As such, potential impacts to land-based economies for forestry would be negligible.

7.7.2.2 Potential Impacts

There are no notable forestry resources within the ROI of Segment 1, and therefore, no impacts to forestry operations are anticipated.

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

7.7.2.3 Mitigation

Impacts on forested areas would be reduced by minimizing the tree clearing to the extent feasible; however, tall-growing vegetation within the ROW would be cleared. The applicant would work with landowners to come to an agreement of any timber removed from private lands, as appropriate.

7.7.3 Mining

The ROI for the mining land-based economy is the route width. Potential impacts are assessed through identification of known, existing mining operations and assessing potential impacts to those operations given the potential introduction of the HVTL. Documented prospect mines are also noted where present within the ROI. No impacts to active facilities are anticipated. If the potential for impacts to mining operations would occur, the applicant would be required to coordinate those impacts with the mining operator.

7.7.3.1 Existing Conditions

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.

Mining operations are prevalent in the project area and consist of aggregate mining operations and bedrock quarries owned either by individuals, private companies, or MnDOT. Two sand and gravel operations were identified within Segment 17's ROI. The sand and gravel operation near Claremont appears to be inactive based on a review of aerial imagery. The gravel pit was identified on a USGS historical topographic map. Aerial photos were reviewed from 1991 to 2021, and the gravel pit was not active. The 1965 Pine Island USGS historical 7.5 minute quadrangle identifies a gravel pit at the identified location. Upon review of historical aerial imagery, an active gravel pit was present in 1940 (reference (244)).

The second quarry is located along Highway 14 near Claremont. Prior to constructing the highway, the property appears to have had a residence. The construction of the highway removed the residence and surrounding structures. The current land use appears to be a stormwater pond and may have been used to supply sand and gravel for the construction of US Highway 14. The USGS quadrangle series does not identify a gravel pit at the location identified.

7.7.3.2 Potential Impacts

Existing aggregate mines and prospective sites could be negatively impacted by transmission line structures if the structures interfere with access to aggregate resources or the ability to remove them. Impacts are most likely to occur during transmission line construction if resource extraction must be ceased temporarily in order to safely string a transmission line. To the extent that there are potentially recoverable aggregate reserves in the project area, construction of the project could limit the ability to successfully mine these reserves, depending on the route selected for the project and the location of these reserves.

The construction of electrical utility facilities would likely interfere with any future geophysical surveys because the surveying technology cannot accurately assess what is underground when transmission lines are above the survey location.

Construction of the project would require sand and aggregate for structure backfill, concrete, and to maintain reliable access routes. Some of the aggregate material could come from local sources. Although demand would temporarily increase during construction, it’s anticipated that no new aggregate source facilities would be constructed, nor would any existing facilities be expanded.

7.7.3.3 Mitigation

If the potential for impacts to mining operations would occur, the applicant would be required to coordinate those impacts with the mining operator.

7.7.4 Tourism

The ROI for the tourism land-based economy is the local vicinity. Potential impacts are assessed through identification of known resources utilized by non-residents that would likely be recreating in the area and bringing in non-local revenue (or tourism dollars) to the area. Most opportunities for tourist activities within the ROI include use of publicly accessible lands and water for outdoor activities (Section 7.5.8). Impacts to tourism are anticipated to be negligible to minimal.

7.7.4.1 Existing Conditions

Route Segment 17 includes the city of Mankato. Tourism opportunities in Mankato include the Children’s Museum of Southern Minnesota, City Art Walking Sculpture Tour, River Hills Mall, Mankato

Symphony Orchestra, Minnesota State University, Mankato Theater and Dance performances, local shopping, historic homes, restaurants, and annual events (references (106); (107)). Arts, Entertainment, and Recreation and Accommodation and Food Services account for 11.2 percent of the jobs in Blue Earth County (reference (108)).

Located outside of the ROI, near Owatonna, visitors have the opportunity to visit Rice Lake State Park for bird watching, canoeing, and nature observation.

Other human-built tourism opportunities in the six-county area include county fairs, arts and crafts fairs, farmers markets, and smaller community events. These events and other opportunities for tourism are advertised in nearby incorporated towns, and the activities are not located within the ROI.

Recreational opportunities identified within the ROI include publicly accessible lands and waters used for outdoor activities (Section 7.5.8). Nonresidents or tourists could visit the project area to take advantage of the area's hunting and fishing opportunities. Public and designated lands are discussed in Section 7.9.6.

7.7.4.2 Potential Impacts

Impacts to the tourism economy are anticipated to be negligible to minimal.

7.7.4.3 Mitigation

No mitigation measures for tourism are proposed.

7.8 Archaeological and Historic Resources

The ROI for archaeological and historic resources is the route width. Direct and indirect impacts could occur from construction and operation of the project. Direct impacts to archaeological and historic resources could result from construction activities such as ROW clearing, placement of structures, the construction of new substations and access roads, temporary construction areas, and vehicle and equipment operation. Direct impacts could also result from the removal of historic buildings or structures. Direct impacts to historic resources could occur if the project is located near or within view of a resource (typically a historic building, structure, or traditional cultural properties (TCP)).

Potential impacts are assessed through identification of documented archaeological and historic resources within one mile of the route alternatives. An emphasis is placed on resources within the route widths, which could have the most potential impact.

7.8.1 Existing Conditions

Cultural resources consist primarily of archaeological sites and historic architectural resources. Archaeological sites are defined as the material remains of past human life or activities (reference (109)). Historic architectural resources are sites, buildings, and structures greater than 45 years in age that "create tangible links to the American past, whether in relation to historical events and people, traditional ways of life, architectural design, or methods of construction," as defined in the Minnesota Historic and Architectural Survey Manual (reference (110)). Traditional Cultural Properties (TCP) are also considered cultural resources. TCPs are defined as locations of significance to a community because of their association with important cultural practices and beliefs (reference (111)).

Federal laws and regulations, including Section 106 of the National Historic Preservation Act (NHPA) of 1966 (Section 106), its implementing regulations found in 36 CFR 800, and the Archaeological Resources Protection Act of 1979, provide the standards for cultural resources identification, evaluation, and mitigation of impacts. Pursuant to Section 106 of the NHPA, a historic property is any archaeological site, historic architectural resource, or traditional cultural property included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Potential cultural resources investigations that could be required under Section 106 include archaeological surveys, historic architectural surveys and/or TCP surveys which serve to identify TCPs. Section 106 applies to all undertakings that take place on federal lands, require federal permitting, and/or utilize federal funds.

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

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

Coordination with the Tribal Historic Preservation Offices (THPO) prevents impacts from the project to known TCPs. THPOs are officially designated by Tribes and serve the same function as a SHPO (reference (112)). THPOs assist with the preservation of Tribal historic properties and cultural traditions. They are also available to advise federal, state, and local agencies on the management of tribal interests. As noted in Section 8.1.1 of the joint certificate of need application and route permit application, the applicant has engaged with multiple tribes and is committed to continued engagement and consultation.

Minnesota is divided into nine Archaeological Regions, which were defined by former State Archaeologist Scott Anfinson (reference (113)), as part of a framework for building a predictive model developed by the Minnesota Department of Transportation (MNDOT) for the presence of archaeological sites, called the MnModel (reference (113)). These regions characterize features of the natural environment that have been fairly stable throughout precontact and contact periods. The distribution of resources among the nine regions is assumed to have influenced the distribution of precontact peoples (reference (113)).

The western portion of Route Segment 17 falls within the Prairie Lakes Archaeological Region (Region 2), extending through the Steele County boundary. The Southeast Riverine Archaeological Region (Region 3) begins at the western boundary Dodge County and extends through the eastern terminus of Route Segment 17.

Region 2, the Prairie Lakes Archaeological Region, includes a large portion of southern Minnesota, including Big Stone, Blue Earth, Brown, Carver, Chippewa, Cottonwood, Faribault, Freeborn, Jackson, Lac Qui Parle, Le Sueur, Lyon, McLeod, Martin, Nicollet, Redwood, Renville, Scott, Sibley, Stevens, Swift, Watonwan, and Yellow Medicine counties and portions of Douglas, Grant, Kandiyohi, Lincoln, Meeker, Nobles, Otter Tail, Pipestone, Pope, Rice, Steele, Traverse, and Waseca counties. This region is characterized by “swell and swale topography,” hilly end moraines, features such as the Minnesota River trench, the Prairie des Coteau scarp, and numerous shallow lake basins (reference (113)). Precipitation ranges between 28 inches per year in the southeast to 22 inches annually in the northwest. At the time of Euroamerican contact, the region was characterized by tallgrass prairie, river-bottom forests and oak woodland. Big Woods vegetation, consisting of Elm, Maple, and Basswood, began developing during the contact period. Bison were the dominant game animal during the late Holocene period, with white tail deer and elk also present in smaller numbers.

Region 3, the Southeast Riverine Archaeological Region, includes Dodge, Fillmore, Goodhue, Houston, Mower, Olmsted, Wabasha, and Winona counties, and portions of Dakota, Freeborn, Rice, and Waseca counties. This region was not glaciated during the Late Wisconsin Ice Age. The region is dominated by a stream-dissected landscape and contains three major river systems: the Cannon, Zumbro and Root Rivers. No natural lakes are found within Region 3; however, valley bottom lakes are present along the Mississippi River. The climate is mild in the Southeast Riverine Region compared to the rest of the state. The average high temperature is 23 degrees Fahrenheit in January and 85 degrees Fahrenheit in July. Annual precipitation ranges between 28-30 inches. Faunal resources in this region during the late Holocene included deer and elk, with a small number of bison present in the upland areas. Aquatic resources could be found in the region’s rivers and tributaries, and plant resources, such as prairie turnips and acorns were also present (reference (113)).

The Glacial ice had fully retreated from the Prairie Lakes Region by approximately 11,000 BC, while the Southeast Riverine Region remained unglaciated, allowing for human occupation of both regions by this time. Early hunter gatherers maintained small group sizes and were very mobile, with subsistence patterns centered on hunting large and medium sized game animals, primarily bison, in the Prairie Lakes region. This period, known as the early Paleoindian, spanned from approximately 11,200 to 10,500 BC, and is characterized by its distinctive fluted projectile points (e.g., Clovis, Folsom, Holcombe). Early prehistoric artifacts (fluted and Plano projectile points) have been recovered in these regions, though primarily as surface collections. There is potential for deeply buried precontact sites of all periods in floodplain alluvium. The late Paleoindian/early Archaic period (10,500 to 7,500 BC) saw an increase in subsistence diversification, evidenced in part in the archaeological record by a more diverse and specialized tool assemblage (reference (114)).

During this period and continuing into the Middle Archaic (7,500 to 3,000 BC), gradually increasing population sizes resulted in decreased, but still expansive, ‘home range’ areas for these hunter gatherers, who still relied heavily on larger forest game animals for subsistence. The suite of stone tools continued to increase during this period, and copper tools made their first appearance at the end of the middle Archaic (reference (114)).

The Late Archaic period (approximately 3,000 to 500 BC) is characterized by the appearance of exotic materials, such as marine shells, communal burial sites, and a more diverse material culture, including tools used in the manufacturing of dugout canoes. Copper tools were also prevalent during this time period. Lifeways during the late Archaic period relied more heavily on second-order foods, such as fish and other aquatic resources, as well as plant life (e.g., wild rice). The Late Archaic was a period of resource intensification and, therefore, saw a decrease in mobility and home range areas, and an increase in group sizes (reference (114)). In Region 2, many sites in the middle prehistoric period are located on islands and peninsulas on larger-sized lakes or along major rivers. Lifeways continued to evolve during the Woodland period (between 1,000 to 500 BC to approximately 1650 AD). The Woodland period is generally characterized by the appearance of pottery and burial mounds. Later, Woodland habitation sites in the Prairie Lakes region are most likely in river valleys, in sheltered, wooded areas.

Contact period sites (circa 1700) are mostly associated with the Dakota tribes (Yankton, Wahpeton and Sisseton in the Prairie Lakes Region and the Santee in the Southeast Riverine Region), and with French and Euroamerican fur traders (reference (113)).

The ROI for archaeological and historic architectural resources is the route width. However, for the purposes of analysis, documented archaeological and historic architectural resources were reviewed to understand the broader potential for archaeological and/or historic architectural resources within a 1-mile buffer of Route Segment 17.

Because proximity to fresh water and food resources was vital to the survival of the early inhabitants of Minnesota, archaeological sites are typically concentrated on well-drained upland terraces along bodies of water. In the project area for Route Segment 17, previously identified archaeological sites are mostly concentrated in the vicinity of Eagle Lake in Blue Earth County, in the lakes region of western Waseca County, and in the far eastern portion of Steele County, the majority of which were identified during Phase I archaeological surveys conducted for the Minnesota Department of Transportation for proposes construction along U.S. Highway 14.

To determine potential cultural resource impacts on cultural resources, known archaeological and historic sites in or adjacent to the project were identified through a review of the OSA’s online portal and MnSHIP, the Minnesota SHPO’s online portal. MnSHIP is a comprehensive database of documented historic architectural resources for the entire state, while the OSA portal is a database of previously recorded archaeological sites in the state. The OSA portal was also reviewed for estimated locations of historic cemeteries, as recorded in 2011 by Vermeer and Terrell (reference (115)). This study identified unrecorded historic cemeteries based on various forms of documentation, such as historic maps and aerial imagery. These cemeteries are often mapped to a much larger area, such as the PLS section or township level, than their actual locations, as the exact locations might not be known or verified. Therefore, even in cases wherein an unrecorded historic cemetery appears to intersect the segment's route width, the resource may not be present in this location. These unrecorded Euroamerican cemeteries are therefore discussed as an added precaution.

Documented archaeological and historic resources within the study area of Route Segment 17 are summarized in the following tables.

- Table 7-12 summarizes the number of archaeological and historic resources within the project area (which is within one mile of the anticipated alignments) and the ROI (route width).
- Table 7-13 provides descriptions of the resources located within the route widths.

Table 7-12 Route Segment 17, Number of Archaeological and Historic Resources within the Project Area and Route Width

	Project Area	Route Width
Archaeological Sites	91	34
Historic Architecture	649	82
Historical Cemeteries	26	12

Table 7-13 Route Segment 17, Description of Archaeological and Historical Resources within the Route Width

Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
21BE0021	Archaeological Site	Eagle Lake I	Unevaluated	Precontact campsite/post-contact artifact scatter, including pre-contact lithic tools and debitage, and historic glass, ceramic, and metal. During a 1995 survey, portions of this site were reported have been demolished.[1] Located in Section 12 of Township 108N, Range 26W.
21BE0022	Archaeological Site	Eagle Lake Site II	Unevaluated	Precontact habitation site. Located in Section 12 of Township 108N, Range 26W.
21BE0066	Archaeological Site	Wussow	Recommended not eligible	Precontact campsite consisting of a Woodland period projectile point and lithic debitage.[2] The site has been heavily disturbed and is in Section 24 of Township 108N, Range 25W.
21BE0067	Archaeological Site	Rose	Unevaluated	Precontact lithic scatter. Located in Section 16 of Township 108N, Range 25W.
21BE0138	Archaeological Site	Unnamed	Unevaluated	Multicomponent artifact scatter consisting of precontact lithic debitage and post-contact ceramic, glass, and metal.[3] Located in Section 7 of Township 108N, Range 25W.
21BE0139	Archaeological Site	Unnamed	Unevaluated	Multicomponent artifact scatter consisting of precontact ceramics, lithic debitage, and FCR, and post-contact glass and metal.[4] Located in Section 7 of Township 108N, Range 25W.
21BE0317	Archaeological Site	Dauk I	Unevaluated	Precontact Lithic Workshop. Located in Section 7, of Township 108N, Range 25W.
21DO0004	Archaeological Site	Dodge Center Creek East	Eligible	Precontact artifact scatter consisting of Woodland periods ceramic, lithic flakes and a biface, FCR, and floral fragments.[5] Located in Section 32 of Township 107N, Range 17W.
21DO0013	Archaeological Site	Unnamed	Unevaluated	Single artifact finding consisting of one chert flake. Located in Section 32 of Township 107N, Range 18W.

Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
21DO0014	Archaeological Site	Unnamed	Eligible	Large (88-acre) precontact multicomponent lithic scatter/ habitation site including Agate Basin, Tama, Raddatz, Table Rock and Bottleneck Stemmed, Lamoka Cluster, Cedar Valley, Nodena Banks, Madison Triangular, Steuben, and small side-notched point types and lithic debitage.[6] Located in Section 30 of Township 107N, Range 18W.
21DOn	Archaeological Site	Hallowell	Unevaluated	Alpha site[15] consisting of a post-contact town site, established in 1856. Located in Section 32 of Township 107N, and Range 17W.
21DOx	Archaeological Site	Kasson	Unevaluated	Alpha site[15] consisting of a post-contact town site, established in 1938. Located in Section 33 of Township 107N, Range 16W.
21GDs	Archaeological Site	Pine Island Mill	Unevaluated	Alpha site[15] consisting of a post-contact mill. Located in Section 31 of Township 109N. Range 15W.
21ST0019	Archaeological Site	Unnamed	Unevaluated	Precontact lithic scatter. Located in Section 25, Township 107N, Range 19W.
21ST0020	Archaeological Site	Unnamed	Unevaluated	Precontact lithic scatter. Located in Section 25 of Township 107N, Range 19W.
21ST0021	Archaeological Site	Unnamed	Unevaluated	Multi-component precontact lithic scatter consisting of lithic debitage, 33 lithic tools including two side notched projectile points and a plano point base, faunal fragments, and charred flora remnants.[7] Located in Section 25, Township 107N, Range 19W.
21ST0022	Archaeological Site	Unnamed	Unevaluated	Precontact lithic scatter. Located in Section 25 of Township 107N, Range 19W.

[15] Alpha sites are archaeological sites that have been recorded based on historic maps, documentation, and/or reporting, but have not been investigated by a qualified archaeologist.

Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
21ST0023	Archaeological Site	Unnamed	Unevaluated	Precontact lithic scatter/habitation site consisting of lithic flakes, utilized flakes, bifaces, an Archaic period projectile point, and faunal remains.[8] Located in Section 25 of Township 107N, Range 19W.
21ST0025	Archaeological Site	Unnamed	Unevaluated	Multicomponent precontact (Paleo-Indian and Late Woodland Periods) lithic scatter/habitation site consisting of debitage, a biface, and two projectile points (Agate Basin and corner notched).[9] Located in Section 25 of Township 107N, Range 19W.
21ST0028	Archaeological Site	Unnamed	Unevaluated	Single precontact artifact find consisting of a chert biface. Located in Section 26 of Township 107N, Range 19W.
21WE0007	Archaeological Site	Krienke	Unevaluated	Precontact lithic scatter. Located in Section 4 of Township 107N, Range 23W.
21WE0025	Archaeological Site	Unnamed	Unevaluated	Precontact lithic scatter/habitation site. Located in Section 32 of Township 108N, Range 24W.
21WE0029	Archaeological Site	Unnamed	Unevaluated	Precontact artifact scatter. Located in Section 21 of Township 107N, Range 22W.
21WE0030	Archaeological Site	Unnamed	Unevaluated	Multicomponent artifact scatter consisting of precontact lithic debitage, two bifaces, and FCR and post-contact ceramics).[10] Located in Section 21 of Township 107N, Range 22W.
21WE0031	Archaeological Site	Unnamed	Unevaluated	Multicomponent artifact scatter consisting of precontact lithic debitage and FCR, and post-contact ceramics.[11] Located in Section 21 of Township 107N, Range 22W.
21WE0034	Archaeological Site	Unnamed	Unevaluated	Precontact artifact scatter consisting of lithic debitage and FCR. Located in Section 21 of Township 107N, Range 22W.

Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
21WE0035	Archaeological Site	Unnamed	Unevaluated	Single precontact artifact find consisting of a middle/late Archaic Period projectile point. Located in Section 21 of Township 107N, Range 22W.
21WE0059	Archaeological Site	Unnamed	Unevaluated	Single precontact artifact find consisting of a chert flake. Located in Section 30 of Township 108N, Range 24W.
21WE0060	Archaeological Site	Unnamed	Recommended not eligible	Single precontact artifact find consisting of a broken corner notched projectile point. Located in Section 30 of Township 108N, Range 24W.
21WE0061	Archaeological Site	Unnamed	Unevaluated	Precontact lithic scatter consisting of 28 flakes, one preform, and three cores (primarily Prairie Du Chien chert).[12] Located in Section 30 of Township 108N, Range 24W.
21WE0066	Archaeological Site	Unnamed	Unevaluated	Precontact lithic scatter consisting of two Prairie du Chien chert cores, and a partial biface.[13] Located in Section 33 of Township 108N, Range 24W.
21WE0077	Archaeological Site	Big John Henry	Unevaluated	Precontact artifact scatter consisting of debitage, a Madison-type projectile point, and FCR.[14] Located in Section 20 of Township 107N, Range 22W.
21WE0079	Archaeological Site	Byron Borrow	Recommended not eligible	Precontact lithic scatter. Located in Section 23 of Township 107N, Range 23W.
21WEh	Archaeological Site	Ross	Unevaluated	Alpha site[15] consisting of a post-contact town site. Located in Section 36 of Township 108N, Range 24w.
BE-LER-00005	Historic Architecture	Smith Mill's Implement/Building	Unevaluated	
BE-LER-00012	Historic Architecture	Wussow Farmstead	Unevaluated	
BE-LER-00015	Historic Architecture	Bridge No. 5296	Unevaluated	Constructed 1934
BE-MKC-00337	Historic Architecture	Mendota-Big Sioux River Road: Mankato Section	Unevaluated	
BE-MKC-00426	Historic Architecture	Bridge No. 07016	Unevaluated	Constructed 1976

Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
BE-MKC-00432	Historic Architecture	Bridge No. 07015	Not Eligible	
BE-MKC-00433	Historic Architecture	Bridge No. 07017	Not Eligible	
BE-MKC-00434	Historic Architecture	Bridge No. 07018	Not Eligible	
BE-MKC-00435	Historic Architecture	Bridge No. 07019	Not Eligible	
BE-MKC-00436	Historic Architecture	Bridge No. 07020	Not Eligible	
BE-MKC-00443	Historic Architecture	Bridge No. 07009	Not Eligible	
BE-MKC-00444	Historic Architecture	Bridge No. 07010	Not Eligible	
BE-MKT-00018	Historic Architecture	House	Unevaluated	Constructed 1940
BE-MKT-00019	Historic Architecture	House	Unevaluated	Constructed 1910
DO-CLC-00042	Historic Architecture	Farmstead	Not Eligible	
DO-CLT-00008	Historic Architecture	Farmstead	Unevaluated	Constructed 1910
DO-CLT-00014	Historic Architecture	Arendts Farmstead	Eligible	Constructed 1900
DO-CLT-00023	Historic Architecture	Farmstead	Unevaluated	Constructed 1900
DO-CLT-00034	Historic Architecture	Farmstead	Unevaluated	Constructed 1920
DO-CLT-00035	Historic Architecture	Farmstead	Unevaluated	Constructed 1920
DO-CLT-00047	Historic Architecture	Lehmann Farmstead	Eligible	Constructed 1895
DO-CLT-00048	Historic Architecture	Claremont Hillside Cemetery	Not Eligible	Constructed 1870
DO-CLT-00049	Historic Architecture	St. Francis de Sales Cemetery	Not Eligible	Constructed 1870
DO-CLT-00052	Historic Architecture	McMartin House	Not Eligible	Constructed 1970
DO-CLT-00064	Historic Architecture	Culvert 91588	Not Eligible	
DO-KSC-00023	Historic Architecture	Bridge No. 20001	Not Eligible	
DO-KSC-00024	Historic Architecture	Bridge No. 20002	Not Eligible	
DO-MTT-00013	Historic Architecture	Culvert 91927	Not Eligible	
DO-WAS-00037	Historic Architecture	Arents Farmstead	Not Eligible	Constructed 1916
DO-WAS-00039	Historic Architecture	Farmstead	Unevaluated	

Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
DO-WAS-00040	Historic Architecture	Winona & St. Peter Railroad/Chicago and North Western Railway Company: Wasioja Twp. Segment	Eligible	
LE-KSC-00020	Historic Architecture	Mendota-Big Sioux River Road	Unevaluated	
LE-KST-00013	Historic Architecture	Mendota-Big Sioux River Road: Kasota Twp. Section	Unevaluated	
LE-KST-00014	Historic Architecture	Mendota-Big Sioux River Road: Kasota Twp. Section	Unevaluated	
ST-HAV-00011	Historic Architecture	Winona & St. Peter Railroad Havana Twp. Segment	Eligible	
ST-HAV-00013	Historic Architecture	Farmstead	Unevaluated	
ST-HAV-00016	Historic Architecture	Farmstead	Unevaluated	
ST-HAV-00017	Historic Architecture	Farmstead	Unevaluated	Constructed 1915
ST-HAV-00020	Historic Architecture	Farmstead	Unevaluated	
ST-HAV-00021	Historic Architecture	Farmstead	Unevaluated	
ST-HAV-00027	Historic Architecture	Farmstead	Unevaluated	Constructed 1890
ST-HAV-00032	Historic Architecture	Homeyer Farmstead	Eligible	Constructed 1895
ST-HAV-00034	Historic Architecture	Pichner Farmstead	Eligible	Constructed 1850
ST-HAV-00035	Historic Architecture	Dunker Farmstead	Eligible	Constructed 1900
ST-HAV-00038	Historic Architecture	Thompson Farmstead	Eligible	Constructed 1900
ST-MER-00012	Historic Architecture	Krause Barn	Unevaluated	Constructed 1900
ST-ONA-00001	Historic Architecture	Owatonna Township Hall	Unevaluated	
ST-ONA-00008	Historic Architecture	Cashman Barn	Unevaluated	Constructed 1927

Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
ST-ONA-00014	Historic Architecture	Kaspar, A. and R., Farmhouse	Eligible	Constructed 1903
ST-ONA-00015	Historic Architecture	Burlington, Cedar Rapids and Northern Railroad: Owatonna Twp.	Eligible	Constructed 1901
ST-ONA-00016	Historic Architecture	Farmstead	Unevaluated	Constructed 1900
ST-ONA-00017	Historic Architecture	Meixner Farmstead	Unevaluated	
ST-ONA-00018	Historic Architecture	Minnesota Central Railroad Owatonna Twp. Segment	Eligible	Constructed 1866
ST-ONA-00019	Historic Architecture	Bridge No. 74820	Not Eligible	Constructed 1965
ST-ONA-00020	Historic Architecture	Bridge No. 74001	Unevaluated	
ST-ONA-00021	Historic Architecture	Bridge No. 74002	Unevaluated	
ST-ONA-00022	Historic Architecture	Bridge No. 74003	Unevaluated	
ST-ONA-00023	Historic Architecture	Bridge No. 74004	Unevaluated	
ST-ONA-00024	Historic Architecture	Bridge No. 74005	Unevaluated	
ST-ONA-00026	Historic Architecture	Bridge No. 74819	Unevaluated	
ST-ONA-00030	Historic Architecture	Bridge No. 74809	Unevaluated	
ST-ONA-00037	Historic Architecture	Bridge No. 2055	Unevaluated	
WE-SMY-00037	Historic Architecture	Bridge No. 2585	Unevaluated	
WE-WOD-00020	Historic Architecture	Sammon Farmhouse	Unevaluated	Constructed 1910
XX-ROD-00016	Historic Architecture	Trunk Highway/U.S. Trunk Highway 14	Not Eligible	
XX-ROD-00022	Historic Architecture	Trunk Highway 56	Not Eligible	
XX-ROD-00042	Historic Architecture	Trunk Highway 60	Not Eligible	
XX-ROD-00056	Historic Architecture	Trunk Highway 22	Not Eligible	
XX-ROD-00072	Historic Architecture	Trunk Highway 57	Not Eligible	
XX-ROD-00112	Historic Architecture	Trunk Highway 218	Not Eligible	

Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
XX-ROD-00164	Historic Architecture	Trunk Highway 13	Not Eligible	
XX-ROD-00178	Historic Architecture	Trunk Highway 65	Not Eligible	
XX-RRD-00015	Historic Architecture	Sakatah Singing Hills State Trail	Eligible	
XX-RRD-CNW004	Historic Architecture	Minneapolis and St. Louis Railway Company/Albert Lea Route: Minneapolis to Merriam Junction Segment	Unevaluated	
XX-RRD-CNW006	Historic Architecture	St. Paul and Sioux City Railroad Company/Chicago St. Paul Minneapolis and Omaha Railway Company (Omaha)/Chicago and North Western Railway Company/Minnesota Valley Railroad Company mainline	Eligible	
XX-RRD-CNW010	Historic Architecture	Minneapolis and St. Louis Railway Company/Chicago and North Western Railway Company: Minneapolis to Iowa State Line at Emmons	Not Eligible	Constructed 1871-1879

Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
XX-RRD-CNW012	Historic Architecture	Minneapolis and St. Louis Railway Company/Chicago and North Western Railway Company: Merriam Junction to Iowa State Line at Emmons	Not Eligible	Constructed 1877-1879
XX-RRD-CSP017	Historic Architecture	Milwaukee and St. Paul Railway Company/Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company: Iowa and Minnesota Division Main Line	Not Eligible	
XX-RRD-CSP018	Historic Architecture	Minnesota Central Railway Co./Milwaukee and St. Paul Railway Co./Chicago Milwaukee and St. Paul Railway Co./Chicago Milwaukee St. Paul and Pacific Railway Co.	Not Eligible	

Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
XX-RRD-CSP022	Historic Architecture	Minnesota Central Railway Company/Milwaukee and St. Paul Railway Company/Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company, Owatonna to Austin	Eligible	
XX-RRD-CSP041	Historic Architecture	Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company: Mankato-Farmington Branch	Not Eligible	
XX-WSD-00001	Historic Architecture	Crane Creek Watershed Project - Steele and Waseca	Unevaluated	
Cemetery ID 24267	Historic Cemetery	Bohemian Cemetery	N/A	Mapped at PLS Forty Level in Section 22 in Township 107N, Range 20W
Cemetery ID 19495	Historic Cemetery	Calvary Cemetery (Old	N/A	Also known as the "Old Catholic Cemetery. Mapped at PLS Forty level in S5, T108N, R26W. Est. 1857, and many burials relocated to the new Calvary Cemetery, est. 1885.
Cemetery ID 20716	Historic Cemetery	Catholic Cemetery	N/A	Mapped at the PLS Township level in Township 109N.
Cemetery ID 19425	Historic Cemetery	Eagle Lake Cemetery	N/A	Est. 1883. Mapped at PLS Forty Level in Section 18, T108N, R25W

Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
Cemetery ID 20283	Historic Cemetery	Fairpoint Cemetery	N/A	Mapped at PLS Township level in Township 106N.
Cemetery ID 20260	Historic Cemetery	Hilltop Catholic Cemetery	N/A	Also known as St. Francis De Sales, est. 1894, and encompassed by Hillside Presbyterian Cemetery, est. 1899. Mapped at the PLS Forty level in Section 33 of T107N, R18W.
Cemetery ID 20271	Historic Cemetery	Maple Grove Cemetery	N/A	Est 1886. PLS Forty level in Section 4, T106N, R16.
Cemetery ID 22692	Historic Cemetery	Othello Cemetery	N/A	Est. 1862. Mapped at the PLS Section Level in Section 31 of Township 108N, Range 15W.
Cemetery ID 19491	Historic Cemetery	Pilgrims Rest Cemetery	N/A	Mapped at the Section level in S31, T109N, R26W. Est. 1858.
Cemetery ID 19456	Historic Cemetery	Rural Grove Cemetery 2/2	N/A	Mapped at the PLS Forty level in S5, T108N, R26W. Est. 1864. May also be present in S8, T108N, R26W.
Cemetery ID 24279	Historic Cemetery	Sacred Heart Cemetery	N/A	PLS Forty Level in Section 21 in T107N, R20W.
Cemetery ID 24255	Historic Cemetery	Thompson Cemetery	N/A	PLS Forty Level in Section 27 of T107N, R19W.

[1] Source: reference (245)
[2] Source: reference (246)
[3] Source: reference (247)
[4] Source: reference (248)
[5] Source: reference (249)
[6] Source: reference (250)
[7] Source: reference (251)
[8] Source: reference (252)
[9] Source: reference (253)
[10] Source: reference (254)
[11] Source: reference (255)
[12] Source: reference (256)
[13] Source: reference (257)
[14] Source: reference (258)

7.8.1.1 NRHP-Eligible Resources

There are 16 NRHP-eligible cultural resources within the ROI of Route Segment 17, including two archaeological sites and 14 historic architectural resources. The archaeological sites include a precontact artifact scatter and a large litchi scatter. The historic architectural resources eligible consist of six nineteenth/early twentieth century farmsteads, a farmhouse, six historic railroad corridors, and the Sakatah Singing Hills State Trail. Additional information regarding each is provided in Sections 7.8.1.1.1 through 7.8.1.1.16.

7.8.1.1.1 21DO0004/Dodge Center Creek East

Site 21DO0004/Dodge Center Creek East is a precontact artifact scatter, likely representing a habitation site, on a wooded upland terrace along Dodge Center Creek. This site was originally identified as a lithic scatter in May of 1991 during a surface reconnaissance conducted by Archaeological Research Services. In October 1991, Archaeological Research Services conducted a Phase II investigation of the site to determine NRHP eligibility, during which a grit-tempered ceramic body sherd, fire cracked rock, charcoal fragments, lithic (primarily chert) flakes, a biface, a smoother and grindstone fragment, were all recovered between 10 and 40 centimeters below ground surface within intact deposits. This site was determined eligible for the NRHP under criterion D for its potential to yield information important to our understanding of patterns of activity, settlement patterns, and raw material procurement for this period of prehistory (reference (249)). In 1994, The 106 Group Ltd conducted a Phase II investigation to re-evaluate the NRHP eligibility of the Dodge Creek East site. However, because the investigation did not identify cultural materials associated with the site within the survey area, a re-evaluation of the site's NRHP eligibility was not possible at that time (reference (249)).

7.8.1.1.2 21DO0014/Unnamed

Site 21DO0014 is a large, 88-acre lithic scatter situated on an upland terrace adjacent to a drained lake or wetland in Dodge County. The site was identified during a Phase I Archaeological survey conducted in 2008 by Florin Cultural Resource Services, during which over 500 lithics were recovered, including Archaic, Woodland, and Oneota Period projectile points. Projectile point types include Agate Basin, Tama, Raddatz, Table Rock and Bottleneck Stemmed, Lamoka Cluster, Cedar Valley, Nodena Banks, Madison Triangular, Steuben Type, and small side-notched types. A three-acre portion of the site was then revisited by Florin Cultural Resource Services in 2009 during a Phase II investigation to evaluate the site's eligibility for listing on the NRHP, during which additional lithic debitage and tools were recovered (reference (250)).

7.8.1.1.3 Arendts Farmstead (Resource ID DO-CLT-00014)

The Arendts Farmstead consists of a house (c. 1900-1940s), barn (c. 1930), silo (c. 1930), hog barn (c. 1920), corncrib (c. 1950), corncrib pad (c. 1950), grain bin (c. 1970) and an implement shed (c. 1990) situated on a 4.5-acre lot (Abel 2008). The farmstead is depicted on historic maps by 1894, at which time the lot was owned by S. Kennedy, and later purchased by B. C. Arendts. Arendts immigrated to Iowa from Norway, in the late nineteenth century, and in 1913 relocated to Dodge County, MN, where he married and raised a family on this farmstead. Most of the existing structures on the farmstead were constructed during this time period. This resource is eligible for the NRHP under Criterion C, as it embodies the “distinctive characteristics of a type, period, or method of construction”. The resource maintains structural integrity and is an example of a “family operated diversified farmstead built and operated in the early 20th century and embodies the physical characteristics that distinguish Minnesota’s diversified family farmstead of that period” (reference (259)). It intersects the route width of Route Segment 17 in Section 25 of Township 107N, Range 18W in Claremont Township of Dodge County.

7.8.1.1.4 Lehmann Farmstead (Resource ID DO-CLT-00047)

The Lehmann Farmstead was established in 1895 and consists of structures constructed between 1895 and 1990. Extant structures include a two-level ground barn (c. 1919), farmhouse (c. 1895, since altered), silo (c. 1945), gable-roofed shed (c. 1920), wood frame brooder house (1930), and a wood frame double-car garage (c. 1990). Several structures have been removed or demolished, including a milk house, hog barn, corn crib, and chicken house. This farmstead is eligible for the NRHP under Criterion C, as the barn is a well-preserved example of a Two-Level Ground Barn characteristic of late nineteenth and early twentieth century timber frame barns constructed by Minnesotans of German descent between 1867 and 1925 (reference (260)). The farmstead is also eligible under Criterion A for its association with agricultural development during and after the construction and expansion of the state’s railroad system extending to agricultural regions in rural Minnesota from 1900-1919, considered the Golden Age of agriculture in Minnesota (reference (260)). It intersects the route width of Route Segment 17 in Section 32 of Township 107N, Range 18W in Claremont Township of Dodge County.

7.8.1.1.5 Homeyer Farmstead (Resource ID ST-HAV-00032)

The Homeyer Farmstead (known as the Caroll Farm at the time of reporting in 2008) consists of a 60 acre parcel on which farmstead structures constructed between 1895 and the 1990s century are present, including an American Foursquare-style farmhouse (c. 1900), timber-frame barn (c. 1895), granary-implement shed (c. 1900), pump house (c. 1900), chicken house (c. 1900), hog barn (c. 1920s), and modern structures dating to the 1980s and 1990s). The farmstead was established by the Henry Homeyer and family who immigrated to Minnesota from Germany in the mid-nineteenth century, and operated the farm from the late nineteenth through the early/mid-twentieth centuries. This resource is eligible for the NRHP under Criterion C, as the barn is a well-preserved example of a Two-Level Ground Barn characteristic of late nineteenth and early twentieth century timber frame barns constructed by Minnesotans of German descent, with a period of significance between 1895-1930 (reference (261)). It intersects the route width of Route Segment 17 in Section 32 of Township 107N, Range 18W in Havana Township of Steele County.

7.8.1.1.6 Pichner Farmstead Barn and Silo (Resource ID ST-HAV-00034)

The Pichner Farmstead was established in the 1850s and consists of several structures constructed between 1850 and 1990; however, only the barn (c. 1937) and silo (c. 1940) are considered eligible for listing on the NRHP due to significant alteration and/or loss of integrity of many of the remaining farmstead structures. The barn, with an attached silo, is an intact example of a Wisconsin dairy barn design of the 1930s, and the silo is a cement stave construction with a domed metal roof and chut. The barn and silo were designed to maximize labor efficiency, storage capacity, and animal wellness, in order to increase productivity. These structures are therefore eligible for the NRHP under Criterion C, for embodying the distinctive characteristics of type, period, or method of construction (reference (262)). It intersects the route width of Route Segment 17 in Section 26 of Township 107N, Range 19W.

7.8.1.1.7 Dunker Farmstead (Resource ID ST-HAV-00035)

The Dunker Farmstead was occupied by Herman Dunker, a German-born Minnesotan, and includes 10 structures constructed between 1900 and 1980; however, only the barn and silo are considered eligible for listing on the NRHP, due to poor integrity and/or alteration of the many of the other structures. The barn is a timber frame traverse frame structure, also known as a Midwest three-portal barn, with a central aisle and enclosed side aisles, constructed in 1900. The attached cement stave silo with a domed metal roof was constructed in 1940. Well-preserved examples of this type of timber-frame barn are rare. These structures are therefore eligible for the NRHP under Criterion C, for embodying the distinctive characteristics of type, period, or method of construction (reference (263)). It intersects the route width of Route Segment 17 in Section 30 of Township 107N, Range 19W.

7.8.1.1.8 Thompson Farmstead (Resource ID ST-HAV-00038)

The Thompson Farmstead was established in the late nineteenth century by Fred K. Schwake, and later purchased by Theodore and Christina Thompson (Minnesotans of Norwegian descent) in 1908, who operated the farm into the 1930s (reference (264)). It consists of 12 structures constructed between 1900 and 1980; however, only the barn and silo are considered eligible for listing on the NRHP, due to poor integrity and/or alteration of the many of the other structures. The barn is a timber frame structure with a gambrel roof and a hay mow door, constructed in 1900. The attached cement stave silo with a domed metal roof was constructed in 1940. Well-preserved examples of this type of timber-frame barn are rare. These structures are therefore eligible for the NRHP under Criterion C, for embodying the distinctive characteristics of type, period, or method of construction (reference (264)). It intersects the route width of Route Segment 17 in Section 26 of Township 107N, Range 19W, in Havana Township of Steele County.

7.8.1.1.9 Kasper, A. and R. Farmhouse (Resource ID ST-ONA-00014)

The Kasper Farmhouse is a wood-frame, two-story, Queen-Anne-inspired domestic dwelling constructed in 1903. It has a limestone foundation and a hipped and gabled roof, an L-shaped open porch, and clapboard siding with corner boards. This dwelling is the only extant structure remaining of the Kasper Farmstead, which was owned in the late nineteenth to the early twentieth century by Czech immigrants Albert and Rose Kasper. The farmhouse is eligible for listing on the NRHP under Criterion C, for embodying the distinctive characteristics of type, period, or method of construction as a well-preserved example of a large Queen-Anne inspired early twentieth century dwelling (reference (265)). It intersects the route width of Route Segment 17 in Section 22 of Township 107N, Range 20W in Owatonna Township of Steele County.

7.8.1.1.10 Winona & St. Peter Railroad/Chicago and Northwestern Company: Wasioja Twp Segment (Resource ID DO-WAS-00040)

This resource consists of the Winona & St. Peter Railroad, later called the Chicago and Northwestern Railroad, and currently the Dakota, Minnesota and Eastern Railroad, an active railroad which was constructed in Owatonna in 1866 (reference (266)). Architectural and Historic Research conducted a survey in 1999/2000 of this railway and recommended the entire Winona & St. Peter Railroad line be eligible as a historic district. The 1.5-mile Wasioja Twp Segment is eligible as a part of this district and includes a trestle over the Zumbro River and a small wooden trestle over a creek. The dates of significance are from 1866 to 1949 (reference (266)). It intersects the route width of Route Segment 17 in Section 31 of Township 107N, Range 17W in Wasioja Township of Dodge County.

7.8.1.1.11 Winona & St. Peter Railroad Havana Twp Segment (Resource ID ST-HAV-00011)

This resource consists of the Winona & St. Peter Railroad, later called the Chicago and Northwestern Railroad, and currently the Dakota, Minnesota and Eastern Railroad), an active railroad which was constructed in Owatonna in 1866 (reference (267)). Architectural and Historic Research conducted a survey in 1999/2000 of this railway and recommended the entire Winona & St. Peter Railroad line eligible as a historic district under Criterion A, for its significant contribution to the development of railway transportation throughout southern Minnesota during the late nineteenth and early twentieth centuries. The 6-mile Havana Twp Segment is eligible as a part of this district and includes a wooden trestle, 50 feet in length, west of 44th Ave SE. The dates of significance are from 1866 to 1949 (reference (267)). It intersects the route width of Route Segment 17 in Sections 21, 22, 25, and 26 of Township 107N, Range 19W in Havana Township of Steele County.

7.8.1.1.12 Burlington, Cedar Rapids and Northern Railroad: Owatonna Twp Segment (Resource ID ST-ONA-00015)

The Burlington, Cedar Rapids, and Northern Railroad (later the Chicago, Rock Island, and Pacific, and currently the Union Pacific Railroad), constructed in 1901, extends 53 miles between Albert Lea in Freeborn County to the north through Steele and Rice Counties. This inventoried segment consists of an active 400-foot segment of the railroad that intersects U.S. Highway 14. This segment is eligible for listing on the NRHP as a part of the eligible historic district, consisting of the entire Burlington, Cedar Rapids, and Northern Railroad line, under Criterion A for its significance as an early transportation route, facilitating the settlement and development of southern Minnesota (reference (268)). It intersects the route width of Route Segment 17 in Section 21 of Township 107N, Range 18W in Owatonna Township of Steele County.

7.8.1.1.13 Minnesota Central Railroad Owatonna Twp Segment (Resource ID ST-ONA-00018)

The Minnesota Central Railroad (later the Chicago, Milwaukee, and St. Paul Railroad and currently the Iowa, Chicago, and Eastern Railroad), constructed in 1866, was the first completed railroad line connecting Minneapolis and Chicago. The Minnesota Central Railroad from Minneapolis to the Minnesota-Iowa border is eligible for listing on the NRHP as a linear historic district under Criterion A for its significance as an early transportation route, facilitating the settlement and development of central Minnesota and connecting the industrial and commercial centers in the Twin Cities and Chicago (reference (269)). This inventoried segment consists of an active 1500-foot segment of the railroad that intersects with U.S. Highway 14 in Section 23 (reference (269)). It intersects the route width of Route Segment 17 in Section 23 of Township 107N, Range 18W in Owatonna Township of Steele County.

7.8.1.1.14 St. Paul and Sioux City Railroad Company/Chicago St. Paul Minneapolis and Omaha Railway Company (Omaha)/Chicago and Northwestern Railway Company/Minnesota Valley Railroad Company mainline (Resource ID XX-RRD-CNW006)

The St. Paul and Sioux City Railroad Company/Chicago St. Paul Minneapolis and Omaha Railway Company /Chicago and Northwestern Railway Company/Minnesota Valley Railroad Company mainline, constructed between 1865 and 1870, extends 118 miles northeast-southwest through Ramsey, Dakota, Scott, Le Sueur, Blue Earth and Watonwan Counties, the majority of which is extant, with the exception of a 2-mile segment in St. Paul. The Minesota Central Railroad from Minneapolis to the Minnesota-Iowa border is eligible for listing on the NRHP as a linear historic district under Criterion A for its significance as an early transportation route, facilitating the settlement and development of southwestern Minnesota and the transport of grain to mills in the Twin Cities (reference (122)). It intersects the route width of Route Segment 17 in Section 5 of Township 108N, Range 26W in Mankato in Blue Earth County.

7.8.1.1.15 Minnesota Central Railway Company/Milwaukee and St. Paul Railway Company/Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company, Owatonna to Austin (Resource ID XX-RRD-CSP022)

Minnesota Central Railway Company/Milwaukee and St. Paul Railway Company/Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company, Owatonna to Austin, constructed in 1867, consists of the railroad ROW running northwest-southeast between Owatonna in Steele County and Austin in Mower County. This resource was determined eligible for the NRHP in June 2021. No additional information is available on the MnSHIP portal regarding this resource; however, it is reasonable to presume that the resource is eligible under Criterion A, for its significance as an early transportation route, facilitating the settlement and development of southern Minnesota. It intersects the route width of Route Segment 17 in Section 23 of Township 107N, Range 20W in Owatonna in Steele County.

7.8.1.1.16 Sakatah Singing Hills State Trail (Resource ID XX-RRD-00015)

Currently functioning as a recreational trail, this resource was formerly the WM&P line from Waterville to Mankato. This resource is eligible for listing on the NRHP under Criterion A for its significant role in the expansion of industry and commerce by facilitating the transportation of goods between portions of rural Minnesota and larger industrial centers. It crosses the route width of Route Segment 17 in Section 5 of Township 108N, Range and 26W along North Riverfront Drive in Mankato, in Blue Earth County.

7.8.2 Potential Impacts

Potential impacts are assessed through identification of documented archaeological and historic resources within one mile of the anticipated alignments. An emphasis is placed on resources within the route width (i.e., the ROI), which could have the most potential impact. Route Segment 17 would parallel U.S. Highway 14 but would not be double-circuited along an existing transmission line for the majority of its length. Construction activities resulting in ground disturbance could impact archaeological resources. However, portions of the route width may have been previously disturbed from construction activities related to Highway 14, reducing potential impacts to intact archaeological resources. Further, structures could be strategically placed to minimize impacts to below ground culture resources.

Direct impacts to archaeological and historic architectural resources could result from construction activities, such as ROW clearing, placement of structures, new access roads, temporary construction areas, vehicle and equipment operation, and removal of historic buildings or structures. Additional direct impacts can result from transmission line location and operation, such as placement within view of a resource (typically a historic building, structure, or TCP) that results in a negative effect on the setting, feeling, and/or association of the resource in the viewshed. This issue is particularly applicable when considering cultural resources where the surrounding environment plays an essential role in defining the character.

Within the route width of Route Segment 17, there are two NRHP-eligible, and 28 unevaluated, archaeological sites. The route width also contains 14 NRHP-eligible, and 37 unevaluated, historic architectural resources. Twelve unrecorded Euroamerican cemeteries may intersect the route width; however, these are all mapped at the PLS Forty, Section, or Township level, and the exact locations are unknown.

7.8.2.1 Archaeological Sites

Thirty-four archaeological sites intersect the route width of Route Segment 17, including two NRHP-eligible, four ineligible, and 28 unevaluated resources. Sites are concentrated in the Eagle Lake vicinity of Blue Earth County, identified during a Phase I archaeological survey by the University of Minnesota Archaeology Laboratory in 1971 (reference (270)) and by IMA Consulting in 1995 (reference (245)); in western Waseca county, most of which were identified during a Phase I archaeological survey conducted by Loucks Associates in 2002; in the Woodville region in eastern Waseca County, mostly identified during a Phase I archaeological survey by BWR, Inc. in 1995 (reference (254)); and in eastern Steele County, south of Rice Lake State Park, identified during a Phase I archaeological survey conducted by Florin Cultural Resources Services in 2007 (reference (250)). A majority of the previously identified archaeological sites within the route width were surveyed between 1971 and 2008. An additional survey would help to determine whether intact sites are still present within the route width. The majority of the study area for Route Segment 17 is of unknown potential for the presence of archaeological sites, according to the Survey Implementation Model (MnModel 4) available on the OSA portal (reference (130)). However, this model shows high potential for sites along the shores of lakes and rivers present in some portions of the study area.

7.8.2.2 Historic Architecture

Of the 82 historic architectural resources that intersect the route width, 14 are eligible for listing on the NRHP, consisting of segments of six historic railroad corridors, five nineteenth/twentieth century farmsteads, an early twentieth century domestic dwelling, and the Sakatah Singing Hills Trail (Section 7.8.1.1) for more information about these NRHP-eligible resources. Project impacts to these resources would be limited to potential alterations to the viewshed and setting surrounding the resources, including additional traffic, noise, and truck activity during construction, and visibility of the transmission line and support structures during operation. This would be most relevant to the farmstead and domestic dwelling resources.

The Arendts Farmstead (DO-CLT-00014) intersects the route width near Claremont in Dodge County, north of the Chicago and Northwestern Railroad line, and within 200 feet of U.S. Highway 14. The anticipated alignment would cross U.S. Highway 14 approximately 400 feet west of the resource, and thus would likely have minimal impact on the viewshed surrounding this resource. The transmission line and support structures may be visible from portions of resources Lehmann Farmstead (DO-CLT-00047), Homeyer Farmstead (ST-HAV-00032), Pichner Farmstead Barn and Silo (resource ID ST-HAV-00034), Dunker Farmstead (resource ID ST-HAV-00035), Thompson Farmstead (resource ID ST-HAV-00038), and the Kasper, A. and R. Farmhouse (ST-ONA-00014), though stands of trees provide at least partial visual screening around these resources. Additionally, the structures associated with resource ST-HAV-00032 are located north of U.S. Highway 14, whereas the anticipated alignment would be located south of the highway.

The project would not be likely to impact the NRHP-eligible railroad corridors, as these resources are currently functioning as active railroads for freight transportation, and the project would not interfere with this function. The transmission line and support structure would likely be visible to users of the Sakatah Singing Hills State Trail (XX-RRD-00015) where it intersects the route width in Mankato. However, the viewshed from this portion of the trail is characterized by built industrial structures and U.S. Highway 14; therefore, the project would not significantly alter the setting of this portion of the resource.

There are 37 unevaluated resources consisting primarily of railroads, farmsteads, bridges, and roadways. The 31 ineligible resources include bridges, farmsteads, domestic dwellings, railroads, roadways, and the Crane Creek Watershed Project. In addition, the Dakota and Ho-Chunk Forced Relocation Route may be in or near the western-most portion of the Route Segment 17 (and of Segments 1 North and 1 South) in Mankato, south of the Wilmarth Substation. Dakota and Ho-Chunk THPOs should be consulted to determine whether this resource is present and whether mitigation measures are warranted.

7.8.3 Mitigation

If a Route Permit is issued, and upon route selection, the applicant would consult with SHPO concerning additional required mitigation measures and would develop a Phase I Cultural Resource Survey Strategy and associated Cultural Resource Survey Reconnaissance survey to identify unknown cultural resources along the proposed route. All investigations would be conducted by a professional archaeologist meeting the Secretary of the Interior's Standards for Archaeology as detailed in the Title 36 Code of Federal Regulations, Part 6. SHPO and interested Tribes will be consulted on methodology prior to completing the study.

As noted in Section 7.5.2 of the joint certificate of need application and route permit application, the applicant will develop an Unanticipated Discoveries Plan, which will outline protocol and mitigation measures, should archaeological resources or human remains be encountered during project construction. The plan will include contact information for SHPO officials, environmental inspectors, archaeologists, geologists, and county sheriffs.

The applicant has engaged, and will continue to engage, with THPOs and interested Tribes to share project information and to glean information about resources of tribal significance that may be impacted by the project.

7.9 Natural Environment

7.9.1 Air Quality

The ROI for air quality is the project area. Impacts can occur during construction and operation of a transmission line and substation. Potential impacts to air quality during construction would be intermittent, localized, short-term, and minimal. Impacts are associated with fugitive dust and exhaust and can be mitigated. Long-term impacts to air quality would also be minimal and are associated with the creation of ozone and nitrous oxide emissions along the HVTL and substations. These localized emissions would be below state and federal standards. Impacts are unavoidable and do not affect a unique resource.

7.9.1.1 Existing Conditions

The Clean Air Act is a federal law that regulates air emissions from stationary and mobile sources. The Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to set (NAAQS for six common air pollutants, referred to as "criteria pollutants". The six criteria pollutants are ground-level ozone O_3, PM_{10} and $PM_{2.5}$, SO_2, nitrogen dioxide (NO_2), carbon monoxide (CO), and lead (Pb) (reference (131)). NAAQS are set to address the public health and welfare risks posed by certain widespread air pollutants (references (132); (133)).

The Clean Air Act identifies two classes of NAAQS: primary standards, which are limits set to protect the public health of the most sensitive populations, such as asthmatics, children, and the elderly; and secondary standards, which are limits set to protect public welfare, such as protection against visibility impairment or damage to vegetation, wildlife, and structures. Compliance with the national and state air quality standards in the state of Minnesota is assessed at the county level. Minnesota's state air quality standards align with NAAQS. The EPA designates all counties traversed by Route Segment 17 to be in attainment for all NAAQS.

In Minnesota, air quality is monitored using stations located throughout the state. The MPCA uses data from these monitoring stations to calculate the Air Quality Index (AQI) on an hourly basis for O_3, $PM_{2.5}$, SO_2, NO_2, and CO. Each day is categorized based on the pollutant with the highest AQI value for a particular hour (reference (134)).

The Rochester air quality monitoring station is in Olmsted County, approximately 15 miles southeast of Route Segment 17. The station monitors for O_3 and $PM_{2.5}$. Table 7-14 summarizes the days in each AQI category at the Rochester monitoring station for the most recent five-year period available, 2019-2023.

Table 7-14 Days in Each Air Quality Index Category - Rochester Monitoring Station

Year	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy
2023	190	160	14	1	0
2022	280	78	1	0	0
2021	275	84	2	0	0
2020	292	73	1	0	0
2019	271	93	0	0	0

Air quality at the Rochester monitoring station has been considered “good” for the majority of the past five reported years. The reporting period 2023 had the largest number of days classified as moderate or worse, with 160 days classified as moderate, 14 days classified as unhealthy for sensitive groups, and one day classified as unhealthy.

7.9.1.2 Potential Impacts

Air emissions during construction would primarily consist of emissions from construction equipment and vehicles and would include pollutants such as CO_2, nitrogen oxides (NO_x), and PM. Dust generated from earth disturbing activities also gives rise to $PM_{10}/PM_{2.5}$. Double-circuiting with an existing transmission line would result in less $PM_{10}/PM_{2.5}$ emissions due to less ground disturbance. Adverse effects on the surrounding environment are expected to be negligible due to the temporary disturbance during construction and the intermittent nature of the emission- and dust-producing construction phases.

During operations, air emissions would not require any air quality permits. Small amounts of emissions would be associated with the intermittent project operation and maintenance activities via mobile combustion and particulate roadway dust generation.

During operation, small amounts of NO_X and O_3 would be created due to corona from the operation of transmission lines. The production rate of O_3 due to corona discharges decreases with humidity and less significantly with temperature. Rain causes an increase in O_3 production. In addition to weather conditions, design of the transmission line also influences the O_3 production rate. The O_3 production rate decreases significantly as the conductor diameter increases and is greatly reduced for bundled conductors over single conductors. Conversely, the production rate of O_3 increases with applied voltage (reference (135)). The emission of O_3 from the operation of a transmission line of the voltages proposed for the project would be minimal.

Emissions would be generated from fuel combustion during routine inspection and maintenance activities. The applicant would perform an annual aerial inspection of the line. Once every four years, crews would visually inspect the lines from the ground. Additionally, vegetation maintenance would generally occur once every four years. Emissions from routine inspection and maintenance activities would be minimal.

7.9.1.3 Mitigation

As noted in the joint certificate of need application and route permit application, if construction activities generate problematic dust levels, the applicant would employ construction-related practices to control fugitive dust as needed. This could include application of water or other commercially available non-chloride dust control agents on unpaved areas subject to frequent vehicle traffic, reducing the speed of vehicular traffic on unpaved roads, and covering open-bodied haul trucks.

As also noted in the route permit application, corona effects would be minimized during operation by using good engineering practices, such as the use of bundled conductors. A corona signifies a loss of electricity, so the applicant would engineer the transmission lines to limit corona.

7.9.2 Climate

The ROI for climate change is the project area. The impact analysis for climate considers existing patterns in the ROI and how the project could be impacted by climate change, as well as how the project could affect climate change. For the counties crossed by Route Segment 17, flood risk is minor or moderate, and fire risk is moderate. The project would minimally contribute to climate change impacts as a result of GHG emissions. The project would be engineered to be resilient under changing climatic factors, including increased average temperatures and changes in precipitation intensities and quantities.

7.9.2.1 Existing Conditions

Climate change is observed as changes in temperature and precipitation patterns, increases in ocean temperatures and sea levels, changes in extreme weather events, and ecosystem changes. These changes are largely attributed to the greenhouse effect. As the amount of greenhouse gases (GHGs) in the Earth's atmosphere increases, the greenhouse effect causes the Earth to become warmer (reference (136)).

There are also naturally occurring climate variations. These are cyclical patterns caused by variations in ocean circulation and atmospheric pressure patterns that occur on timescales of weeks to decades. Increased global surface temperatures could change these natural climate patterns and the resulting impact on regional precipitation and temperature anomalies (reference (137)).

Warmer and wetter conditions have been observed in Minnesota since observations first began in 1895, especially in the past several decades. An increase in precipitation volume and intensity has also been observed, including large-area extreme rainstorms. A rise in temperatures, particularly during the winter season in Minnesota, has been occurring as well. These trends are expected to continue (reference (138)).

To understand how climate change is anticipated to affect the project area, historical and projected climate data is considered, as well as climate hazard projections.

Climate projections are based on the Minnesota dynamically downscaled climate model data that was developed by the University of Minnesota and are summarized in three scenarios: Shared Socioeconomic Pathway (SSP) 245, SSP370, and SSP585. SSP is a measure adopted by the Intergovernmental Panel on Climate Change (IPCC) to represent various greenhouse gas concentration pathways as well as social and economic decisions (reference (139)).

SSP245 represents a "Middle of the Road" scenario where economic, social, and technological trends follow historical patterns, population growth is moderate, and inequality persists. Additionally, SSP245 includes an intermediate emissions scenario, where a net radiative forcing of 4.5 watts per meter squared (W/m^2) is received by the earth due to the greenhouse gas (GHG) effect and emissions begin to decrease around 2040 (reference (139)).

SSP370 represents a "Regional Rivalry" scenario where nations focus on regional issues instead of cross-collaboration and development. SSP370 also includes a high emissions scenario, where a net radiative forcing of 7.0 W/m^2 is received by the earth (reference (139)).

SSP585 represents a "Fossil-fueled Development" scenario where there is increased development in competitive markets driven by an increased global consumption of fossil fuels. SSP585 also includes a very high emissions scenario, where a net radiative forcing of 8.5 W/m^2 is received by the earth and no emissions are reduced through 2100 (reference (139)).

Table 7-15 shows the modeled historical and projected temperature values for the project.

Table 7-15 Modeled Historical and Projected Temperature Trends for the Project

Scenario	Time Period	Average Daily Temperature (°F) – Ensemble Mean	Minimum Daily Temperature (°F) – Ensemble Mean	Maximum Daily Temperature (°F) – Ensemble Mean
Historical	1995-2014	44.9	35.4	57.3
SSP245	2040-2059	48.6 (3.7)	39.2 (3.9)	60.8 (3.5)
SSP245	2060-2079	49.9 (5.0)	40.6 (5.3)	62.0 (4.7)
SSP245	2080-2099	51.6 (6.7)	42.2 (6.8)	63.8 (6.5)
SSP370	2040-2059	50.0 (5.1)	40.2 (4.9)	62.7 (5.4)
SSP370	2060-2079	52.0 (7.2)	42.4 (7.0)	64.6 (7.3)
SSP370	2080-2099	53.9 (9.0)	44.5 (9.1)	66.1 (8.8)
SSP585	2040-2059	49.2 (4.3)	39.8 (4.4)	61.4 (4.1)
SSP585	2060-2079	51.9 (7.0)	42.6 (7.3)	63.9 (6.6)
SSP585	2080-2099	56.2 (11.3)	47.3 (11.9)	67.9 (10.6)

[1]Values in parentheses represent the difference from the modeled historical value.

Table 6-16 shows the model historical and projected precipitation values for the project.

Table 7-16 Modeled Historical and Projected Precipitation Trends for the Project

Scenario	Time Period	Total Annual Precipitation (in) - Ensemble Mean
Historical	1995-2014	35.3
SSP245	2040-2059	37.1 (1.8)
SSP245	2060-2079	36.3 (1.1)
SSP245	2080-2099	34.3 (-1.0)
SSP370	2040-2059	30.0 (-5.3)
SSP370	2060-2079	31.6 (-3.7)
SSP370	2080-2099	34.6 (-0.7)
SSP585	2040-2059	35.3 (0.1)
SSP585	2060-2079	38.6 (3.3)
SSP585	2080-2099	40.6 (5.3)

[1] Values in parentheses represent the difference from the modeled historical value.

The EPA Climate Resilience Evaluation and Awareness Tool (CREAT) provides 100-year storm intensity projections to help with planning for water, wastewater, and stormwater utilities (references (140); (141)). A 100-year storm is an event that has a one percent chance of occurring in a given year. The CREAT tool considers two time periods, 2035 and 2060. For each time period, two scenarios are considered, from a 'Not as Stormy' future to a 'Stormy' future. Within the counties traversed by the project, the 2035 time period shows a 1 to 5 percent increase in the 100-year storm intensity for the 'Not as Stormy' scenario, and an 11 to 20 percent increase for the 'Stormy' scenario. The 2060 time period shows a 6 to 10 percent increase in the 100-year storm intensity for the 'Not as Stormy' scenario, and a 26 to 30 percent increase for the 'Stormy' scenario.

The EPA Streamflow Projections Map summarizes general projections related streamflow under climate change (reference (142)). The EPA Streamflow Projections Map for 2071 to 2100 (RCP 8.5) anticipates a general change in average streamflow of streams within the Route Segment 17 project area by a ratio of 1.26 to 1.29 (90th percentile) under wetter projections and a ratio of 0.83 to 0.89 (10th percentile) under drier projections when compared to baseline historical flows (1976 to 2005).

The First Street Risk Factor risk assessment and map tool was used to determine a risk assessment for each of the counties traversed by Route Segment 17 to help identify current future climate change risks (reference (143)). Table 6-17 summarizes risks for flood, fire, wind, air quality, heat as defined by Risk Factor (144); (145); (146); (147); (148)).

Table 7-17 Climate Change Risks for Counties Traversed by Route Segment 17

County	Flood Risk	Fire Risk	Wind Risk	Air Quality Risk	Heat Risk
Blue Earth	Minor	Moderate	Minor	Minor	Minor
Waseca	Minor	Moderate	Minor	Minor	Minor
Steele	Minor	Moderate	Minor	--	Minor
Dodge	Moderate	Moderate	Minor	--	Minor
Olmsted	Moderate	Moderate	Minor	Minor	Minor
Goodhue	Moderate	Moderate	Minor	Minor	Minor

Flood risk is minor or moderate for all counties. The fire risk is moderate for all counties. The wind risk, air quality risk, and heat risk are all minor for all counties assessed. The First Street Risk Factor risk assessment and map tool did not assess the air quality risk for Steele and Dodge Counties.

7.9.2.2 Potential Impacts

The project would result in GHG emissions that could minimally contribute to climate change impacts such as changes in temperature, precipitation, and extreme weather events. These emissions are discussed in Section 7.9.4. Double-circuiting with an existing transmission line would result in less GHG emissions from land use change. The climate change risks most susceptible to the project include increases in 100-year storm frequencies and soil erosion from increased storm intensities. The project could also be susceptible to more frequent wildfires.

7.9.2.3 Mitigation

The project would be engineered to be resilient under changing climatic factors, including increased average temperatures and changes in precipitation intensities and quantities.

There may be periods of dry weather and concerns of wildfires. However, the transmission lines would be maintained following or exceeding NERC reliability standards that address vegetation management, including the increase of noxious weeds that could occur from changed conditions that allow them to spread. Surface water temperatures could increase in locations where the project requires tree clearing along shorelines, increasing sun exposure. This would be exacerbated by increased temperatures.

7.9.3 Geology and Topography

The ROI for geology and topography is the route width. Structure foundations have the potential to impact bedrock, including karst. To minimize impacts, micrositing and structure foundation design would account for the presence of karst if present, and the applicant would adhere to temporary dewatering and stormwater runoff regulations as required. Minimal impacts are anticipated to topography along route width given that original surface contours are regraded and revegetated to the extent feasible.

7.9.3.1 Existing Conditions

Surface geology is dominated by quaternary-aged glacial sediments deposited by ice of the Des Moines lobe from the most recent Wisconsin glaciation. Deposits of sandy loam, sand, and gravel of the New Ulm Formation are present on the west, with deposits of loamy diamicton of the Browerville Formation present on the east. Deposits of glaciolacustrine silt and clay sediments and post-glacial floodplain alluvium are also present (reference (149)). Thickness of the glacial deposits varies depending on the location and type of deposit; thickness generally ranges from less than 50 feet to over 300 feet (reference (150)). The project area is underlain by bedrock formed during the Cambrian and Ordovician period in the Paleozoic Era, and consists of sandstone, siltstone, shale, limestone, and dolostone (reference (151)).

Karst features are common in southeast Minnesota. Surface karst features include, but are not limited to, sinkholes, caves, stream sinks, and springs. Several karst features, including one sinkhole, one tile outlet, and four springs, are located within route width (Table 7-18; references (152); (153)).

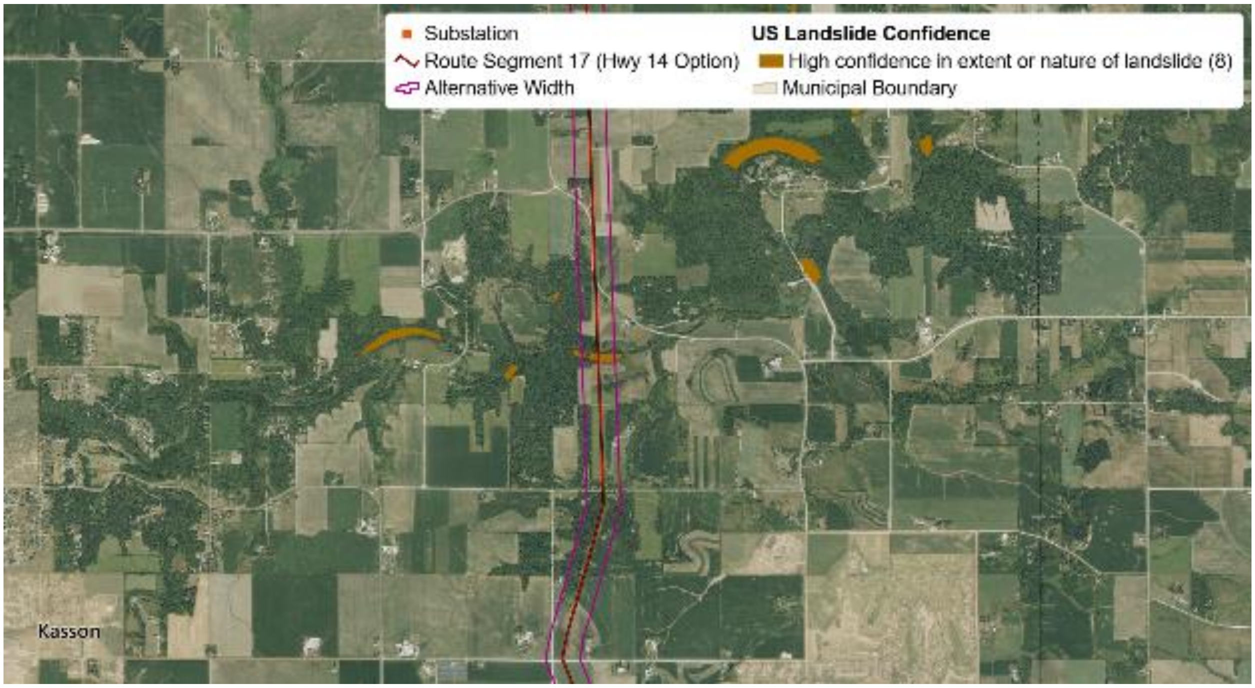
Table 7-18 Karst Features Within Route Width

Segment	Karst Feature	Karst Feature ID	Map
Route Segment 17 (Highway 14 Option)	Spring	74A0000008	Map 35-5
Route Segment 17 (Highway 14 Option)	Spring	74A0000007	Map 35-5
Route Segment 17 (Highway 14 Option)	Spring	74A0000006	Map 35-5
Route Segment 17 (Highway 14 Option)	Sinkhole	55D0001426	Map 35-7
Route Segment 17 (Highway 14 Option)	Spring	MN55:A00521	Map 35-8
Route Segment 17 (Highway 14 Option)	Tile Outlet	55T0000103	Map 35-8

Elevations along the route width range from about 840 feet above mean sea level (AMSL) near Mankato to 1100 feet AMSL near Pine Island. Topography is generally flat with localized areas of steeper slopes occurring adjacent to waterbodies.

The project area seismic risk is very low; it is located within an area rated as less than a two-percent chance of damage from natural or human-induced earthquake in 10,000 years (reference (154)).The type of landslide most common in Minnesota is shallow slope failure triggered by a heavy rain event. This slope failure is generally less than 3 feet deep but can erode the entire length of a slope. Deeper landslides, mudflows, and debris flows are much less common in Minnesota than in more mountainous areas. Less destructive landslides, such as slow-moving earthflows and soil creep, can also occur when soil moisture and shallow groundwater saturate sediments during heaving rain events or snowmelt. Human factors including inadequate storm water management, undercutting of slopes, placement of artificial fill, and land-use changes, such as urbanization and agricultural practices, can lead to erosion and landslides (reference (155)). The USGS United States Landslide Inventory includes records of landslide activity within the route width, at the South Branch Middle Fork Zumbro River intersection north of Byron (Figure 7-15; reference (156)).

Figure 7-7 USGS United States Landslide Inventory: Activity Documented Within Route Segment 17 Route Width



7.9.3.2 Potential Impacts

Thick glacial deposits cover most of the project area. Bedrock is generally deeper than 50 feet, however, in some areas, bedrock may be present just below the surface. Construction and operation of transmission line projects can impact geology through temporary, construction-related impacts and/or long-term impacts.

Karst features identified within route width include one sinkhole, one tile outlet, and four springs. The presence of sinkholes is an indication of active karst. Active karst is a terrain having distinctive landforms and hydrology created primarily from the dissolution of soluble rocks within 50 feet of the land surface. Pollutants being carried by stormwater runoff can pass rapidly through the subsurface into the groundwater, creating a greater risk of groundwater contamination than is found in other soil types (reference (271)).

Impacts to topography, such as the creation of abrupt elevation changes are not expected. Transmission line structures would be installed at existing grade. Changes in slope are not anticipated during the project, so there would be limited risk of landslides.

7.9.3.3 Mitigation

The applicant would conduct geotechnical evaluations prior to project construction to identify structure placements and avoid impacts to subsurface geological features.

Geotechnical analyses would evaluate whether karst areas are present at structure locations, and micro-siting and structure foundation design would account for the presence of karst. If geotechnical analyses determine karst features are present where construction will occur, the applicant will comply with MPCA stormwater requirements and would prohibit infiltration of stormwater runoff within 1,000 feet up-gradient or 100 feet down-gradient of active karst features.

Should grading occur for installation of the HVTL structures, it would be restricted to establishing a flat, safe workspace. Major topographical changes to the landscape would not occur. Once construction is complete, disturbed areas would be regraded to restore original surface contours and revegetated to the maximum extent feasible.

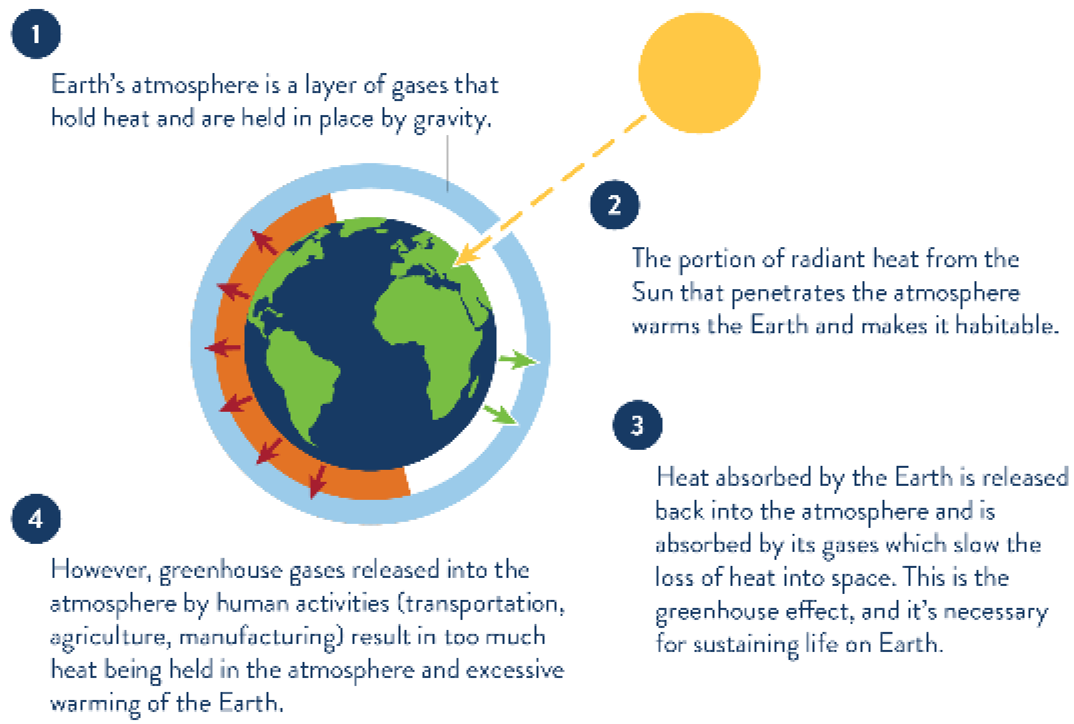
7.9.4 Greenhouse Gases

The ROI for greenhouse gas (GHG) emissions is the ROW. Construction activities would result in short-term increases in GHG emissions because of the combustion of fossil fuels in construction equipment and vehicles. These emissions would be short-term and dispersed over the ROI; therefore, total emissions would be minimal and not result in a direct impact to any one location. Maintenance activities would also cause GHG emissions, but to a much lesser extent. Operational impacts from formation of nitrous oxide and release of sulfur hexafluoride would be minimal. Impacts are unavoidable but can be minimized.

7.9.4.1 Existing Conditions

GHGs are gases that trap heat in the atmosphere. Some of the solar radiation that reaches Earth's surface radiates back toward space as infrared radiation. GHGs trap heat in the atmosphere from the absorption of this infrared radiation, which causes a rise in the temperature of Earth's atmosphere as illustrated in Figure 7-8. This warming process is known as the greenhouse effect (reference (157)).

Figure 7-8 Greenhouse Gases and Earth's Atmosphere



The most common GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases. GHG emissions are calculated as carbon dioxide equivalent (CO_2e), which is equal to the global warming potential (GWP) for each pollutant multiplied by the potential pollutant emissions. CO_2e normalizes all GHG emissions to CO_2 for comparability across different pollutants. Human GHG emissions are responsible for about two-thirds of the energy imbalance that is causing Earth's temperature to rise, which has direct and cascading effects on weather and climate patterns, vegetation, agriculture, disease, availability of water, and ecosystems (reference (158)).

Climate change and decarbonization have been discussed for decades at all levels of government, as well as in global, national, and local institutions. The state of Minnesota has established a goal for the reduction of GHG emissions, set forth in Minnesota Statute § 216H.02:

> *It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions by at least the following amounts, compared with the level of emissions in 2005: (1) 15 percent by 2015; (2) 30 percent by 2025; (3) 50 percent by 2030; and (4) to net zero by 2050.*

Minnesota Statute § 216B.1691 Renewable Energy Objectives, which became effective in 2023, requires all electric utilities to generate or procure 100 percent of electricity sold to Minnesota customers from carbon-free sources by 2040, with an interim goal of 80 percent (for public utilities) and 60 percent (for

other electric utilities) carbon-free electricity by 2030. Carbon-free sources are those that generate electricity without emitting CO_2. Electric utilities are also required to generate or procure 55 percent of electricity sold to Minnesota customers from an eligible energy technology by 2035. Eligible energy technology includes technology that generates electricity from solar, wind, and certain hydroelectric, hydrogen, and biomass sources (Minnesota Statute §216B.1691).

7.9.4.2 Potential Impacts

GHG emissions associated with the construction and operation of the project consist of direct emissions generated from combustion sources (for example, mobile on- and off-road sources) and land use change. Double-circuiting with an existing transmission line would result in less GHG emissions from land use change. Indirect emissions associated with the operation of the project include the GHG emissions associated with electrical consumption.

Construction emissions from mobile combustion were calculated for on-road vehicles and off-road construction equipment. Construction emissions from combustion sources are anticipated to be similar for each alternative. Therefore, the total construction combustion emissions and length of the applicant-proposed segments were used to calculate an emission rate per segment length, in metric tons CO_2e/mile, to quantify combustion emissions for each alternative. Construction emissions from temporary land use changes were calculated with an assumed construction duration of 60 days for each land use change area. The calculated emission rate per segment length is 70.86 metric tons CO_2e/mile. GHG emissions calculations are summarized in Appendix L.

Identified GHG emissions associated with operation of the project include direct emissions generated from combustion sources (for example, mobile on- and off-road sources) and land use change, and indirect emissions from electrical consumption. Operational emissions from mobile combustion are anticipated to be similar for each alternative. Therefore, operational emissions from mobile combustion have only been calculated for the applicant-proposed segments. Operational emissions from temporary land use changes were calculated with the assumption that forest land, cropland, and settlement land would be converted to grassland following completion of the project and for the duration of operations. Operational emissions from electrical consumption are assumed to be negligible and have not been calculated.

The Prevention of Significant Deterioration (PSD) is a Clean Air Act permitting program for new or modified major sources of air pollution in attainment areas. It is designed to prevent NAAQS violations, preserve and protect air quality in sensitive areas, and protect public health and welfare (reference (159)). The current threshold for new facilities with operational GHG emissions is 100,000 tons CO_2e per year. Estimated project GHG emissions are below this threshold.

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

routinely because they are largely attributed to faulty equipment and leakage. Equipment containing SF_6 is designed to avoid SF_6 emissions (reference (160)).

7.9.4.3 Mitigation

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

The project would ultimately result in a net decrease of GHG emissions during operation, as it would facilitate the replacement of legacy fossil fuel generation with renewable resources. The project would also increase regional transmission reliability and allow additional carbon-free energy sources to be integrated into the power supply. The project will therefore assist in achieving climate goals.

7.9.5 Groundwater

The ROI for groundwater is the ROW. Documented active wells and Drinking Water Supply Management Areas (DWSMA)/Wellhead Protection Areas (WHPAs) are present within the ROI. Associated wellhead protection plans should be reviewed by the applicant. To minimize impacts, the applicant would store materials, including fuel and gasoline, in sealed containers to prevent spills, leaks, or other discharges to soil and groundwater in accordance with the Stormwater Pollution Prevention Plan (SWPPP) during construction. Potential impacts to groundwater could also occur during construction (specifically installation of foundations) if artesian groundwater conditions are present and the confining layer is breached. Artesian groundwater conditions can be found throughout the state of Minnesota and are not limited to certain areas of geography. Provided the pressurized conditions and extents are identified and understood, and a plan is implemented to manage pressurized groundwater conditions should they be encountered, impacts would be minimized and/or mitigated.

7.9.5.1 Existing Conditions

The DNR divides Minnesota into six groundwater provinces based on bedrock and glacial geology. The aquifers within these provinces occur in two general geologic settings: bedrock and unconsolidated sediments deposited by glaciers, watercourses, and waterbodies. The ROW crosses the South-Central Province. Water availability in the South-Central Province is limited in surficial sands and moderate in buried sands. The South-Central province contains thick loam and clayey unconsolidated sediments, with limited extent surficial and buried sand aquifers, overlying thick sandstone and carbonate aquifers. The ROW on the far east side crosses the Karst Province. Sediment in this province is thin or absent and, therefore, not used or relatively unimportant as aquifers, except in major river valleys where sediment thickness is greater. The Karst Province is underlain by productive bedrock aquifers, however those closest to the land surface are susceptible to impacts by human activities (reference (161)).

Groundwater flow direction in these shallow, unconsolidated sediments is expected to follow surface topography and surface water flow. However, groundwater flow direction could vary depending on factors such as the presence of shallow bedrock, underground utilities, and/or other surficial features. The depth to the water table is generally less than 50 feet below ground surface along the ROW (reference (162)).

The EPA defines a sole source aquifer (SSA) or principal source aquifer area as:

- One that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer
- Where contamination of the aquifer could create a significant hazard to public health
- Where there are no alternative water sources that could reasonably be expected to replace the water supplied by the aquifer.

There are currently no EPA-designated SSAs along the ROW (reference (163)).

Wells are abundant within the project area. The MWI, which is managed by the MDH, provides information about wells and borings such as location, depth, geology, construction, and static water level at the time of construction. According to the MWI, there are six wells within the ROW (Table 7-14; reference (164)).

Table 7-19 MWI Water Wells within ROW

MWI Unique Well ID	Status	Depth (Feet)	Static Water Level (Feet) on MWI Report	Use	Segment	Map
811311	Active	20	19	Monitoring Well	Route Segment 17 (Highway 14 Option)	Map 35-3
340101	Sealed	160	Not Listed	Scientific Investigation	Route Segment 17 (Highway 14 Option)	Map 35-6
848260	Active	300	43	Industrial / Commercial	Route Segment 17 (Highway 14 Option)	Map 35-6
1000003067	Sealed	212	Not Listed	Domestic	Route Segment 17 (Highway 14 Option)	Map 35-6
217611	Sealed	165	51	Domestic	Route Segment 17 (Highway 14 Option)	Map 35-6
220858	Active	199	111	Domestic	Route Segment 17 (Highway 14 Option)	Map 35-7

The WHPA program administers the public and non-public community water supply source-water protection (SWP) in Minnesota. WHPAs are areas surrounding public water supply wells that contribute groundwater to the well. In these areas, contamination on the land surface or in water can affect the drinking water supply. WHPAs for public and community water-supply wells are delineated based on a zone of capture for 10-year groundwater time-of-travel to the well and are available through a database and mapping layer maintained by MDH (reference (165)). The viewer also includes the DWSMA and DWSMA Vulnerability. DWSMAs are delineated areas within the WHPA and are managed in a wellhead protection plan, usually by a city.

Table 7-15 summarizes the DWSMAs/WHPAs included in the MDH database that are crossed by ROW.

Table 7-20 Summarizes the DWSMAs/WHPAs included in the MDH database that are crossed by ROW

County	DWSMA/WHPA Name	Segment	Vulnerability to Contamination	Map
Blue Earth	School of Sisters of Notre Dame	Route Segment 17 (Highway 14 Option)	Low	Map 35-1
Steele	Owatonna	Route Segment 17 (Highway 14 Option)	Low	Map 35-4
Dodge	Claremont	Route Segment 17 (Highway 14 Option)	Low	Map 35-6
Dodge	Kasson 4	Route Segment 17 (Highway 14 Option)	Low	Map 35-7
Goodhue	Pine Island	Route Segment 17 (Highway 14 Option)	Moderate	Map 35-9

A Special Well and Boring Construction Area, or well advisory, is a mechanism which provides for controls on the drilling or alteration of public and private water-supply wells, and environmental wells in an area where groundwater contamination has, or might, result in risks to the public health. There are no MDH-designated Special Well and Boring Construction Areas along ROW (reference (166)).

Flowing wells and borings are drilled holes that encounter an aquifer with sufficient natural pressure to force water above the ground surface, so that water will flow without pumping. Flowing artesian conditions exist when a low permeability confining layer, such as clay or shale, overlies the aquifer. This puts the groundwater under pressure because the material doesn't permit water to flow through it. When a well or boring is completed, the confining layer is breached, creating a pressure relief valve that allows the water to rise above the top of the aquifer. If the pressure in the aquifer is great enough to force water to rise above the land surface, the well flows. Flowing conditions can also occur in an unconfined aquifer, most often at lower elevations in groundwater discharge areas near rivers, lakes, or other waterbodies. These unique features can be found throughout the state of Minnesota and are not limited to certain areas or geography (reference (167)).

7.9.5.2 Potential Impacts

When an unexpected artesian condition is found, it can have a substantial impact that could compromise the condition and use of the area in which the flow is encountered and could cause challenges with construction of transmission line tower foundations along the routes. Artesian groundwater conditions, when unintentionally encountered, can cause excavation stability issues and uncontrolled release of groundwater at the ground surface and to surface waters. If uncontrolled, artesian groundwater conditions can be extremely difficult to repair and in some instances are unrepairable. However, subsurface investigations and construction in artesian groundwater conditions can be completed successfully provided the pressurized conditions and extents are identified and understood, and a plan is implemented to manage pressurized groundwater conditions should they be encountered.

7.9.5.3 Mitigation

The applicant would coordinate with the DNR, as necessary, to confirm that ground disturbing activities such as geotechnical investigation and structure installation placement does not disrupt groundwater hydrology.

The applicant would conduct geotechnical evaluations prior to project construction to identify locations where potential groundwater impacts could occur.

Depending on the results of the geotechnical evaluations, the applicant would obtain a Water Appropriation Permit from DNR if groundwater dewatering activities would be greater than 10,000 gallons of water per day or 1 million gallons per year.

The applicant would assess any wells identified within the ROW during project construction to determine if they are open, and seal them, if necessary, in accordance with MDH requirements.

Indirect impacts to groundwater can be mitigated by avoiding or minimizing impacts to surface waters. Measures to control soil erosion and sedimentation would be implemented during construction activities.

Five DWSMAs/WHPAs are crossed by ROW. The associated wellhead protection plan would be reviewed by the applicant. To minimize impacts, the applicant would store materials including fuel and gasoline in sealed containers to prevent spills, leaks, or other discharges to soil and groundwater in accordance with the SWPPP during construction.

7.9.6 Public and Designated Lands

The ROI for public and designated lands is the ROW. Public and designated lands often involve unique resources intended for protection, preservation, and/or recreational use. Public lands (local, state, or federal level) and conservation easements within the ROI are identified and qualitatively assessed for potential impact (e.g., vegetation clearing). There are not public lands within the ROI.

7.9.6.1 Existing Conditions

Public lands include those owned at the local, state, and federal levels. No public land is present within the ROI for Route Segment 17.

Privately held land could also be subject to special designations. The project crosses lands that are part of various conservation easement programs, including the RIM Reserve program and Conservation Reserve Enhancement Program (CREP). The Minnesota Board of Water and Soil Resources (BWSR) acquires, on behalf of the state, conservation easements to permanently protect, restore, and manage critical natural resources without owning the land outright. The RIM Reserve program compensates landowners for granting conservation easements and establishing native vegetation habitat on economically marginal, flood-prone, environmentally sensitive, or highly erodible lands (reference (171)).

Route Segment 17's (Hwy 14 Option) anticipated alignment crosses RIM land twice (Map 39-6 and Map 39-23. A total of 4.1 acres of RIM easements are present within the ROW.

CREP is a federal program that leverages federal and non-federal funds to target specific state, regional, or nationally significant conservation concerns. In exchange for removing environmentally sensitive land from production and establishing permanent resource-conserving plant species, farmers and ranchers are paid an annual rental rate along with other federal and non-federal incentives as specified in each CREP agreement (reference (172)). A total of 3.2 acres of CREP easement are present within the ROW (Map 39).

The PWP Program intends to protect at-risk wetlands through permanent easements where landowners receive rental payments that are calculated based on a percentage of the assessed value (reference(173)). Similar to RIM, BWSR administers the program at the state level; locally, the program is administered by the soil and water conservation districts (reference (174)).

Route Segment 17's (Hwy 14 Option) anticipated alignment crosses PWP land once (Map 39-15).

7.9.6.2 Potential Impacts

The RIM land crossed by Route Segment 17 would be subject to disturbance. The RIM land has a railroad running on its north side (Map 39-6); if Route Segment 17 were selected, the disturbed area required for infrastructure within the easement would be increased. The easement shown on Map 39-15 would also be subject to disturbance and would be difficult to avoid.

Public lands and the lands subject to conservation easement programs aim to establish native and permanent plant species and/or conserve and protect the natural habitat. Permanent clearing of vegetation, or the expansion of the cleared areas in cases where an existing line is already present, within the conservation areas would impact the function and intent of these areas and potentially have long-term effects to the unique resources.

7.9.6.3 Mitigation

The sample route permit (Section 5.3.17 of Appendix H) contains the following mitigation related to public and designated lands: "The Permittee shall restore the ROW, temporary workspaces, access roads, abandoned ROW, and other public or private lands affected by construction of the Transmission Facility." If easements are crossed, the applicant would work with landowners to determine measures to avoid and minimize impacts on these agricultural resources and to avoid interfering with landowner participation in the CREP, PWP, or RIM programs. Additionally, the applicant would continue to coordinate potential easement crossings with BWSR.

7.9.7 Rare and Unique Natural Resources

Rare and unique natural resources include federally and state protected species and sensitive ecological resources. The ROI for protected species is the project area (1 mile) and the ROI for sensitive ecological resources is the route width. Impacts to protected species are evaluated by reviewing documented occurrences of these species within the ROI. Potential impacts to sensitive ecological resources, which could provide suitable habitat for protected species, are evaluated by assessing the presence of these resources within the ROI.

One federally protected species and several state protected species have been documented within the ROI for Route Segment 17. Potential direct or indirect impacts to protected species could occur should they be present within or near the ROW during construction or maintenance activities. While more mobile species would leave the area for nearby comparable habitats, non-mobile species, such as vascular plants or nesting birds, could be directly impacted. Several sensitive ecological resources, such as native plant communities, intersect the ROI for Route Segment 17. Construction activities also have the potential for direct impacts to sensitive ecological resources if they are present within the area subject to construction disturbance. Long-term impacts would involve permanent clearing of vegetation in areas identified as sensitive ecological resources which could indirectly impact any protected species associated with these habitats.

Several measures could be implemented to avoid, minimize, or mitigate impacts to protected species and sensitive ecological resources, including those provided in the DNR's Natural Heritage Review response (Appendix M). Some measures are specific to the protected species and their associated habitats and could include rare species surveys to confirm ahead of construction activities or monitoring during construction. Measures to avoid, minimize, or mitigate impacts include but are not limited to prudent routing, implementation of BMPs, working in already disturbed areas, and working in frozen ground conditions. The applicant committed to continuing to work with the DNR to minimize and mitigate potential impacts.

7.9.7.1 Existing Conditions

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

At the state level, the evaluation and protection of Minnesota's rare and unique natural resources are overseen by the DNR Division of Ecological and Water Resources through the identification and evaluation of threatened and endangered species and sensitive ecological resources. State endangered or threatened species are protected under the Minnesota Endangered Species Statute (Minnesota Statute § 84.0895).

The DNR Natural Heritage Inventory System (NHIS) database (License Agreement #2022-008) was used to assess the presence of state protected species within the Route Segment 17 project area. Although the NHIS database does not represent a comprehensive survey, it provides information on the potential presence of protected species. The NHIS is continually updated as new information becomes available and is the most complete source of data on Minnesota's protected species. Although reports or queries might not show records for state-protected species within the vicinity of a project, it does not necessarily mean that they are not present. It could simply mean that the area has not been surveyed or that records have not been reported to the DNR.

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

Map 44 provides an overview of sensitive ecological resources within the ROI of Route Segment 17. In order to protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on any maps.

7.9.7.1.1 Federal Protected Species

The USFWS IPaC online tool was queried on January 27, 2025, for a list of federally threatened and endangered species, proposed species, candidate species, and designated critical habitat that may be present within the Route Segment 17 (Appendix M). Route Segment 17 would not traverse any federally designated critical habitat or proposed critical habitat. The IPaC query identified nine federal species that could potentially be in the Route Segment 17 project area, including three endangered species, one threatened, four proposed endangered or threatened species, and an experimental population, nonessential species. The species identified in the IPaC query and their typical habitats are summarized in Table 7-21.

Table 7-21 Federal Species Potentially Present within Vicinity of Route Segment 17

Scientific Name	Common Name	Federal Status	State Status	Habitat
Myotis septentrionalis	Northern long-eared bat	Endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Bombus affinis	Rusty Patched bumble bee	Endangered	Watchlist	Areas with consistent flowering vegetation throughout the growing season. Overwinter in upland forests and woodlands.[1]
Erythronium propullans	Minnesota dwarf trout lily	Endangered	Endangered	River terrace, mesic oak-basswood forest, or mesic maple-basswood forest on a north-facing slope above or near a stream.[1]
Lespedeza leptostachya	Prairie bush clover	Threatened	Threatened	Bedrock outcrop prairie or north-, northeast, or northwest-facing mesic prairie to dry prairie.[1]
Perimyotis subflavus	Tri-colored bat	Proposed endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Simpsonaias ambigua	Salamander mussel	Proposed endangered	Endangered	Swift flowing rivers and streams under flat rocks or under ledges of rock walls.[1]
Argynnis idalia occidentalis	Western regal fritillary	Proposed threatened	Not listed	Tall grass prairie, wet fields, meadows, marshes.[2]
Danaus plexippus	Monarch butterfly	Proposed threatened	Not listed	Areas with a high number of flowering plants. Presence of milkweed (*Asclepias* spp.) to complete the caterpillar life stage.[3]
Grus americana	Whooping crane	Experimental population, non-essential	Not listed	Wetlands, lakes, ponds, rivers, and agricultural fields.[4]

[1] Habitat information from reference (175)).
[2] Habitat information from reference (176)).
[3] Habitat information from reference (177)).
[4] Habitat information from reference (178)).

Federally proposed threatened or endangered species are species that the USFWS has determined are in danger of extinction throughout all or a significant portion of their range and has proposed a draft rule to list them as threatened or endangered. Proposed species are not protected by the take prohibitions of the federal ESA. A non-essential experimental population is a designation that refers to a population that has been established within its historical range under Section 10(j) of the ESA to aid in recovery of the species. Species designated as non-essential experimental populations are only protected by the federal ESA within a national wildlife refuge or a national park; the route width of Route Segment 17 does not intersect a national wildlife refuge or a national park.

7.9.7.1.2 State Protected Species

The DNR's NHIS database was queried in January 2025 (Barr License Agreement LA-2022-008), to determine if any state endangered, threatened, or special concern species have been documented within 1 mile of Route Segment 17; the DNR uses a 1 mile buffer as a standard distance to capture the range of species that have already been documented and could be present in a particular area, given presence of suitable habitat. The NHIS database identified records for seven state endangered species, 16 state threatened species, 22 state special concern species, and 1 state watchlist species (also a federally endangered species) within 1 mile of Route Segment 17. State endangered, threatened, and the watchlist/federally endangered species documented in the NHIS database, along with their typical habitats, are summarized in Table 7-22. State special concern species documented in the NHIS database within 1 mile of Route Segment 17 are summarized in Appendix M. While these species are tracked by the DNR, they are not legally protected under the Minnesota Endangered Species Statute.

Table 7-22 Natural Heritage Information System Database Records of State or Federally Threatened or Endangered Species within 1 Mile of Route Segment 17

Scientific Name	Common Name	Type	Federal Status[1]	State Status[2]	Habitat[3]	Route Segment 17		
						ROW	Route width	1 mile
Acris blanchardi	Blanchard's cricket frog	Frog	Not listed	END	Littoral zone of lakes, medium rivers and streams, small rivers and streams, marsh, floodplain forest, river shore, lake shore.	X	X	X
Arcidens confragosus	Rock pocketbook	Mussel	Not listed	END	Medium to large rivers.			X
Carex Formosa	Handsome sedge	Vascular plant	Not listed	END	Southern mesic maple-basswood forests.			X
Hydrastis canadensis	Goldenseal	Vascular plant	Not listed	END	Mesic hardwood forests.			X
Juglans cinerea	Butternut	Vascular plant	Not listed	END	Mesic hardwood forests.			X
Lampsilis teres	Yellow sandshell	Mussel	Not listed	END	Large rivers.			X
Lanius ludovicianus	Loggerhead shrike	Bird	Not listed	END	Upland native and non-native grasslands; perching sites contain shrubs or small trees.	X	X	X
Actinonaias ligamentina	Mucket	Mussel	Not listed	THR	Medium to large rivers.	X	X	X
Alasmidonta marginata	Elktoe	Mussel	Not listed	THR	Medium to large rivers.			X
Arnoglossum plantagineum	Tuberous Indian-plantain	Vascular plant	Not listed	THR	Native mesic prairie.		X	X
Asclepias sullivantii	Sullivant's milkweed	Vascular plant	Not listed	THR	Wet and mesic tallgrass prairie.			X
Berula erecta	Stream parsnip	Vascular plant	Not listed	THR	Wet seepage meadows, calcareous fens, and spring-fed streams in forested ravines.			X
Carex davisii	Davis' sedge	Vascular plant	Not listed	THR	Mature alluvial forests associated with major river valleys of the Mississippi River drainage.		X	X

Scientific Name	Common Name	Type	Federal Status[1]	State Status[2]	Habitat[3]	Route Segment 17		
						ROW	Route width	1 mile
Eurynia dilatate	Spike	Mussel	Not listed	THR	Small to large rivers.	X	X	X
Glyptemys insculpta	Wood turtle	Turtle	Not listed	THR	Small to medium fast-moving rivers and streams with adjacent deciduous and coniferous forests.			X
Lasmigona costata	Fluted-shell	Mussel	Not listed	THR	Medium to large rivers.			X
Napaea dioica	Glade mallow	Vascular plant	Not listed	THR	Stream banks, floodplains, and terrace forests in the valleys of small to medium sized streams.	X	X	X
Platanthera flava var. herbiola	Tubercled rein orchid	Vascular plant	Not listed	THR	Moist or wet meadows or sunny swales in savannas.	X	X	X
Polyodon spathula	Paddlefish	Fish	Not listed	THR	Open waters of large rivers and river lakes.			X
Rhynchospora capillacea	Hair-like beak rush	Vascular Plant	Not listed	THR	Calcareous fens and spring fens in large peatland complexes.			X
Theliderma metanevra	Monkeyface	Mussel	Not listed	THR	In Minnesota, the St. Croix River is the only large river that supports a population of this species.			X
Valeriana edulis var. ciliata	Edible valerian	Vascular plant	Not listed	THR	Moist, sunny calcareous habitat, including calcareous fens, wet meadows, and moist prairies.	X	X	X
Venustaconcha ellipsiformis	Ellipse	Mussel	Not listed	THR	Headwater reaches of rivers in gravel riffles.		X	X
Bombus affinis	Rusty-patched Bumble Bee	Insect	END	WL	Areas with consistent flowering vegetation throughout the growing season.			X

[1] "END" = endangered
[2] "THR" = threatened; "WL" = watchlist (tracked by the DNR but not protected at the state level)
[3] Habitat information from reference (175)).

7.9.7.1.3 Sensitive Ecological Resources

The DNR has established several classifications for sensitive ecological resources across the state, many of which are scattered throughout the Route Segment 17 geographic area (Map 44). Some of these sensitive ecological resources are crossed by the ROI for Route Segment 17, including Sites of Biodiversity Significance (SBS), native plant communities, railroad rights-of-way prairies, and a Lake of Biological Significance.

The DNR maps SBS and assigns a biodiversity significance rank to sites surveyed across the state. These ranks are used to communicate statewide the native biological diversity of each site and help to guide conservation and management activities (reference (180)). As shown on Map 44, several SBS intersect the ROI for Route Segment 17. The DNR assigns biodiversity significance ranks, as follows:

- **Outstanding** – best occurrences of the rarest species and native plant communities.
- **High** – good quality occurrences of the rarest species and high-quality examples of native plant communities.
- **Moderate** – occurrences of rare species, moderately disturbed native plant communities.
- **Below** – sites with moderately disturbed native plant communities, but lacking occurrences of rare species.

The DNR identifies and maps areas containing native plant communities across the state. A native plant community is a group of native plants that interact with each other and their environment in ways that have not been greatly altered by modern human activity or introduced organisms (reference (181)). The DNR provides a state conservation status to each native plant community, as follows:

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

As shown on Map 44, several native plant communities intersect the ROI for Route Segment 17, including the following types and associated state conservation status (or range of statuses if multiple subtypes):

- Mesic Prairie (Southern); S2
- Elm – Basswood – Black Ash (Hackberry) Forest; S3
- Southern Floodplain Forest; S3
- Silver Maple – Green Ash – Cottonwood Terrace Forest; S3
- Wet Prairie (Southern); S2
- Southern Dry – Mesic Oak – Aspen Forest; S3,S4
- Southern Mesic Maple-Basswood Forest; S2, S3

- Elm – Ash – Basswood Terrace Forest; S2
- Southern Dry Mesic Oak Forest; S3, S4
- Southern Wet-Mesic Hardwood Forest; S2
- Sugar Maple – Basswood – (Bitternut Hickory) Forest; S2

The 1997 Minnesota State Legislature directed the DNR to survey active railroad rights-of-way for native prairie (reference (210)). These areas undergo active management to maintain the existence of prairie communities. As shown on Map 44, mesic railroad rights-of-way prairies intersect the ROI for Route Segment 17.

The DNR maps certain waterbodies as Lakes of Biological Significance based on the unique presence of aquatic plants or animals (reference (182)). The DNR assigns biological significance classes (outstanding, high, or moderate) to these waterbodies based on a variety of factors, such as the quality of the lake/habitat and presence of certain plants and animals. As shown on Map 44-1, Eagle Lake, a Lake of Biological Significance, intersects the ROI for Route Segment 17.

State and federal lands that are preserved or managed for wildlife are scattered throughout Route Segment 17; these areas would also be considered sensitive ecological resources and are discussed in Section 7.9.6 and Section 7.9.12.1.

7.9.7.2 Potential Impacts

Project construction and operation have the potential to impact protected species and sensitive ecological resources. Construction-related potential short-term impacts on federally or state protected wildlife species would be similar to those described for non-listed species in Section 7.9.12.2 and could include displacement during construction activities that generate noise, dust, or disturbance of habitat. Ground disturbing activities (e.g., grading), permanent clearing of vegetation, and construction activities in areas identified as sensitive ecological resources could impact protected species associated with these habitats.

7.9.7.2.1 Federal Protected Species

The species identified in the IPaC query are potentially present within the vicinity of Route Segment 17, where suitable habitat is present.

The NHIS database does not document the presence of northern long-eared bats, maternity roost trees, or hibernacula within 1 mile of Route Segment 17. However, suitable forested habitat is present in the route width of Route Segment 17. Impacts to northern long-eared bats could occur if tree clearing or construction take place during the bat’s active season, when the species are breeding, foraging, or raising pups in forested habitat. Bats could be injured or killed if occupied trees are cleared during the active season, and the species could be disturbed during clearing or construction activities due to noise or human presence.

The NHIS database does not identify any records of tricolored bats within 1 mile of Route Segment 17; however, forested areas within the route width of Route Segment 17 could provide suitable habitat for the species. Potential impacts to tricolored bats would be similar to those described for northern long-eared bats.

The NHIS database does not identify any records of salamander mussel within 1 mile of Route Segment 17; however, the species could be present in larger streams in the area. However, as discussed in Section 7.9.9.2, watercourses would be spanned and appropriate BMPs would be employed; as such, impacts to the salamander mussel or other aquatic protected species are not anticipated.

The NHIS database does not identify any records of Minnesota dwarf trout lily within 1 mile of Route Segment 17. Suitable habitat for this species could be present within the route width and ROW of Route Segment 17. The ROW of Route Segment 17 intersects a Southern Mesic Maple-Basswood Forest native plant community; this native plant community is one in which Minnesota dwarf trout lily is found. Route Segment 17 intersects this native plant community in an area where there is an existing 345 kV transmission line ROW. Impacts to Minnesota dwarf trout lily could occur should this species or suitable habitat be present in areas undergoing grading or clearing activities associated with project construction.

The NHIS database does not identify any records of prairie bush clover within 1 mile of Route Segment 17. The few small mesic prairie native plant communities and railroad rights-of-way mesic prairies that intersect the route width and ROW of Route Segment 17 could provide habitat suitable for prairie bush clover. Impacts to prairie bush clover could occur should this species or suitable habitat be present in areas undergoing grading or clearing activities associated with project construction.

As noted in Table 7-22, the NHIS database has documented records of rusty patched bumble bees within 1 mile of Route Segment 17. Although the route width of Route Segment 17 is primarily agricultural, suitable foraging habitat for rusty patched bumble bees is present in non-agricultural areas with flowering plants and suitable overwintering habitat is present in the forested areas. In addition, as shown on Map 44, Route Segment 17 intersects rusty patched bumble bee high potential zones, areas identified by the USFWS where rusty patched bumble bees are likely to be present. Potential impacts to rusty patched bumble bees could occur as a result of ground disturbing activities and/or removal of vegetation that serves as habitat.

The NHIS database does not track documented records of western regal fritillary. Suitable habitat for western regal fritillary is present in the wet meadows and marshes that intersect the route width of Route Segment 17. Potential impacts to western regal fritillary could occur as a result of ground disturbing activities and/or removal of vegetation that serves as habitat.

The NHIS database does not track documented records of monarch butterflies. Suitable habitat for monarch butterflies is present in the non-agricultural parts of Route Segment 17. Potential impacts to monarch butterflies could occur as a result ground disturbing activities and/or removal of suitable reproductive (milkweed plants) or feeding (flowering plants) habitat.

Whooping cranes are rare in the state of Minnesota, and the NHIS database does not track documented records of them. Potential impacts to whooping cranes would be similar to those described for other waterfowl/avian species in Section 7.9.12.2.

7.9.7.2.2 State Protected Species

The state threatened and endangered species identified in Table 7-22 and special concern species identified in Appendix M are known to occur in the vicinity of Route Segment 17 where suitable habitat is present. The discussion below is focused on potential impacts to state threatened and endangered species; however, impacts to and mitigation measures for special concern species would generally be similar for many species occupying similar habitats.

As noted in Table 7-22, 13 state endangered or threatened vascular plant species have been documented within 1 mile of Route Segment 17; three of these vascular plant species, glade mallow, tubercled rein orchid, and edible valerian, were documented within the ROW of Route Segment 17. Impacts to the vascular plant species identified in Table 7-22 could occur should they or suitable habitat for them be present in areas undergoing grading or clearing activities associated with project construction.

Blanchard's cricket frogs have been documented within the ROW of Route Segment 17 in an area where the alignment would cross a stream while paralleling an existing 161 kV transmission line. All watercourses would be spanned by Route Segment 17; however, Blanchard's cricket frogs could be present on the adjacent river shore. Potential impacts to Blanchard's cricket frogs could occur during project construction as a result of construction equipment and ground disturbing activities should they be present in suitable upland habitat adjacent to streams.

The loggerhead shrike has been documented within the ROW of Route Segment 17. Potential impacts to the loggerhead shrike would be similar to those described for other avian species in Section 7.9.12.2.

The wood turtle has been documented within 1 mile of Route Segment 17 but has not been documented within its route width or ROW. Wood turtle habitat generally includes fast moving streams, which would be spanned by Route Segment 17. However, wood turtles are also found foraging and basking in adjacent forested or agricultural uplands. Potential impacts to wood turtles could occur during project construction as a result of construction equipment and ground disturbing activities should they be present in suitable upland habitat adjacent to streams.

All watercourses would be spanned by Route Segment 17; as such, direct impacts to the state protected mussel and fish species identified in Table 7-22 are not anticipated.

7.9.7.2.3 Sensitive Ecological Resources

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

Creation of new transmission line rights-of-way or expanding existing rights-of-way through sensitive ecological resources could impact protected species associated with habitats within them. This could occur as a result of habitat conversion or fragmentation or due to the placement of structures and other infrastructure within them. The route width and ROW of Route Segment 17 would intersect sensitive ecological resources, as summarized in Table 7-23 and shown on Map 44. However, as discussed in Section 3.1.3, the majority of Route Segment 17 would parallel U.S. Highway 14. Additional parts of Route Segment 17 would share or parallel existing transmission line and/or railroad rights-of way. In areas where Route Segment 17 would share or parallel existing ROW, impacts to sensitive ecological resources would be minimized.

The route width and ROW of Route Segment 17 intersect several SBS and native plant communities. For the most part, Route Segment 17 would traverse these sensitive ecological resources while paralleling U.S. Highway 14 or an existing transmission line or railroad ROW. However, in a few situations, the Route Segment 17 anticipated alignment would cross a sensitive ecological resource while establishing a new corridor. The anticipated alignment would create a new corridor through the Kaplan Woods SBS (ranked outstanding) and associated southern floodplain forest. The anticipated alignment would cross this area in a location that is approximately 900 feet long and could therefore likely span it. However, a densely forested area would need to be cleared within the ROW, thereby fragmenting this native plant community (Map 39-35).

Route Segment 17 would require crossing three railroad rights-of-way prairies. However, the anticipated alignments for Route Segment 17 would cross these railroad rights-of-way prairie perpendicularly and would do so while paralleling an existing road ROW. As such, impacts to these prairies would be minimized by spanning them.

The ROW of Route Segment 17 intersects the southern edge of Eagle Lake, a Lake of Biological Significance. Although the anticipated alignment would not cross the lake, some of the forested area on the edge of the lake would need to be cleared, as it is located within the ROW.

Table 7-23 Sensitive Ecological Resources within the Route Width and ROW of Route Segment 17

Resource	Units	Route Segment 17	
		Route width	ROW
Sites of Biodiversity Significance	Outstanding rank (acres)	87	3
	High rank (acres)	35	2
	Moderate rank (acres)	149	7
	Below rank (acres)	86	9
	Total acres	357	21
Native Plant Communities	Conservation Status S1 (community is critically imperiled), S2 (community is imperiled), or S3 (community is vulnerable to extirpation or extinction) (acres)	177	7
	Total acres (Conservation Status S1-S5)	177	7
Railroad Rights-of-Way Prairie	Crossing (count)	3	3
Lakes of Biological Significance	Moderate rank (count)	1	1
	Total count	1	1

7.9.7.3 Mitigation

Through prudent routing and implementation of BMPs and mitigation measures, impacts to federally or state protected species and sensitive ecological resources can be minimized. The primary means to mitigate potential impacts to federally and state protected species is to avoid routing through habitat used by these species. Additionally, impacts can be mitigated by incorporating species (or species type) specific BMPs in coordination with the USFWS and/or the DNR. The primary means to mitigate impacts to sensitive ecological resources is by avoiding and/or spanning these communities if possible. In addition, paralleling existing road or transmission line rights-of-way, would reduce the potential for fragmentation of these resources.

Mitigation and minimization measures for potential impacts to rare and unique natural resources are not standard Commission route permit conditions. However, as noted in Appendix H, there are standard route permit conditions to minimize potential impacts to vegetation and avian species, which would be applicable to minimizing impacts to federal and state protected species and sensitive ecological resources; these are summarized in Section 7.9.10.3 and Section 7.9.12.3, respectively.

As summarized in their route permit application, the applicant has committed to the following measures to minimize the potential for impacts to federal and state protected species and sensitive ecological resources:

- Obtaining available USFWS and DNR rare species databases prior to construction activities to determine locations where the routes and structures are near or adjacent to known locations of listed species.

- Conducting rare species surveys in those areas and similar high-quality habitats preferred by listed species.
- Avoiding impacts to federal- and state-listed species to the maximum extent practicable and coordinating with the appropriate federal and/or state agency in the unlikely event of unavoidable impacts to listed species.
- Continuing to work with the DNR to refine the final alignments and reduce impacts to natural resource sites.
- Potentially incorporating some seasonal restrictions, such as fencing of rare features, and vegetation restoration as applicable.
- Working with the DNR to refine the final alignments and reduce impacts to SBS and native plant communities.
- Implementation of integrated vegetation management plans associated with its existing pollinator initiative, which was created to enhance pollinator habitat.

In their Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR recommended the following to minimize potential impacts to sensitive ecological resources:

- Avoid working in Minnesota Biological Survey and rare (S1-S3) native plant communities.
- As much as possible, operate within already-disturbed areas.
- Retain a buffer between proposed activities and Minnesota Biological Survey Sites.
- Confine construction activities to the opposite side of the road from Minnesota Biological Survey Sites. If this is not feasible, confine construction activities to the existing road rights-of-way.
- Minimize vehicular disturbance in the area (allow only vehicles necessary for the proposed work).
- Do not park equipment or stockpile supplies in the area.
- Do not place spoil within Minnesota Biological Survey Sites or other sensitive areas.
- If possible, conduct the work under frozen ground conditions.
- Inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of invasive species.
- Use effective erosion prevention and sediment control measures.
- Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible.
- Use only weed-free mulches, topsoils, and seed mixes. Of particular concern is birdsfoot trefoil (Lotus corniculatus) and crown vetch (Coronilla varia), two invasive species that are sold commercially and are problematic in prairies and disturbed open areas, such as roadsides.

In their Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR recommended the following to minimize potential impacts to state-listed species:

- To minimize potential impacts to loggerhead shrike, tree and shrub removal must not occur within potential habitat during the breeding season, April through July. If avoiding tree or shrub removal within potential habitat from April through July is not feasible, a qualified surveyor will need to conduct a survey for active nests before any trees or shrubs will be removed.
- To avoid impacts to Blanding's turtles, the following avoidance measures are required:
    - Avoid wetland and aquatic impacts during hibernation season, between September 15th and April 15th, if the area is suitable for hibernation.
    - Erosion and sediment control should be limited to wildlife friendly erosion control to avoid the inadvertent take of Blanding's turtles.
    - Hydro-mulch products should not contain any materials with synthetic (plastic) fiber additives, as the fibers can re-suspend and flow into waterbodies.
    - Construction areas, especially aquatic or wetland areas, should be thoroughly checked for turtles before the use of heavy equipment or any ground disturbance.
    - Check any holes that have been left unattended for prolonged periods for turtles before being filled.
    - The DNR's Blanding's turtle flyer must be given to all contractors working in the area (reference (183)).
    - Illegal collection is a concern with wood turtles; therefore, no signs that would bring attention to the presence of wood turtles should be posted.
    - Monitoring during construction should be completed, and any sightings should be reported to Reports.NHIS@state.mn.us including date, observer, location, and photograph of the Blanding's turtle.
    - If turtles are in imminent danger, they must be moved by hand out of harm's way, otherwise they are to be left undisturbed. Directions on how to move turtles safely are found in reference (185)).
- To avoid impacting timber rattlesnakes the following avoidance measures are required:
    - Crews working the area should be advised that if they encounter any snakes, the snakes should not be disturbed.
    - Erosion and sediment control should be limited to wildlife friendly erosion control to avoid the inadvertent take of timber rattlesnakes.
- Timber rattlesnake precautions may include, but are not limited to, the following recommendations:
    - Wear appropriate personal protection equipment, such as thick pants, boots, and leather gloves.

  - Care should be taken around stockpiled materials as snakes may be using these materials for shelter.
  - Sightings should be reported to Reports.NHIS@state.mn.us; including date, observer, location, and photograph of the timber rattlesnake.
- To avoid impacts to aquatic species, stringent erosion prevention and sediment control practices should be maintained throughout the duration of the project to prevent adverse debris and material from impacting downstream populations.
- To avoid impacting state protected plants, all known occurrences of state protected plant species and all potential habitats must be avoided. If this is not feasible, a qualified surveyor will need to (1) resurvey known occurrences and (2) determine if suitable habitat exists within the activity impact area and, if so, conduct a survey prior to any project activities.
- To minimize impacts to northern long-eared bats and other bat species, tree removal should be avoided from June 1 through August 15.

In their ENM (Appendix F), MnDOT submitted the following comments regarding minimizing potential impacts to federal and state-protected species:

- The applicants should consult with the USFWS with respect to listed species which may occur within the project area, and limit ground disturbances to the extent practical in areas of semi-natural or natural vegetation. State-listed threatened and endangered species may be located along portions of the route along MnDOT ROW. We recommend the applicants consult with the DNR to identify recorded locations and conduct species-specific surveys prior to construction to confirm locations prior to identifying pole placement and temporary workspaces. MnDOT requests copies of all biological field survey data/reports within its ROW be submitted to MnDOT.
- Herbicide use must be minimized during construction and future maintenance occurring on MnDOT ROW. If used, herbicide must be applied via hand-held spot treatments applied to individual plants. Avoid broadcast applications of herbicides without further consultation to MnDOT Office of Environmental Stewardship (OES). Restrict all activities to avoid the application of insecticides and fungicides on MnDOT ROW.
- The applicants must establish native vegetation in areas that are not proposed to be mowed more than once per year, and must include mowing and spot treatment control to establish seeded vegetation, as described in the MnDOT Seeding Manual (see http://www.dot.state.mn.us/environment/erosion/vegetation.html).

7.9.8 Soils

The ROI for soils is the ROW. Existing soil types and associated qualities are reviewed to better understand the most likely impacts to occur as a result of construction activities. Nearly all soils within the ROI have a moderate or severe rutting hazard rating. Common soil impacts include rutting, compaction, and erosion. Potential impacts would be short-term during construction, localized, and

can be minimized. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicant would obtain a NPDES/State Disposal System Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicle trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored in a suitable location. Disturbed areas would be promptly seeded after construction.

7.9.8.1 Existing Conditions

Soil information for Route Segment 17 was obtained from the USDA-Natural Resource Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database. Map 45 shows the surface soil textures across Route Segment 17. Soil types within the ROI of Route Segment 17 were reviewed to identify soil characteristics that could be more prone to impacts in some areas versus others (Table 7-24).

Table 7-24 Route Segment 17 (Highway 14 Option) NRCS Mapped Soils within ROI

Segment ID	Buffer Width (ft.)	Total Acreage	Compaction Prone Medium or higher rating (acres (%))	Erosion Hazard Moderate or higher rating (acres (%))	Rutting Hazard Moderate or severe rating (acres (%))	Hydric Soils[1] 67-99% or 100% (acres (%))	Revegetation Concerns[2] NCC class of 3 or greater (acres (%))
Route Segment 17 (Highway 14 Option)	75	1,729	837 (48%)	318 (18%)	1,722 (100%)	786 (45%)	33 (2%)

[1] A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil profile. Hydric soils are typically associated with lowlands and wetlands and are rated by their proportion of hydric soil in the map unit.
[2] Soils with a non-irrigated land capability classification of 3 or greater were considered to have low revegetation potential.

All of the soils within the ROI of Route Segment 17 have a moderate or severe rutting hazard rating. Ratings in this hazard category indicate the potential of surface rut formation through the operation of heavy, wheeled equipment. Ratings are based on depth to the water table, rock fragments on or below the surface, the classification of the soil material based on the Unified Soil Classification System, depth to a restrictive layer, and slope. A rating of "moderate" indicates that rutting is likely and "severe" indicates that ruts form readily.

Approximately half of the soils within the ROI of Route Segment 17 have a medium or higher soil compaction rating. Soil compaction occurs when moist or wet soil particles are pressed together, reducing pore space between them, and is primarily caused by heavy vehicular traffic or permanent structure placement, such as with the new substations. Soils are rated based on their susceptibility to compaction from the operation of ground-based equipment for planting, harvesting, and site preparation activities when soils are moist. A "medium" rating means that after the initial compaction (that is, the first equipment pass), the soil can support standard equipment with only minimal increases in soil density. A "high" rating means that the soil will continue to compact after each equipment pass.

Approximately half of the soils within the ROI of Route Segment 17 are mapped as hydric soils. A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil profile. Hydric soils are typically associated with lowlands and wetlands and are rated by their proportion of hydric soil in the map unit. Within the ROW, soils consist of not hydric (0 percent), marginally hydric (1-32 percent), partially hydric (33-66 percent), predominantly hydric (67-99 percent), and hydric (100 percent) soils.

7.9.8.2 Potential Impacts

Transmission line projects have the potential to impact soils during construction and operation of the project. Construction might require some amount of grading to provide a level surface for safe operation of construction equipment. In addition, potential topsoil and subsoil mixing might result from the excavation, stockpiling, and redistribution of soils during installation of transmission line structures. Localized soil erosion, compaction, and topsoil and subsoil mixing could affect revegetation within temporary work areas.

7.9.8.3 Mitigation

The sample route permit (Section 5.3.8 of Appendix H) includes the following measures to mitigate impacts to soils:

> *"The Permittee shall implement those erosion prevention and sediment control practices recommended by the MPCA Construction Stormwater Program. If construction of the Transmission Facility disturbs more than one acre of land or is sited in an area designated by the MPCA as having potential for impacts to water resources, the Permittee shall obtain a National Pollutant Discharge Elimination System/State Disposal System Construction Stormwater Permit from the MPCA that provides for the development of a Stormwater Pollution Prevention Plan that describes methods to control erosion and runoff.*
>
> *The Permittee shall implement reasonable measures to minimize erosion and sedimentation during construction and shall employ perimeter sediment controls, protect exposed soil by promptly planting, seeding, using erosion control blankets and turf reinforcement mats, stabilizing slopes, protecting storm drain inlets, protecting soil stockpiles, and controlling vehicle tracking. Contours shall be graded as required so that all surfaces provide for proper drainage, blend with the natural terrain, and are left in a condition that will facilitate re-vegetation and prevent erosion. All areas disturbed during construction of the Transmission Facility shall be returned to pre-construction conditions."*

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicant would obtain a NPDES/State Disposal System Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicle trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored in a suitable location. Disturbed areas would be promptly seeded after construction. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

7.9.9 Surface Water

The ROI for surface water is the route width. Impacts to surface waters were assessed by identifying watercourses and waterbodies and considering their proximity to the project and special designations. The Route Segment 17 anticipated alignment crosses watercourses and waterbodies but parallels the US Highway 14 ROW at most crossing locations. Direct impacts caused by structures placed in surface waters would be avoided by spanning surface waters. Direct impacts to other resources can cause indirect impacts to surface waters. For example, construction activities near surface waters could cause riparian vegetation disturbance and surface erosion, which can lead to runoff impacting surface waters. In addition to spanning surface water crossings, impacts to surface waters would be mitigated through implementation of the SWPPP, AIMP, and VMP.

7.9.9.1 Existing Conditions

Several federal and state laws regulate watercourses and waterbodies. The Clean Water Act (CWA) establishes the structure for regulating the discharge of materials into waters of the United States and for developing water quality standards for surface waters (U.S. Code [USC]: Chapter 33 § 1311 and 1344). The CWA could potentially regulate several types of activities and their impacts associated with the project.

Watercourses and waterbodies may be regulated under Section 10 of the Rivers and Harbors Act (USC Chapter 33 § 401) and Section 404 of the CWA (USC Chapter 33 § 328.3 and 1344). The Rivers and Harbors Act regulates activities such as excavating, dredging, and altering the course of Section 10 designated waters (USC Chapter 33 § 403). Section 404 of the CWA prohibits discharge of dredged or fill materials without a permit. It provides legal protection to more waterbodies than the Rivers and Harbors Act, namely all jurisdictional waters of the United States, including navigable waters, interstate waters, and wetlands with a significant nexus to navigable waters (USC Chapter 33 § 320). The U.S. Army Corps of Engineers (USACE) holds both Section 10 and Section 404 permitting authority.

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

Section 303(d) of the CWA requires states 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. Waters that do not meet their designated uses because of water quality standard violations are listed as impaired. In Minnesota, the MPCA has jurisdiction over determining 303(d) waters which are described and listed as impaired.

Some watercourses and waterbodies are designated as public waters and are listed in the Public Waters Inventory (PWI) by the state of Minnesota. The statutory definition of a public water is found in Minnesota Statute § 103G.005, Subdivision 15a (Minnesota Statute §103G.005). These water resources are under the jurisdiction of the DNR, and a DNR license to cross public waters would be required when an activity would cross, change, or diminish the course, current, or cross-section of public waters by any means, including filling, excavating, or placing materials in or on the beds of public waters. PWI watercourse crossings are unavoidable, and the applicant would be required to coordinate with the DNR to obtain licenses to cross.

Minnesota regulates trout streams according to Minnesota Statute § 6264.0050. As provided by Minnesota Rules 6135.1100, subpart 4, item B: Crossings on or under the beds of streams designated by the commissioner of natural resources as trout waters shall be avoided unless there is no feasible alternative. When unavoidable, maximum efforts shall be taken to minimize damage to trout habitat.

Minnesota designates some water resources as Outstanding Resource Value Waters because of their exceptional qualities. Minnesota Statute § 7050.0180 prohibits, or stringently controls, new or expanded discharges from either point or nonpoint sources to outstanding resource value waters.

Route Segment 17 is in the Minnesota River and Lower Mississippi River Basins and crosses four major watersheds, as delineated by the USGS: Middle Minnesota River (8-digit Hydrologic Unit Code (HUC) 07020007), Zumbro River (8-digit HUC 07040004), Cannon River (8-digit HUC 07040002), and Buffalo Whitewater River (8-digit HUC 07040003). According to the Watershed Health Assessment Framework (WHAF), the mean watershed score for these four major watersheds ranges from 41 to 50 on a hundred-point scale (reference (185)). The mean watershed score is the average score of five separate components: hydrology, geomorphology, biology, connectivity, and water quality. At the state scale, mean watershed scores tend to decrease further downstream. Urban watershed degradation is attributed, in part, to impervious surfaces, intensity of water use, and point source pollution (reference (186)).

Map 35 shows the watercourses in the route width of Route Segment 17. Surface waters in the route width of Route Segment 17 include rivers and streams (watercourses) and lakes and ponds (waterbodies). Major watercourses within the route width of Route Segment 17 include, but are not limited to: Cascade Creek, Dodge Center Creek, Masten Creek, Middle Fork Zumbro River, North Branch Middle Fork Zumbro River, Plum Creek, South Branch Middle Fork Zumbro River, Straight River, Tompkins Creek, and an unnamed watercourse. Several of these watercourses are designated as public watercourses in the PWI and are also classified as impaired waters (Map 35). None of the other watercourses crossed by Route Segment 17 are designated as an Outstanding Resource Value Water or

Section 10 navigable water (reference (187)). Route Segment 17 crosses a trout stream, Tompkins Creek (Map 39-34).

Map 35 shows the waterbodies in the route width of Route Segment 17. The route width of Route Segment 17 includes waterbodies identified by the NHD, including waterbodies and wetlands. Of these waterbodies, none are designated as trout lakes by the DNR, and one is designated as a public water basin in the PWI: Eagle Lake. Route Segment 17 does not cross any impaired waterbodies.

The DNR Shallow Lakes Program works to protect and enhance wildlife habitat on larger lakes that are dominated by shallow water; these shallow lakes serve as important habitat to wildlife species (reference (188)); designated shallow wildlife lakes are discussed in Section 7.9.12. The DNR maps certain waterbodies as Lakes of Biological Significance based on the unique presence of aquatic plants or animals (reference (182)). Lakes of Biological Significance are discussed in Section 7.9.7.

The route width of Route Segment 17 includes 100-year floodplains designated by the Federal Emergency Management Administration (FEMA) (Map 35). Over eleven surface waters are associated with these 100-year floodplains. The route width of Route Segment 17 includes the 100-year floodplains of the Minnesota River, Mayhew Creek, Straight River, Izaak Walton Creek, Dodge Center Creek, Masten Creek, Cascade Creek, South Branch Middle Fork Zumbro River, Middle Fork Zumbro River, Harkcom Creek, North Branch Middle Fork Zumbro River, and unnamed watercourses.

7.9.9.2 Potential Impacts

The project was designed to span watercourses, waterbodies, and floodplains to the extent practicable and to minimize the number of structures in surface water resources where these resources cannot be spanned or crossings cannot use double-circuiting. The maximum transmission line structure span distance for watercourses, waterbodies, and floodplains is 1,000 feet. The crossing length of most of these resources is less than 1,000 feet, meaning that the project is expected to be able to span most watercourses and waterbodies, with a few exceptions for the waterbodies noted below. No structures would be placed within the surface waters that can be spanned by Route Segment 17, and no direct impacts on these watercourses and waterbodies are anticipated.

Route Segment 17 crosses 62 NHD watercourses, including PWI and impaired watercourses. The PWI watercourses and impaired streams crossed by the anticipated alignment for Route Segment 17 include the following:

- **Public Watercourses:** Route Segment 17 crosses nine PWI watercourses, including: Mayhew Creek, Straight River, Dodge Center Creek, Masten Creek, South Branch Middle Fork Zumbro River, Middle Fork Zumbro River, North Branch Middle Fork Zumbro River, and two unnamed watercourses.
- **Impaired Watercourses:** Route Segment 17 crosses six impaired watercourses, including: Straight River, Dodge Center Creek, South Branch Middle Fork Zumbro River, Middle Fork Zumbro River, and an unnamed creek.

Route Segment 17 also crosses Tompkins Creek which is a designated trout stream (Map 39-34). Trout streams can be especially sensitive to sedimentation and temperature changes. Route Segment 17 would cross Tompkins Creek in a location where it could be double-circuited with an existing 345 kV transmission line. Existing woody vegetation has already been cleared at the crossing location and therefore minimal impacts would be anticipated.

In total, there are four NHD waterbodies within the route width of Route Segment 17 where two of the waterbodies are parallel to U.S. Highway 14. One of the four NHD waterbodies is a PWI waterbody, Eagle Lake. A delineation of the ordinary high water mark would be required to confirm the total length of the waterbody crossing. The lake appears to abut close to U.S. Highway 14, and a crossing length greater than 1,000 feet could necessitate structures within the waterbody.

Despite spanning watercourses and waterbodies, indirect impacts associated with crossing these resources could occur during construction. Removal of vegetation and soil cover could result in short-term water quality impacts due to increased turbidity. Construction impacts could also remove riparian or shoreline forest areas within the ROW that currently assist with water attenuation and decreasing erosion impacts. In addition to habitat changes, vegetation clearing could increase light penetration to watercourses and waterbodies, potentially resulting in localized increases in water temperatures and changes to aquatic communities, especially those that rely on cold water, such as trout.

Impacts to floodplains during construction would include soil disturbance and vegetation removal. Vegetation clearing within a floodplain, especially tree removal, can greatly destabilize the area, make it more prone to ongoing erosion and sediment issues, and further contribute to water quality issues. The project might require that transmission line structures be placed within a FEMA-designated floodplain. Route Segment 17's anticipated alignment crosses nine floodplains that exceed 1,000 feet; most of these crossings would occur where the project would parallel the U.S. Highway 14 ROW.

7.9.9.3 Mitigation

The sample route permit (Section 5.3.9 of Appendix H includes the following measures to mitigate impacts to surface water:

- Space and place structures at variable distances to span and avoid watercourse and floodplains.
- Contain soil excavated from riparian areas and not place it back into the riparian area.
- Access riparian areas using the shortest route possible in order to minimize travel and prevent unnecessary impacts.
- Do not place staging or stringing set up areas within or adjacent to water resources, as practicable.
- Assemble structures on upland areas before they are brought to the site for installation.

- Restore water resource areas disturbed by construction activities to pre-construction conditions in accordance with the requirements of applicable state and federal permits or laws and landowner agreements.
- Meet the USACE, DNR, Minnesota BWSR, and local units of government water resource requirements.

Mitigation measures are anticipated to prevent and minimize impacts to watercourses and waterbodies. The applicant would obtain a NPDES Construction Stormwater permit from the MPCA for construction of the project which requires development of a SWPPP that identifies BMPs to be used during construction to minimize erosion and sedimentation. Per the stormwater permit, additional BMPs would be required for work near special waters, which include impaired waters and trout streams. Sediment barriers, such as silt fence, straw bales, and bio-logs, would be used along waterways and slopes during construction to minimize soil erosion and sedimentation. The Applicant would maintain water and soil conservation practices during construction and operation of the project to protect topsoil and adjacent water resources and minimize soil erosion. If tree removal is required along waterways, trees would be cut, leaving the root systems intact to retain bank stability. Construction would be completed according to NPDES permit requirements and an approved AIMP and VMP.

Impacts would be mitigated by using BMPs. Watercourses would only be crossed by construction equipment where required to support construction activities. Crossing PWI waters would require a DNR license to cross public waters, and work near special or impaired waters would require additional BMPs as detailed in the construction stormwater permit. According to the joint certificate of need application and route permit application, the applicant would work with the DNR to confirm that all proper licenses and approvals are obtained for public water crossings. Further, the joint certificate of need application and route permit application also states that through the licensing process, the applicant would work with the DNR to determine appropriate mitigation measures for these crossings.

7.9.10 Vegetation

The ROI for vegetation is the ROW. Impacts to vegetation are primarily evaluated by examining vegetative landcover types within the ROW. Most existing vegetation is agricultural.

Potential short-term impacts, such as clearing, compacting, or otherwise disturbing vegetation, could occur during construction and maintenance activities. Potential long-term impacts on vegetation would occur where structures are located or where conversion of forested vegetation to low-growing vegetation would be required. Impacts would be localized and unavoidable.

Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation including but not limited to implementation of the VMP and AIMP. The applicant committed to working with state and local agencies to coordinate appropriate BMPs for noxious weeds and also committed to implementing integrated vegetation management plans associated with its existing pollinator initiative.

7.9.10.1 Existing Conditions

The DNR and the U.S. Forest Service (USFS) have developed an ECS for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features (reference (10)). The ECS splits the state of Minnesota into Ecological Provinces, Sections, and Subsections.

Route Segment 17 is within the Eastern Broadleaf Forest Province. The Eastern Broadleaf Forest Province is characterized as a transition zone between semi-arid portions of Minnesota that were historically prairie and semi-humid mixed coniferous-deciduous forests to the northeast (reference (189)). Within this province, Route Segment 17 would cross the Big Woods and Oak Savanna subsections.

The project crosses the Big Woods subsection. Prior to European settlement, vegetation in the Big Woods subsection consisted of oak woodlands and maple-basswood forest on the irregular ridges, with aspen, bur oak, red oak, and white oak found along the western and other margins of this subsection. At present, the Big Woods subsection is dominated by cropland and pasture, with a small percentage of upland forest and wetland also present (reference (11)).

The project crosses the Oak Savanna subsection. Prior to European Settlement, vegetation in the Oak Savanna subsection consisted of bur oak savanna, with areas of tallgrass prairie and maple-basswood forest. Bur oak savanna was found on rolling moraine ridges at the western edge of the subsection and in dissected ravines at the eastern edge. Tallgrass prairie was concentrated on gently rolling portions of the landscape, in the center of the subsection. Maple-basswood forest was found in steep, dissected ravines or where stream orientation reduced fire frequency or severity. At present, the subsection is dominated by agricultural vegetation, with urban development accelerating along the northern boundary (reference (12)).

The project would cross the Rochester Plateau subsection in Goodhue and Olmsted County. Prior to European settlement, vegetation in the subsection consisted of tallgrass prairie and bur oak savanna. At present, the Rochester Plateau subsection is heavily farmed, with small areas of characteristic of oak openings and barrens (reference (199)).

In general, the vegetation resources across Route Segment 17 is dominated by agricultural vegetation and crops including grain, soybeans, hay/haylage, sweet corn, corn for silage, green peas, corn for grain, and oats for grain (Section 7.7.1). Map 34 provides an overview of landcover types according to the NLCD across Route Segment 17, and Table 5-25 summarizes the landcover types within the ROW of Route Segment 17. The NLCD is derived from Landsat imagery along with various other data sources. As such, it provides only an approximation of existing landcover types.

Natural vegetation, forested and grassy wind breaks, scattered woodlots, drainage ditches, and large grassland pastures regularly disturbed by grazing cattle are scattered throughout Route Segment 17. Agricultural and developed land makes up most of the landcover in the ROW (70 percent and 20 percent, respectively). Based on the NLCD data, the ROW of Route Segment 17 is approximately two percent forested.

Developed land areas within the ROI of Route Segment 17 include rural existing roadways, residential lots, and businesses concentrated around the cities of Mankato, Eagle Lake, Janesville, Waseca, Owatonna, Claremont, Dodge Center, Kasson, Byron, and Pine Island.

Table 7-25 Landcover Types within the ROW of Route Segment 17

Landcover Type	Route Segment 17 (Hwy 14 Option)	
Agricultural (cultivated crops and hay/pasture)	1,207.9 acres	70%
Barren Land (rock/sand/clay)	12.8 acres	1%
Developed (low-high intensity; open space)	344.1 acres	20%
Forest (upland and wetland)	42.3 acres	2%
Herbaceous (upland and wetland)	71.0 acres	4%
Open Water	2.3 acres	<1%
Shrub/Scrub (upland and wetland)	0.0 acres	0%
Total acres	1,729 acres	

7.9.10.2 Potential Impacts

Impacts to landcover associated with the project would primarily be associated with ROW clearing within rangeland and agricultural areas. Construction of the project would result in short-term impacts on existing vegetation, including localized physical disturbance and soil compaction. 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. These impacts to low growing vegetation would be temporary, having the ability to regrow after construction. Vegetation would be permanently removed where structures and foundations would be installed. Construction would also result in long-term impacts to vegetation by permanently removing high growing and forested vegetation within the ROW where present; the ROW would be maintained with low-growing vegetation during operations. The clearing of trees and tall vegetation is required for the construction, maintenance, and safe operation of the project.

Construction and maintenance activities have the potential to result in the introduction or spread of noxious weeds and other non-native species. Noxious weeds, which are regulated under Minnesota Statute 18, can be introduced to new areas through propagating material like roots or seeds transported by contaminated construction equipment. Activities that could potentially lead to the introduction of noxious weeds and other non-native species include ground disturbance that leaves soils exposed for extended periods, introduction of topsoil contaminated with weed seeds, vehicles importing weed seed, and conversion of landscape type, particularly from forested to open settings. Noxious weeds establish more quickly on disturbed soil surfaces than native vegetation and in turn displace existing native land cover without proper controls in place.

Route Segment 17 has a minimal amount of NLCD-mapped forested land cover and because Route Segment 17 follows existing road and transmission line rights-of-way, forested vegetation within the ROW has mostly already been fragmented. Conversion from forest to open habitats in the ROW could have impacts on native vegetation by altering environmental conditions, such as light penetration; this could alter the vegetation community adjacent to the ROW and increase the potential spread of noxious weeds and other non-native species.

7.9.10.3 Mitigation

As noted in Section 3.1.3, the applicant would be required to comply with MnDOT's conditions when working within MnDOT ROW. Specific to vegetation, this would include establishing native vegetation in areas that are not proposed to be mowed more than once per year and including mowing and spot treatment control to establish seeded vegetation, as described in MnDOT's Seeding Manual. The applicant would also be required to use specific seed specifications.

Mitigation and minimization measures for potential impacts to vegetation resources are standard Commission route permit conditions (5.3.10, 5.3.11, 5.3.12, and 5.3.13 of Appendix H) and include the following:

- Minimize number of trees to be removed in selecting the ROW, specifically preserving to the maximum extent practicable windbreaks, shelterbelts, living snow fences, and vegetation in areas such as trail and stream crossings where vegetative screening could minimize aesthetic impacts.
- Remove tall growing species located within the transmission line ROW that endanger the safe and reliable operation of the transmission line. Leave undisturbed, to the extent possible, existing low growing species in the ROW or replant such species in ROW to blend the difference between the ROW and adjacent areas, to the extent that the low growing vegetation that will not pose a threat to the transmission line or impede construction.
- Employ BMPs to avoid the potential introduction and spread of invasive species on lands disturbed by construction activities. Develop an Invasive Species Prevention Plan and file with the Commission prior to construction.
- Take all precautions against the spread of noxious weeds during construction. Site appropriate seed certified to be free of noxious weeds should be used and to the extent possible, native seed mixes should be used.
- Restrict pesticide use to those pesticides and methods of application approved by the Minnesota Department of Agriculture, DNR, and the U.S. EPA. Selective foliage or basal application shall be used when practicable.

As summarized in the joint certificate of need application and route permit application, the applicant has committed to the following measures as the primary means to mitigate impacts to vegetation and minimize the potential for the introduction or spread of noxious weeds and invasive species:

- Limiting vehicle traffic to roads and pathways along the proposed ROW and within previously disturbed areas to the extent practicable
- Restricting equipment to narrow paths within the proposed ROW
- Spanning areas of sensitive vegetation
- Installing the line as a double circuit with an existing transmission line where possible
- Routing parallel or adjacent to existing rights-of-way, such that tree removal is minimized

The applicant committed to working with the state and counties crossed by the project to identify where noxious weeds may be present and develop appropriate BMPs to minimize impacts. The applicant would implement a vegetation management plan to mitigate impacts and restore lands impacted by construction, as provided in the applicant's route permit application. Furthermore, the applicant committed to implementing integrated vegetation management plans associated with its existing pollinator initiative, created to enhance pollinator habitat. The plans minimize chemical use by avoiding broadcast applications and employ spot treatments for control of invasive species.

7.9.11 Wetlands

The ROI for wetlands is the ROW. Impacts to wetlands were evaluated by examining wetland type, size, and potential for spanning. Route Segment 17 would require ROW within forested wetlands. In three areas, clearing would be required in forested wetlands adjacent to PWI watercourses.

Localized direct impacts to wetlands would include vegetation clearing, movement of soils, and construction traffic which could alter or impair wetland functions. Forested wetlands would be subject to long-term impacts given their conversion to non-forested wetlands. Wetland crossings longer than 1,000 feet might require one or more structures to be placed in the wetland, resulting in small, localized permanent wetland impacts. Route Segment 17 would require two wetland crossings longer than 1,000 feet.

Impacts can be minimized using BMPs. Wetland impacts would be regulated and could require permits. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW, moving the anticipated alignment to a least impactful alignment within the route width, or minimizing clearing required in forested wetlands by selecting a route with an existing ROW where the project could be double-circuited.

7.9.11.1 Existing Conditions

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

Minnesota also has state-level regulations focused on protecting wetlands. The Minnesota Wetland Conservation Act (WCA) (Minnesota Rules 8420) is administered by the BWSR under Minnesota Rules 8420.0100, subpart 3 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 (1) avoid disturbing the wetland if feasible, (2) minimize wetland impacts, and (3) replace lost wetland acres, functions, and values. Certain activities are exempt from the WCA, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation.

A second state-level program that offers protection to the state's waters and wetlands is the PWI program administered by the DNR (Minnesota Statute § 103G.005). The DNR regulates work below the ordinary high-water level of PWI wetlands and waters through the public waters work permit program. Examples of work activities addressed by this program include filling, excavation, bridges and culverts, dredging, structures, and other construction activities.

Wetlands are areas with hydric (wetland) soils, hydrophytic (water-loving) vegetation, and wetland hydrology (inundated or saturated much of the year). Wetlands detain floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. Wetland types vary widely due to differences in topography, soils, hydrology, vegetation, water chemistry, climate, and other factors.

Calcareous fens are rare and distinctive peat-accumulating wetlands that receive groundwater rich in calcium and other minerals. The WCA, authorized by Minnesota Statute Section 103G.223, states that calcareous fens may not be filled, drained, or otherwise degraded, wholly or partially, by any activity, except as provided for in a management plan approved by the commissioner of the DNR. The DNR regulates calcareous fens under Minnesota Rules 8420.0935.

The USFWS NWI, as updated by the DNR, identifies wetland complexes and isolated wetlands within the ROI of Route Segment 17 (Map 35). Wetland types in Route Segment 17 generally include seasonally flooded wetlands, wet meadows, shallow marshes, deep marshes, shallow open water, shrub swamps, wooded swamps, and riverine wetlands. As shown on Map 35, wetlands in the route width are mostly non-forested. Route Segment 17's ROI includes three PWI wetlands. No calcareous fens are mapped within 5 miles of Route Segment 17 (reference (190)).

7.9.11.2 Potential Impacts

The proposed transmission line could temporarily or permanently impact wetlands if they cannot be avoided during project design. Construction of transmission line structures typically includes vegetation clearing, movement of soils, and construction traffic. These activities could alter or impair wetland functions. Even small changes in hydrology (for example, periods of inundation, changes in flow, and sedimentation) can impair wetland function. Any wetland that would receive permanent transmission line infrastructure would also be impacted long term during operation of the project due to equipment access through the wetland for maintenance.

Transmission lines cannot be safely or reliably operated with trees growing within the ROW. As such, existing trees must be removed throughout the ROW, including forested wetlands. Forested wetlands, within any new transmission line ROW, would likely undergo a permanent change in wetland/vegetation type. Wetlands can also be impacted by soil erosion and sediment deposition during construction. Sedimentation and ground disturbance in wetlands can make them more susceptible to the establishment of invasive plant species, such as reed canary grass, which would adversely impact wetland function by reducing vegetative biodiversity and altering wildlife habitat.

Route Segment 17's ROI includes primarily non-forested wetlands (114 acres) compared to forested wetlands (15 acres). Forested wetlands would be subject to wetland type conversion. In the following locations, forested wetlands would be subject to conversion adjacent to PWI watercourses:

- South of the city of Owatonna, on the south side of U.S. Highway 14, and adjacent to Straight River (Map 39-19)
- Southwest of the city of Dodge Center, on the south side of U.S. Highway 14, and adjacent to Dodge Center Creek (Map 39-26)
- South of CSAH 5 and adjacent to Zumbro River (Map 39-35)

In most cases, wetlands can be spanned to avoid placing structures within them. However, wetland crossings longer than 1,000 feet might require one or more structures to be placed within the wetland. Route Segment 17 includes two crossings longer than 1,000 feet in the following locations in Blue Earth County:

- West of County Road 12 and east of 594th Avenue (Map 39-3)
- At the Eagle Lake crossing location (Map 39-3)

7.9.11.3 Mitigation

Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width.

The sample route permit (Section 5.3.9 of Appendix H) includes the following measures to mitigate impacts to wetlands:

- Develop wetland impact avoidance measures and implement them during construction of the project.
- Space and place the structures at variable distances to span and avoid wetlands.
- Limit unavoidable wetland impacts as a result of the placement of structures to the immediate area around the structures.

- Construct in wetland areas during frozen ground conditions where practicable and according to permit requirements by the applicable permitting authority.
- Use wooden or composite mats to protect wetland vegetation when construction during winter is not possible.
- Contain soil excavated from the wetlands and not place it back into the wetland.
- Access wetlands using the shortest route possible in order to minimize travel through wetland areas and prevent unnecessary impacts.
- Do not place staging or stringing set up areas within or adjacent to wetlands, as practicable.
- Assemble structures on upland areas before they are brought to the site for installation.
- Restore wetland areas disturbed by construction activities to pre-construction conditions in accordance with the requirements of applicable state and federal permits or laws and landowner agreements.
- Meet the USACE, DNR, Minnesota BWSR, and local units of government wetland requirements.

7.9.12 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width. Impacts to wildlife and wildlife habitat are assessed both by considering wildlife inhabiting the ROI as well as assessing the presence of potential habitat for wildlife within the ROI, including areas that are preserved or managed for wildlife. Potential short-term, localized impacts to wildlife could occur from displacement during construction or maintenance activities. Potential long-term impacts could occur as a result to habitat loss, conversion, or fragmentation.

Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife and associated habitat. The primary means for mitigating impacts to wildlife or associated habitat is to avoid areas known to contain high-quality habitat or which serve as migratory corridors. Use of existing rights-of-way can minimize habitat loss and fragmentation. Impacts to wildlife can also be minimized by spanning habitats and minimizing the number of structures in high-quality habitat through the use of specialty structures.

7.9.12.1 Existing Conditions

Wildlife inhabiting the ROI are typical of those found in disturbed habitats associated with agriculture and rural and suburban development. Watercourses and waterbodies, and areas of natural vegetation, such as wetlands, forested areas, and open herbaceous areas, also provide habitat for wildlife in the area. Wildlife species inhabiting the ROI are generally adapted to disturbance associated with agricultural activities and human settlement. Typical species include mammals such as deer, fox, squirrels, coyote, and racoons; songbirds, such as robins and red-winged blackbirds; waterfowl, such as eagles and wood ducks; reptiles, such as snakes and turtles; amphibians, such as toads and frogs; and aquatic biota such as fish and mussels.

The state of Minnesota is in the Mississippi Flyway of North America. The Mississippi Flyway is a bird migration route that encompasses the Great Plains of the U.S. and Canada. Migratory birds use portions of the Mississippi Flyway as resting grounds during spring and fall migration, as well as breeding and nesting grounds throughout the summer. Suitable habitat for migratory birds is present throughout Route Segment 17.

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

Minnesota is home to over 2,000 known native wildlife species and over 300 of these species have been identified as Species in Greatest Conservation Need (SGCN) because they are rare, their populations are declining, or they face serious threats that can cause them to decline, and thus have populations below levels desirable to promote their long-term health and stability. Minnesota's Wildlife Action Plan 2015-2025 includes a habitat approach, which focuses on sustaining and enhancing terrestrial and aquatic habitats for SGCN in the context of the larger landscapes (reference (191)). The Wildlife Action Plan lays out the basis for the long-term vision of a Wildlife Action Network composed of terrestrial and aquatic habitat cores and ROWs to support biological diversity and ecosystem resilience with a focus on SGCN. As shown on Map 46, several Wildlife Action Network corridors are scattered throughout Route Segment 17 and are crossed by the ROI for Route Segment 17. The Wildlife Action Network is a metric that can be used to assess buffers and connectors of habitats representing the diversity of habitat quality, supporting SGCN. As detailed by the DNR, "Consideration should be given to projects or activities that could result in the loss, degradation, or fragmentation of habitat within the Wildlife Action Network, as habitat loss was identified as a substantial contributor to SGCN population declines" declines" (reference (191)).

Several lands that are preserved or managed for wildlife and associated habitat are scattered throughout Route Segment 17, including DNR state game refuges, USFWS Grassland Bird Conservation Areas (GBCAs), and DNR-designated shallow wildlife lakes; these wildlife resource areas are shown on Map 46.

DNR state game refuges are established to protect and preserve natural habitat and game populations (reference (193)). The ROI for Route Segment 17 intersects the East Minnesota River Game Refuge and the Claremont Game Refuge (Map 46-1 and Map 46-6).

The USFWS designates GBCAs priority areas for grassland protection and enhancement that are thought to provide suitable habitat for many or all priority grassland bird species in tall grass prairie. Several GBCAs intersect the ROI for Route Segment 17 (Map 46).

There are over 5,000 shallow lakes that are greater than 50 acres in size in the state of Minnesota; these shallow lakes serve as important habitat to wildlife species (reference (188)). The DNR Shallow Lakes Program designates certain shallow lakes as shallow wildlife lakes; this designation allows them to protect and enhance wildlife habitat on these larger lakes (reference (196)). A DNR designated shallow wildlife lake (Eagle Lake) intersects the ROI for Route Segment 17 (Map 46-1).

In addition to the lands that are preserved or managed for wildlife, there are several sensitive ecological resources, such as native plant communities, that would also provide habitat for wildlife; these resources are discussed in Section 7.9.7.1.

7.9.12.2 Potential Impacts

7.9.12.2.1 General Wildlife Impacts

Construction activities that generate noise, dust, or disturbance of habitat could result in short-term, indirect impacts on wildlife. During project construction, wildlife would generally be displaced within and adjacent to the ROW. Clearing and grading activities could also affect birds' eggs or nestlings and small mammals that might be unable to avoid equipment. Many wildlife species would likely avoid the immediate area during construction and possibly not return following construction; the distance that animals would be displaced depends on the species and the tolerance level of each animal. However, comparable habitat is available adjacent to the project.

Construction of the project could result in long-term adverse impacts on wildlife due to loss, conversion, or fragmentation of habitat, particularly areas that are preserved and/or managed for wildlife. The route width and ROW of Route Segment 17 intersect areas preserved or managed for wildlife, as summarized in Table 5-26 and shown on Map 46.

As discussed in Section 3.1.3, the majority of Route Segment 17 would parallel U.S. Highway 14. Additional parts of Route Segment 17 would parallel existing transmission line and/or railroad rights-of- way near the beginning of the route segment and for its last subpart. In areas where Route Segment 17 would parallel existing ROW, impacts to wildlife and associated habitat would be minimized because habitat fragmentation has already occurred in these areas.

Table 7-26 Wildlife Resources within the Route Width and ROW of Route Segment 17

Resource	Units	Route Segment 17	
		Route width	ROW
State Game Refuge	Acres	428	64
Grassland Bird Conservation Areas	Acres	446	67
Designated Shallow Wildlife Lakes	Count	1	1
Wildlife Action Network corridors	High or medium-high rank (acres)	217	17
	Medium rank (acres)	199	22
	Low or medium-low rank (acres)	338	53
	Total acres	754	92

The ROW of Route Segment 17 would intersect the East Minnesota River Game Refuge and the Claremont Game Refuge in areas where the anticipated alignments would parallel existing transmission line and road corridors, thereby minimizing the potential for new impacts to state game refuges.

Route Segment 17 would intersect GBCAs in one area where the anticipated alignment would parallel an existing transmission line ROW and another location where the anticipated alignment would parallel an existing road ROW. Establishment of a new transmission line corridor through a GBCA could increase potential impacts to birds flying through the area.

The ROW of Route Segment 17 intersects Eagle Lake, a designated shallow wildlife lake. Although the Route Segment 17 anticipated alignment would not cross the lake, some of the forested area on the edge of the lake would need to be cleared, as it is located within the ROW.

The route width and ROW of Route Segment 17 would intersect several Wildlife Action Network corridors; however, impacts would be minimized by mostly intersecting these corridors in areas that have already been fragmented by transmission lines or roads. Most of the locations where the anticipated alignment of Route Segment 17 crosses Wildlife Action Network corridors occur in areas where the anticipated alignment would parallel an existing road or transmission line ROW. However, there is one corridor in the central part of the Route Segment 17, where the ROW and anticipated alignment would cross a large Wildlife Action Network corridor and would require establishing a new corridor through it. The anticipated alignment would cross this area in a location that is approximately 900 feet long and could therefore likely span it. However, a densely forested area would need to be cleared within the ROW, thereby fragmenting this habitat. Note, this is the same location as the Kaplan Woods SBS and associated southern floodplain forest native plant community described in Section 7.9.7.2.3.

7.9.12.2.2 Avian Impacts

Potential impacts to avian species (for example, songbirds, raptors, and waterfowl) could occur due to electrocution and collision with transmission line conductors. Electrocution occurs when an arc is created by contact between a bird and energized lines or an energized line and grounded structure equipment. Electrocution occurs more frequently with larger bird species, such as hawks, because they have wider wingspans that are more likely to create contact with the conductors.

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

Impacts to birds would be minimized by paralleling existing transmission line ROW; Route Segment 17 would parallel existing transmission line ROW for 22 percent of its length. Construction of new transmission line corridors would add a potential new impact to avian species.

The incidence of birds colliding with transmission lines is influenced by the number of horizontal planes in which the conductors are strung. Stringing the conductors in a single horizontal plane presents less of a barrier to birds crossing the transmission line ROW. Situations where the Route Segment 17 transmission line would parallel an existing transmission line could result in the addition of another horizontal plane, unless the lines are strung at the same height.

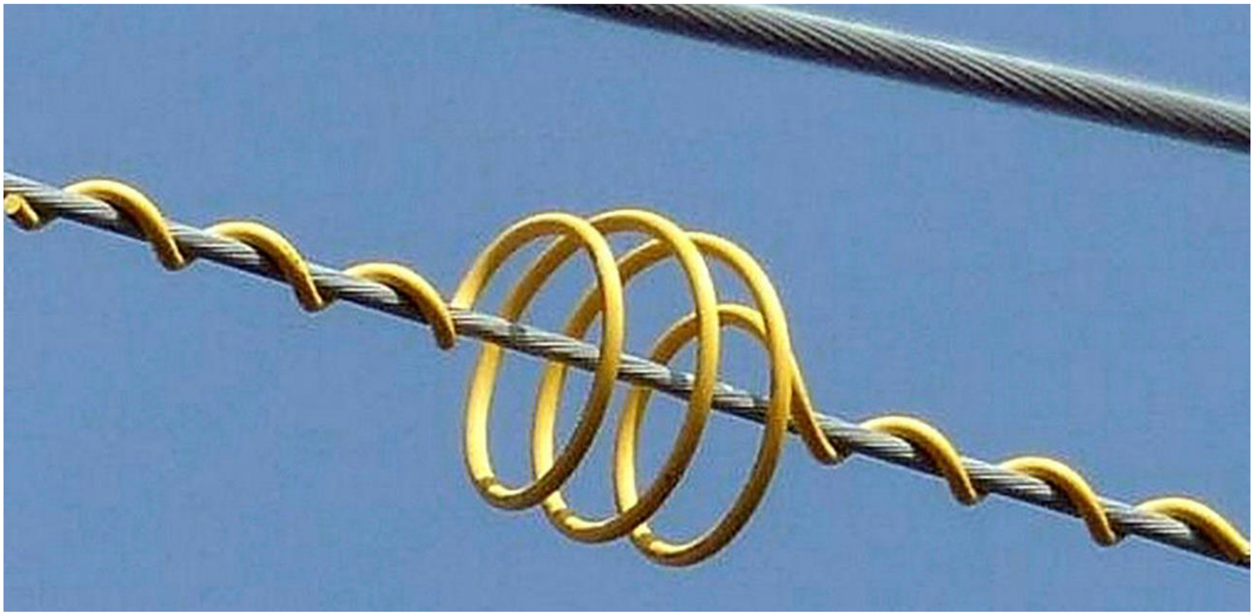
7.9.12.3 Mitigation

Potential impacts to wildlife and wildlife habitat can often be minimized or mitigated through several strategies. The primary strategy for mitigating impacts is to select route alternatives away from areas known to contain high-quality habitat or which serve as migratory corridors. Use of existing rights-of-way can minimize habitat loss and fragmentation. Impacts to wildlife can also be minimized by spanning habitats and minimizing the number of structures in high-quality habitat through the use of specialty structures.

Mitigation and minimization measures for potential impacts to avian species, including federally and/or state protected avian species, are standard Commission route permit conditions. As noted in Appendix H, as part of the Commission’s route permit, the applicant, in cooperation with the DNR, would need to identify areas of the transmission line where bird flight diverters would be incorporated into the transmission line design to prevent large avian collisions attributed to visibility issues. A typical bird flight diverter installation is shown in Figure 5-14. In addition, standard transmission design would need to incorporate adequate spacing of conductors and grounding devices in accordance with Avian Power Line Interaction Committee standards to eliminate the risk of electrocution to raptors with larger wingspans that could simultaneously come in contact with a conductor and grounding devices.

As discussed in Section 7.9.10.3, there are several standard Commission route permit conditions to mitigate or minimize potential impacts to vegetation resources; these standard route permit conditions would also be applicable to mitigating and minimizing potential impacts to wildlife habitat.

Figure 7-9 Typical Bird Flight Diverter



As summarized in its route permit application, the applicant has committed to the following measures to minimize the potential for impacts to wildlife and wildlife habitat:

- Designing the route to avoid wildlife habitat identified to the extent possible during a constraints analysis completed during the routing process.
- Implementation of specific BMPs for protected species that would also be beneficial to wildlife in general; these are discussed in Section 7.9.7.3.
- Coordinating with the DNR and/or USFWS to identify wildlife migration pathways, particularly avian flyways crossed by the route alternatives, and to identify areas where transmission lines should be marked to minimize avian interactions.

Currently, the state of Minnesota does not track locations of bald eagles or their nests, and the USFWS does not have any public data available on eagle nests. The DNR is in the process of developing a database of eagle nest locations; however, it is not currently available. The DNR suggests reporting any eagle sightings on eBird (https://ebird.org/home); these reports will ultimately become part of the DNR's eagle database.

The USFWS bald eagle management guidelines indicate that activities within 660 feet of an active nest and occur within line of sight of the nesting location might have the potential to disturb nesting bald eagles (reference (198)). Impacts to bald eagles could be minimized by conducting a visual inspection for bald eagle nests not more than two weeks prior to the start of construction, if work will occur during the active nesting period for bald eagles (January 15th – July 31st). If an active nest is observed and if construction would need to take place during the time that the nest remains active, consultation with the USFWS would need to occur to determine the appropriate next steps. Under such a circumstance, a variety of options are available, including the presence of a biological monitor to observe and determine if project activities are resulting in disturbance, a shift in project schedule to avoid the active nesting season, or a submittal for an incidental take permit that would allow work to proceed even if it is likely to result in disturbance.

As summarized in their joint certificate of need application and route permit application, the applicant has committed to continuing coordination with the USFWS regarding the 2024 revised regulations for the issuance of permits for eagle incidental take and eagle nest take (Permits for Incidental Take of Eagles and Eagle Nests, 50 Code of Federal Regulations CFR, Parts 13 and 22, 2024).

In their ENM (Appendix F), MnDOT submitted the following comments regarding minimizing potential impacts to avian species:

- The applicants should minimize tree clearing/trimming within MnDOT ROW to extent possible. Tree clearing may be restricted to winter months (November 15 - March 31). On MnDOT ROW, additional tree-clearing restrictions will typically be included in MnDOT's utility permit. If construction activities occur within the nesting season for migratory birds, conduct pre-construction nest surveys. If active nests are discovered, implement a Migratory Bird Plan to avoid and minimize impacts.

7.10 Electric System Reliability

In the joint certificate of need application and route permit application, the applicant summarized Midcontinent Independent System Operator’s (MISO’s) reliability analysis findings and noted that the applicant completed their own examination of system reliability improvements yielded by the project. Reliability analyses studied all NERC contingency categories (P1-P7). These analyses support the purpose and need of the project.

The purpose of the project, as also discussed in Section 4.1, is to construct an HVTL to provide additional transmission capacity to reduce congestion and to improve electric system reliability throughout the region as more renewable energy resources are added to the high-voltage transmission system. The project would provide additional transmission capacity that is needed to mitigate current capacity issues and as part of the Long Range Transmission Planning (LRTP) Tranche 1 Portfolio, would address reliability violations as defined by the NERC at over 300 different sites across the Midwest. The project would increase transfer capability across the MISO Midwest subregion to allow reliability to be maintained for all hours under varying dispatch patterns driven by differences in weather conditions.

The joint certificate of need application and route permit application discussed that the existing 230 kV transmission system in eastern North Dakota and South Dakota plays a key role in transporting and delivering energy to customers in Minnesota, but the existing 230 kV system is currently at its capacity. The project, as part of LRTP Tranche 1, would provide a new 345 kV transmission line, which is designed to provide additional transmission capacity to mitigate current capacity issues on the existing 230 kV transmission system and to improve electric system reliability as more renewable energy resources are added throughout the region.

The applicant designed the project with the intent of meeting the project's electric system reliability needs. Reliability was also considered by the applicant in their alternatives analysis.

7.11 Costs that are Dependent on Design and Route

The applicant's overall project costs, as presented in the joint certificate of need application and route permit application and discussed in Section 3.5, are based on high and low-cost estimates of the project as a whole, and do not distinguish between the individual route segments and alternatives. The transmission line is expected to cost approximately $3.7 million per mile. The estimated project construction cost at the time of the application was between $524.7 million and $577.2 million. Also, as discussed in Section 3.5, since the filing of the joint certificate of need application and route permit application, the applicant has updated this range of project costs to include alternatives, and the updated estimated cost is between $436.8 million and $583.8 million.[16] The applicant's testimony notes the total cost to construct Route Segment 17 (Hwy 14 Option) is estimated to be $397.1 million.

Construction cost estimates rely on the best available information at the time of the estimate. Estimates include (1) transmission line structures and materials; (2) transmission line construction and restoration; (3) transmission line and substation permitting and design; (4) transmission line ROW acquisition; and (5) substation materials, substation land acquisition, and construction. The cost estimates assume the applicant would pay prevailing wages for applicable positions during project construction.

The following variables were considered when estimating project costs:

- Unexpected weather conditions
- Environmental sensitivities resulting in the need for mitigation measures
- Poor soil conditions in areas where no data was obtained
- Transmission line outage constraints
- Potential shallow bedrock
- River crossings
- Labor shortages
- Market fluctuations in material pricing and availability
- Labor costs

[16] Northern States Power Company, dba Xcel Energy: TESTIMONY-- T. Wendland Direct Testimony and Schedules, Docket No. 20253-216973-01

These cost estimates could increase over time for any number of reasons, including escalation, inflation, and commodity pricing, especially for these types of large-scale 345 kV transmission projects with multi-year schedules.

7.12 Route Segment 17 (Hwy 14 Option) Relative Merits

Route Segment 17 (Hwy 14 Option)'s relative merits are provided in Chapter 8.

8 Segment 1 and 2 Route Options Relative Merits

So far, this EIS has discussed potential impacts by segments (Segment 1 and Segment 2) and Route Segment 17 (Hwy 14 Option) which was an alternative proposed during scoping. Route Segment 17 has the same beginning point as Segment 1 (Mankato [Wilmarth Substation]) and the same end point as Segment 2 (Pine Island [North Rochester Substation]).

However, the Commission must select a complete route for the proposed 345 kV transmission line. The full route would initiate at Mankato [Wilmarth Substation) and end at the Mississippi River. As described in Section 3.1.4, the eastern-most 43.4 miles is referred to as Segment 3 and could be double-circuited with existing structures that were previously permitted as a 345-kV double-circuit capable line. No alternatives to Segment 3 were proposed during scoping. As such, Segment 3 is assumed as part of the final 345 kV route for purposes of this EIS, and this chapter presents options for routing the proposed 345 kV transmission line from Mankato (Wilmarth Substation) to Pine Island (North Rochester Substation). In other words, Chapter 8 presents the relative merits for Segments 1 and 2 combined.

The route options discussed in this chapter do not represent the only routing possibilities. Rather, they are examples—other routes could be developed by combining parts of the applicant-proposed routes and/or combining parts with alternatives. This chapter illustrates how various subparts could be selected to build a project route. No option is meant to represent a “best-case scenario” or to be “least impactful overall.”

The three route options discussed in this chapter include:

- Route Option A – Segment 1 North and Segment 2 North
- Route Option B – Segment 1 North (with Route Segment 18) and within the Segment 2 West Faribault to Rochester Study Area, Segment 2 North and Connector Segment 2G and Segment 2 South
- Route Option C – Route Segment 17 (Highway 14 Option)

Route Option A includes the applicant-proposed northern options for Segments 1 and 2. Route Option B includes the applicant-proposed northern options for Segment 1 (with incorporation of the Route Segment 18 alternative recommended during scoping), and the north-south option from the Segment 2 East of Faribault to west of North Rochester study area (Section 6.13). Route Option C includes the Highway 14 Option which was proposed during scoping as Route Segment 17.

The Segment 1 and 2 route options are illustrated in Map 47. The potential impacts of the Segment 1 and 2 route options are summarized in Table 8-1.

Table 8-1 Human and Environmental Impacts of Segment 1 and 2 Route Options

Resource	Element	Route Option		
		Option A	Option B	Option C
Length (miles)		83.3	76.0	95.2
Opportunities for Double-Circuiting	Double-circuit with existing 69 kV line (miles, percent)	26.7 (32%)	5.5 (7%)	0
	Double-circuit with existing 115 kV line (miles, percent)	35.0 (42%)	33.5 (44%)	4.0 (4%)
	Double-circuit with existing 161 kV line (miles, percent)	<.1	<.1	<.1
	Double-circuit with existing 345 kV line (miles, percent)	7.2 (9%)	2.6 (3%)	13.9 (15%)
	Total opportunity for double-circuiting (miles, percent)	68.9 (83%)	41.5 (55%)	17.9 (19%)
ROW Sharing / Paralleling	Transmission line (miles, percent)	68.9 (83%)	41.5 (55%)	21.2 (22%)
	Roads (miles, percent)	32.2 (38%)	12.9 (17%)	67.3 (71%)
	Railroad (miles, percent)	2.9 (4%)	2.9 (4%)	8.2 (9%)
	Pipeline (miles, percent)	0	0	0
	Total ROW sharing or paralleling with existing infrastructure (transmission line, road, railroad, and pipeline) (miles, percent)	75.1 (90%)	48.8 (64%)	81.5 (86%)
	Total ROW paralleling with division lines (parcel, section, and field lines) (miles, percent)	68.4 (82%)	59.5 (78%)	81.4 (86%)
	Total ROW sharing or paralleling (all)	80.3 (96%)	69.3 (91%)	89.1 (94%)
Human Settlement	Residences within 0 - 75 feet, ROW (count)	1	0	4
	Residences within 75 – 500 feet, Route Width (count)	175	122	191
	Residences within 500 – 1,600 feet, local vicinity (count)	158	96	59
	Total Residences (count)	334	218	254
	Non-residential structures within 0 - 75 feet (count)	7	6	9
	Non-residential structures within 75 - 500 feet (count)	504	279	348
	Non-residential structures within 500 - 1,600 feet (count)	331	261	412
	Total Non-residential structures (count)	842	546	769
Conservation Easements	RIM (acres in ROW)	2.9	2.9	4.1
	Conservation Reserve Enhancement Program (acres in ROW)	2.0	0	0
	Forest Legacy Land (acres in ROW)	5.6	5.6	0
	Permanent Wetlands Preserve (acres in ROW)	0	0	0.5

Resource	Element	Route Option		
		Option A	Option B	Option C
Land-Based Economies	Agricultural land (acres in ROW)	1,024	1,061	1,208
	Prime farmland (acres in ROW)	967	907	1,436
Archaeology and Historic Architecture	Archaeological sites in route width (count in route width)	7	3	34
	Historic architectural resources in route width (count in route width)	19	10	54
	Historic cemeteries (count in route width)	9	3	12
Water Resources	NHD stream crossings (count)	84	73	62
	PWI stream crossings (count)	32	23	9
	Trout stream crossings (count)	0	0	1
	Impaired stream crossings (count)	15	12	6
	NHD lake crossings (count)	4	4	4
	Impaired lake crossings (count)	1	1	0
	PWI basin/wetland crossings (count)	10	10	1
	Forested wetlands (acres in ROW)	12	11	15
	Total wetlands (acres in ROW)	141	135	129
	Wetland crossings greater than 1,000 feet (count)	9	9	2
Vegetation	Forested landcover in the ROW (acres)	94	75	42
Wildlife	Wildlife Management Areas (acres in ROW, acres in route width)	10 79	10 79	0
	Important Bird Areas (acres in ROW, acres in route width)	4 42	4 42	0
	Grassland Bird Conservation Areas (acres in ROW, acres in route width)	509 3,400	443 2,958	67 446
	State Game Refuge (acres in ROW, acres in route width)	17 127	17 127	64 428
	Waterfowl Production Area (acres in ROW, acres in route width)	0 <1	0 <1	0
	Designated Shallow Wildlife Lakes (count in ROW, count in route width)	1	1	1
	Aquatic Management Areas crossings (count in ROW, count in route width)	1 1	1 1	0
	Wildlife Action Network Corridors (acres in ROW, acres in route width)	181 1,219	123 841	92 754
Rare and Unique Natural Resources	State Threatened or Endangered Species (documented records in NHIS database; count in ROW, count in route width)	6 12	6 12	7 10
	Scientific and Natural Areas (acres in ROW, acres in route width)	2 28	2 28	0
	Sites of Biodiversity Significance (acres in ROW, acres in route width)	47 388	41 363	21 357

Resource	Element	Route Option		
		Option A	Option B	Option C
	Native Plant Communities (acres in ROW, acres in route width)	27 212	23 191	7 177
	Designated Old Growth (acres in ROW, acres in route width)	<1 6	<1 6	0
	Railroad rights-of-way prairie crossings (count)	1	1	3
	Lakes of Biological Significance (count in ROW, count in route width)	1 3	1 3	1 1

The Segment 1 and Segment 2 route options' relative merits analysis uses graphics (Table 8-2) to provide a visual assessment of the relative merits for each route option. The graphic for a specific routing factor or element is not meant to be indicative of the best route option but is provided as a relative comparison to be evaluated together with all other routing factors. Table 8-3 summarizes the relative merits analysis of the three route options.

Table 8-2 Guide to Relative Merits Analysis

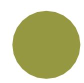
Consistency with Routing Factor or Anticipated Impacts	Symbol
Route option is consistent with the routing factor OR Impacts are anticipated to be negligible to minimal or the impact is positive	
Route option is consistent with routing factor but less so than the other options OR Impacts are anticipated to be minimal but the potential for impacts is greater than the other options or require special permit conditions OR Impacts are anticipated to be moderate	
Route is not consistent with routing factor or consistent only in part OR Impacts might be moderate but the potential for impacts is greater than the other options or might require special permit conditions OR Impacts are anticipated to be significant	

Table 8-3 Relative Merits of Segment 1 and Segment 2 Route Options

Routing Factor / Resource	Route Option A	Route Option B	Route Option C	Summary
		Factor A Human Settlement		
Aesthetics	◒	◒	◒	Aesthetic impacts are anticipated to be moderate for Route Options A, B, and C. Route Option B has less residences within the ROW, route width, and local vicinity, with a total of 218 residences within the local vicinity compared to Route Option A (334) and Route Option C (254). Route Option B also has less non-residential structures within the local vicinity. Route Options A, B, and C would result in aesthetic impacts to areas used for recreational purposes as all three would introduce new crossings at the Straight River, a state water trail, where there is no existing infrastructure already present. Route Option A could be double-circuited with or paralleling existing transmission lines for 83% of its length, and 90% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads). Route Option B could be double-circuited with or paralleling existing transmission lines for 55% of its length and 64% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads). Route Option C could be double-circuited with or paralleling existing transmission lines for 22% of its length and 86% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads).
Displacement	◒	◒	◒	Route Option C has 4 residences and Route Option A has 1 residence within the ROW that could be subject to displacement; however, the applicant has indicated no residences would be displaced. All three options have a similar count of non-residential structures within the ROW (6 to 9).
Land Use and Zoning	◒	◒	◒	One known area of future development was noted during scoping and would be subject to impacts from Route Options A and B. It is a development that has broken ground on the western side of 589th Avenue west of the city of Mankato (Segment 1 North), and impacts could be avoided and/or mitigated with an alternative (Alignment 2 [Section 5.13.3]). Route Option C would impact the urban expansion districts near the city of Dodge Center and Kasson in Dodge County where municipal growth is anticipated.
Recreation	◒	◒	◒	Recreational resources within the route width subject to impacts include local parks, a publicly accessible trail system, public watercourses, snowmobile trails, and a scenic byway. The local parks are within the route width but not ROW, and no impacts are anticipated. Intermittent impacts would occur during construction, and long-term impacts would include aesthetic impacts. Route Option A and Route Option B route widths would cross the Sakath Singing Hills State Trail for 4.2 miles. Existing infrastructure, including roads and transmission lines, crosses the trail in multiple locations. Impacts to the trail are anticipated to be minimal. The Cannon River is a designated state water trail and wild and scenic river and is located within the route width of Route Option A and Route Option B; there is an existing transmission line at the crossing location. The Straight River is a state water trail and is located within the route width of Route Options A, B, and C. There are no existing transmission lines at the crossings. The Zumbro River is a state water trail and is located within the route width of Route Option C; there are existing transmission lines at the three crossings. Impacts to the Cannon River, Straight River, and Zumbro River are anticipated to be minimal. The Minnesota River Valley Scenic Byway follows the Minnesota River and crosses Route Options A, B, and C; minimal impacts to the scenic byway are anticipated.
Factor C Land-Based Economies				
Agriculture	●	●	●	Most land within the route width is agricultural (76% of Route Option A, 80% of Route Option B, and 63% of Route Option C); impacts cannot be avoided but can be mitigated. Prudent routing (e.g., ROW sharing via double-circuiting or paralleling with existing infrastructure) could help minimize impacts. Route Option A shares or parallels existing infrastructure for 90% of its length, Route Option B shares or parallels existing infrastructure for 64% of its length, and Route Option C shares or parallels existing infrastructure for 86% of its length. Overall, impacts are anticipated to be minimal.
Forestry	●	●	●	No notable forestry resources were identified within the route width of Route Options A, B, or C; therefore, no impacts to forestry are anticipated.
Mining	●	●	●	No active gravel pits were identified within the route width of Route Options A, B, or C; therefore, impacts to mining are anticipated to be minimal.
Tourism	●	●	●	Known events and other opportunities for tourism are advertised in nearby incorporated towns, and the activities are not located within the ROI. Recreational opportunities identified within the ROI include publicly accessible lands and waters used for outdoor activities. Impacts to the tourism-based economy are anticipated to be negligible to minimal.

Routing Factor / Resource	Route Option A	Route Option B	Route Option C	Summary
Factor D Archaeological and Historic Resources				
Archaeological	●	●	◓	Route Option C's route width contains two NRHP-eligible archaeological sites as compared to no sites within the route width for Route Options A and B. Route Option C's route width has more unevaluated sites for the NRHP (28) compared to Route Option A (7) and Route Option B (3). Route Option C's route width contains more potential historic cemeteries (12) than Route Option A (9) or Route Option B (3). However, the exact locations of the cemeteries are unknown. Survey efforts would be completed by the applicant and would inform potential impacts; impacts are anticipated to be avoided and/or mitigated.
Historic	●	●	◓	Route Option C's route width has more previously documented NRHP-eligible historic architectural resources (14) compared to Route Option A (3) and Route Option B (0). Route Option C's route width includes more historic architectural resources which are unevaluated for the NRHP (37) compared to Route Option A (17) and Route Option B (2). Survey efforts would be completed by the applicant and would inform potential impacts; impacts are anticipated to be avoided and/or mitigated.
Factor E Natural Resources				
Public and Designated Lands	●	●	●	No locally-owned (city or county), state-owned, or federally-owned lands are present within the ROW for Route Option C. Public lands within the ROW for Route Option A and Route Option B include Wildlife Management Areas, an Aquatic Management Area, and a Scientific and Natural Area – all of which are owned by the DNR. Impacts by Route Option A and Route Option B are anticipated to be minimal as crossings are in locations where the project could be double-circuited with existing transmission line, or could be avoided depending upon the location of the final alignment. The applicant would be required to coordinate with DNR. Additionally, RIM land, Conservation Reserve Enhancement Program easements, Forest Legacy Land, and PWPs are present within Route Option A's ROW; RIM land and Forest Legacy Land are present within Route Option B's ROW; and RIM land and a PWP are present within Route Option C's ROW. Permanent clearing of vegetation, or the expansion of the cleared areas in cases where an existing line is already present within the conservation areas, would impact the function and intent of these areas unless they could be avoided during final design.
Surface Water	◓	◓	◓	Route Option A has the most watercourse crossings (84) and Route Option C has the least (62). However, Route Option A would cross most of these watercourses while double-circuiting existing transmission lines. Route Option C would cross a trout stream, while Route Options A and B avoid trout streams. Route Options A and B have 10 PWI basin/wetland crossings, while Route Option C only has 1; however, these PWI crossings are in areas that could be double-circuited. All three route options would cross waterbodies that are greater than 1,000 feet wide (e.g., Eagle Lake) and could require placement of structures within them if they cannot be spanned.
Vegetation	●	●	●	All three route options would impact forested vegetation, with Route Option A having the most forested vegetation in the ROW (94 acres) and Route Option C having the least amount of forested vegetation in the ROW (42 acres). Because all three route options would follow existing transmission line and/or road ROW for most of their lengths, most of these forested areas have already been fragmented. However, there are densely forested areas in the ROW of Route Option C in areas that do not follow an existing ROW; as such, these forested areas would become fragmented. The incorporation of Route Segment 18 into Route Option B would avoid a forested area that is intersected by Route Option A; this area has already been fragmented by an existing transmission line.
Wetlands	◓	◓	◓	All three route options have relatively similar acreages of wetlands, with Route Option A having the most wetland in the ROW (141 acres) and Route Option C having the least (129 acres). The ROW of all three route options intersect forested wetland, with Route Option C intersecting the most (15 acres) and Route Option B intersecting the least (11 acres). Because Option C would parallel U.S. Highway 14 for the majority of its length and Route Option A and Route Option B would double-circuit an existing transmission line for much of their lengths, most of forested wetlands within the existing ROW for both options have already been cleared. However, there are three forested wetlands within the ROW of Route Option C that would require clearing adjacent to PWI watercourses. Two calcareous fens are located less than five miles from Route Options A and B. The ROW Route Option A and Route Option B have nine crossings of wetlands that are wider than 1,000 feet; Route Option C has two crossings of wetlands that are wider than 1,000 feet.
Wildlife and Wildlife Habitat	◓	◓	◓	The route width and ROW of all three route options would intersect wildlife resources. Route Options A and B would generally intersect more acres of wildlife resources but would mostly do so while double-circuiting existing transmission lines. While the ROW may need to be expanded to accommodate the double-circuiting, these areas have already been fragmented. Route Option C would mostly follow U.S. Highway 14 and as such, would also mostly intersect wildlife resources in areas that have already been fragmented. There is one location where the anticipated alignment of Route Option C would cross a densely forested Wildlife Action Network corridor in an area where there is not an existing transmission line or road ROW; as a result, this corridor would be fragmented. In addition, the majority of Route Option C would not follow an existing transmission line corridor, this could result in more avian impacts relative to Route Options A and B, which follow existing transmission line corridors for most of their length.

Routing Factor / Resource	Route Option A	Route Option B	Route Option C	Summary
Rare and Unique Natural Resources	◒	◒	◒	All three route options have a similar number of NHIS records within the ROW and route width. Route Options A and B would intersect the Townsend Woods Scientific and Natural Area, in an area where it could be double-circuited; Route Option C would avoid this resource. The ROW of Route Options A and B intersect more acres of SBS and native plant communities than Route Option C. Route Option C intersects more railroad rights-of-way prairie than Route Options A and B. Route Options A and B would generally intersect sensitive ecological resources in areas that could be double-circuited with an existing transmission line. For the most part, Route Option C would traverse these sensitive ecological resources while paralleling U.S. Highway 14 or an existing transmission line or railroad ROW. However, in a few situations, the Route Option C anticipated alignment would cross a sensitive ecological resource while establishing a new corridor, such as through the Kaplan Woods SBS (ranked outstanding) and associated southern floodplain forest.
Minnesota Statute § 216E.03 - subdivision 7 (15e) (transmission lines)				
Paralleling Existing Transmission Line	●	●	◒	Route Option A could be double-circuited for 68.9 miles which is 83% of its length. Route Option B could be double-circuited for 41.5 miles which is 55% of its length. Route Option C could be double-circuited for 17.9 miles which is 19% of its length.
Minnesota Statute § 216E.03 - Subdivision 7 (8) (roads/railroads)				
Paralleling Roads and Railroads	◒	◒	●	Route Option A would parallel roads or railroads for 32.2 miles which is 38% of its length. Route Option B would parallel roads or railroads for 12.9 miles which is 17% of its length. Route Option C would parallel roads or railroads for 67.3 miles which is 71% of its length.
Factor H Paralleling Division Lines				
Paralleling existing survey lines, natural division lines, and agricultural field boundaries	●	●	●	Route Option A would follow existing division lines (field, parcel, and section lines) for 68.4 miles which is 82% of its length. Route Option B would follow existing division lines (field, parcel, and section lines) for 59.5 miles which is 78% of its length. Route Option C would follow existing division lines (field, parcel, and section lines) for 81.4 miles which is 86% of its length.
Factor J Paralleling Existing Infrastructure				
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.	●	◒	●	Cumulatively, Route Option A parallels existing infrastructure (transmission lines, roads, or railroads) for 90% of its length. Cumulatively, Route Option B parallels existing infrastructure (transmission lines, roads, or railroads) for 64% of its length. Cumulatively, Route Option C parallels existing infrastructure (transmission lines, roads, or railroads) for 86% of its length.
Factor L Costs				
Costs Dependent on Design and Route	●	●	◒	The applicant indicated the cost for its preferred route is $339.9 million. The applicant's preferred route is the same as Option B as presented in the EIS, except that Option B includes Route Segment 18 and the applicant did not include this alternative in its preferred route. Route Segment 18 is 1.6 miles long and is not anticipated to significantly change the applicant's cost estimate. In comparison, the applicant indicated the total cost to construct Option C is estimated to be $397.1 million. [17] The applicant did not provide a cost estimate for Option A. However, in the joint certificate of need application noted that the transmission line is expected to cost approximately $3.7 million per mile. Option A is more than 7 miles longer than Option B and would be anticipated to cost more than Option B .

[17] Northern States Power Company, dba Xcel Energy: TESTIMONY-- T. Wendland Direct Testimony and Schedules, Docket No. 20253-216973-01

9 Segment 3, Pine Island (North Rochester Substation) to Mississippi River - Affected Environment, Potential Impacts, and Mitigation

This chapter provides an overview of the human and environmental resources that could be affected by Segment 3 (Section 3.1.4). It discusses potential impacts relative to the construction and operation of the project on these resources. It also discusses ways to avoid, minimize, and mitigate these impacts.

Segment 3 would be a new 345 kV transmission line that would run from the North Rochester Substation near Pine Island to the Mississippi River (and Minnesota/Wisconsin border) where it would cross the river at a point near the city of Kellogg (Map 1). Segment 3 is 43.4 miles and would be double-circuited in its entirety (Map 6). The existing double-circuit structures were previously permitted as a 345-kV double-circuit capable line by the Commission as part of the CapX2020 Hampton – La Crosse Project in 2012 (reference (2)). As described in Section 3.1.4, there are no alternatives being considered for Segment 3.

The westernmost 27 miles of Segment 3 would convert an existing 161 kV transmission line to 345 kV. These 27 miles of 161 kV transmission line would need to be relocated; the relocated part is referred to in the EIS as Segment 4 (161 kV Relocation) and is discussed in Section 10. The easternmost 16 miles of Segment 3 would involve installing new 345 kV transmission lines on existing transmission structures.

9.1 Terms and Concepts

Understanding proposed and alternative route impacts involves contextualizing their duration, size, intensity, and location. This form of contextual information serves as the basis for assessing the overall project impacts on resources. To provide appropriate context, the following terms and concepts are used to describe and analyze potential impacts:

- **Duration –** Impacts vary in length of time. Short-term impacts are generally associated with construction but might extend into the early operational phase of the project. Long-term impacts are associated with the operation of the project. Permanent impacts extend beyond project decommissioning and reclamation.
- **Size –** Impacts vary in size. To the extent possible, potential impacts are described quantitatively, for example, the number of impacted acres or the percentage of affected individuals in a population.
- **Uniqueness –** Resources are different. Common resources occur frequently, while uncommon resources are not ordinarily encountered.
- **Location –** Impacts are location-dependent. For example, common resources in one location might be uncommon in another.

The context of an impact, in combination with its anticipated on-the-ground effect, is used to determine an impact intensity level, which can range from highly beneficial to highly harmful.

Impact intensity levels are described using qualitative descriptors, which are explained below. These terms are not intended as value judgments, but rather a means to confirm common understanding among readers and to compare potential impacts between route alternatives.

- **Negligible** impacts do not alter an existing resource condition or function and are generally not noticeable to an average observer. These short-term impacts affect common resources.
- **Minimal** impacts do not considerably alter an existing resource condition or function. Minimal impacts might, for some resources and at some locations, be noticeable to an average observer. These impacts generally affect common resources over the short- or long-term.
- **Moderate** impacts alter an existing resource condition or function and are generally noticeable to the average observer. Impacts might be spread out over a large area, making them difficult to observe but can be estimated by modeling. Moderate impacts might be long-term or permanent to common resources, but generally short- to long-term to uncommon resources.
- **Significant** impacts alter an existing resource condition or function to the extent that the resource is impaired or cannot function as intended (highly harmful). Significant impacts are likely noticeable or predictable to the average observer. Impacts might be spread out over a large area, making them difficult to observe, but can be estimated by modeling. Significant impacts can be of any duration and affect common or uncommon resources.

Also discussed are opportunities to mitigate potential impacts through mitigation. Mitigation means:

- Avoiding impacts altogether by not undertaking a certain project or parts of a project;
- Minimizing impacts by limiting the degree of magnitude of a project;
- Rectifying impacts by repairing, rehabilitating, re-creating, or restoring the affected environment;
- Reducing or eliminating impacts over time by preservation and maintenance operations during the life of the project;
- Compensating for impacts by replacing or providing substitute resources or environments; or
- Reducing or avoiding impacts by implementing pollution prevention measures.

Some impacts can be avoided or minimized; some might be unavoidable but can be minimized; others might be unavoidable and unable to be minimized but can be rectified (corrected). The level at which an impact can be mitigated might change the impact intensity level.

When referring to construction practices or mitigation measures, this EIS uses the convention of describing these as actions by the applicant, even if the action would be carried out by the applicant's contractor.

9.2 Regions of Influence

Potential impacts on human and environmental resources are analyzed within specific geographic areas called regions of influence (ROI). The ROI is the geographic area where the project might exert some influence and is used as the basis for assessing potential impacts. ROIs vary by resource and potential impact (Table 6-1). As necessary, the EIS discusses potential impacts and mitigation measures beyond the identified ROI to provide appropriate context. Direct impacts within the ROI might cause indirect impacts outside the ROI.

This EIS uses the following ROIs:

- **Right-of-Way –** the ROW for the 345 kV transmission line is 150-feet-wide (75 feet on each side of the anticipated alignment). As noted in Section 3.3.2, Segment 3 would be constructed in existing ROW and no new ROW is required.
- **Route Width –** the route width for Segment 3 is consistently 1,000-feet wide (500 feet on each side of the anticipated alignment).
- **Local vicinity –** within 1,600 feet of the anticipated alignment (in other words, a 3,200-foot-wide buffer area distributed equally on either side of the anticipated alignment)
- **Project area –** within one mile of the anticipated alignment (in other words, a two-mile-wide buffer distributed equally on either side of the anticipated alignment)
- **Three-county area** – term used to collectively describe the three counties in which the project is located (including Goodhue, Olmsted, and Wabasha counties).

Table 9-1 Regions of Influence

Resource Type	Resource Element	Region of Influence
Human settlement	Aesthetics	Local vicinity
	Cultural values	Three-county area
	Displacement	ROW
	Environmental justice	Census Tracts within the route width
	Land use and zoning	ROW
	Noise	Local vicinity
	Property values	Local vicinity
	Recreation	Route width
	Socioeconomics	Three-county area
	Transportation and Public Services	Roadways/rail - Local vicinity/Route Width Public utilities - ROW Emergency Services – Three-county Area Airports – 3.78 miles
Human health and safety	Electromagnetic fields	ROW
	Implantable medical devices	ROW
	Public and worker safety	ROW
	Stray voltage	ROW
	Induced voltage	ROW
	Electronic interference	ROW
Land-based economies	Agriculture	Route width
	Forestry	Route width
	Mining	Route width
	Tourism	Local vicinity
Archaeological and historic resources	Archaeological and historic resources	Route width
Natural environment	Air quality	Project area
	Climate	Project area
	Geology and topography	Route width
	Greenhouse Gases	ROW
	Groundwater	ROW
	Public and designated lands	ROW
	Rare and unique natural resources	Project area for protected species; route width for sensitive ecological resources
	Soils	ROW
	Surface water	Route width
	Vegetation	ROW
	Wetlands	ROW
	Wildlife and Wildlife Habitat	Route width

9.3 Environmental Setting

Segment 3's project area is dominated by rural and agricultural land use with a concentrated area of development on the west end near Pine Island, and woodlands and river valleys on the east end (Map 48). Segment 3 crosses the Zumbro River and ends at the Mississippi River (Map 49). The Great River Road Scenic Byway is crossed by Segment 3 near the Mississippi River (Map 50-4).

The DNR and the USFWS have developed an ECS for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features (reference (10)). Under this classification system, Segment 3 is in the Eastern Broadleaf Forest Province (Map 51). This section is further divided into subsections, including the Rochester Plateau and the Blufflands subsections. These subsections are used below to classify the environmental setting of the project.

The Rochester Plateau Subsection is primarily characterized by level to gently rolling older till plains, overlying dolomite, limestone, and sandstone. The boundaries are characterized by end moraines to the west, and by an area of transition between a level to rolling plateau and dissected landscapes to the east. Topography is controlled by underlying glacial till along the western edge. As glacial till thins to the east, topography is largely bedrock controlled. Depth of drift over bedrock varies from 100 to 200 feet in the west to 10 to 100 feet in the east, with bedrock exposures common. Loess thickness is variable, ranging from 30 feet thick on broad ridgetops, to less than a foot on valley walls. The predominant soils are Udalfs, with localized Aquents along the floodplains and major rivers. Presettlement tallgrass prairie and bur oak savanna were the primary vegetation; at present, most of the area is farmed (reference (199)).

The Blufflands Subsection is primarily characterized by loess-capped plateau that is deeply dissected by river valleys where dolomite, limestone, sandstone, and shale bedrock formations are exposed in valley walls. Topography is controlled by underlying glacial till along the western edge of the subsection where loess is several feet thick. As glacial drift thins to the east, topography is largely bedrock controlled. Depth of drift over bedrock varies from 0 to 50 feet. Loess thickness is variable, ranging from 30 feet thick on broad ridgetops to less than a foot on valley walls. The predominant soils are Udalfs, with localized Aquents along the floodplains and major rivers. Presettlement vegetation consisted of tallgrass prairie and bur oak savanna on ridge tops and dry upper slopes; red oak-white oak-shagbark hickory-basswood forests on moister slopes; and red oak-basswood-black walnut forests in protected valleys. At present, about 30% of the area is farmed, 20% is in pasture, and 50% is in woodland (reference (272)).

Segment 3 is in Goodhue, Olmsted, and Wabasha Counties. Communities nearest to Segment 3 include Pine Island on the west and Plainview in the eastern half (Map 2-4). Existing transmission lines are prevalent throughout (Map 52). Segment 3 is generally bound by U.S. Highway 52 to the west and the Mississippi River to the east (Map 52).

9.4 Use or Paralleling of Existing Rights-of-Way

Segment 3 would be double-circuited on existing structures and within existing ROW in its entirety. Opportunities for paralleling other types of existing ROW, such as roads, are further discussed in Section 9.5.1.

9.5 Human Settlements

9.5.1 Aesthetics

The ROI for aesthetics is the local vicinity. Transmission lines alter a viewshed. Because aesthetic impacts are subjective, the potential impacts can vary widely and be unique to each person. For Segment 3, the transmission line structures are already present and would be altered with the addition of the 345 kV circuit. Impacts are largely assessed by reviewing the number of nearby residences and opportunities for double-circuiting with an existing transmission line and/or ROW paralleling. Segment 3 would be double-circuited with existing transmission line structures in its entirety and be within existing ROW.

Determining the relative scenic value or visual importance in any given area is subjective and depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question.

Aesthetic impacts can be minimized by selecting routes that are located away from homes, schools, businesses, and other places where people congregate (for example, parks or other recreation areas). Aesthetic impacts can also be minimized by following existing transmission line ROW where elements of the built environment already define the viewshed.

9.5.1.1 Existing Conditions

The aesthetic and visual resources of a landscape are defined as the existing natural and built features which affect the visual quality and character of an area. A landscape's character is largely influenced by topography, vegetation, water resources, existing development, and infrastructure. Determining the relative scenic value or visual importance in any given area depends, in large part, on the individual viewer, or community of viewers, whose perceptions are shaped by their values and experiential connection to the viewing area, as well as their physical relationship to the view, including distance to structures, perspective, and duration of the view.

Viewer sensitivity is understood as an individual's interest or concern for the quality of a viewshed and varies depending upon the activity viewers are engaged in, their values and expectations related to the viewshed, and their level of concern for potential changes to the viewshed. High viewer sensitivity is generally associated with individuals engaged in recreational activities; traveling to scenic sites for pleasure and to or from recreational, protected, natural, cultural, or historic areas; or experiencing viewsheds from resorts, roadside pull-outs, or residences. Residents have a higher sensitivity to potential aesthetic impacts than temporary observers. Low viewer sensitivity is generally associated with individuals commuting, working, or passing through an area.

For the purpose of this document, it is assumed that landscapes which are, for the average person, harmonious in form and use are generally perceived as having greater aesthetic value. Infrastructure which is not harmonious with a landscape or affects existing landscape features reflects a change in the aesthetic view that for some, or many, could negatively affect a viewer's perception and expectation of the area. Assessing visual quality reflects the difference between the landscape change and the individual or communal reaction to that change. As noted above, individual or communal perspectives are complex, affected by individual or shared values and experiences with the land. As such, some viewers could perceive the project setting as having high visual quality while others might perceive the area to have less visual quality. Perceived aesthetics can carry more weight when they are tied to a specific feature, like residential properties, scenic byways, or historic/archaeological/natural features. This is a key reason among those that prefer to co-locate new infrastructure among the built environment (utility ROWs, roads, railways, pipelines).

The topography of Segment 3 is characterized by loess mantled ridges and bluffs are dissected by river valleys. Segment 3 is primarily agricultural (71 percent), with small pockets of developed, forested, herbaceous, and open water land cover.

Segment 3 is adjacent to Pine Island city limits and it north of Oronoco and Plainview. It does not traverse through or near developed areas associated with these municipalities. There are also recreational features that influence the visual character and enjoyment of these areas, such as water trails. There are no wind or solar farms in the local vicinity of Segment 3.

The entirety of Segment 3's route would be double-circuited with the existing transmission line. Existing transmission line structures were permitted by the Commission as double-circuit capable. The 345 kV circuit would be strung on the existing structures, and for part of Segment 3, replace the existing 161 kV. The existing 345 kV transmission structures along Segment 3 would vary in height between 70 and 175 feet. The existing ROW has already been cleared of woody vegetation.

Certain landscape areas have higher aesthetic value due to their scenic qualities. These areas could include scenic byways, recreation areas, and river crossings. Segment 3 crosses the Zumbro River, which is a state water trail (Map 50-2). It also goes through the Richard J. Dorer Memorial Hardwood State Forest before crossing the Great River Road Scenic Byway (Map 50-4 and Map 50-5). Segment 3 ends at the Mississippi River, which is classified as a wild, scenic, and recreational river (Map 50-5).

9.5.1.2 Potential Impacts

No changes would occur to the existing structures except for the addition and/or replacement of the existing 161 kV circuit to include the 345 kV circuit.

In some cases, Segment 3 parallels other types of ROW (roads); it also parallels divisions lines (Table 9-2; Map 52).

Table 9-2 Segment 3, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

	Segment 3 (43.4 mi total)	
Double-circuited with existing transmission line	43.4 mi	100%
Follows existing roads	3.5 mi	8%
Follows existing railroads	0.0	0%
Follows existing infrastructure (transmission lines, roads, and railroads)	43.4	100%
Follows division lines (field, parcel, and section lines)	27 mi	62%
Total ROW paralleling [1]	43.4	100%
Total length that does not follow existing infrastructure or division lines	0.0	0%

[1] Total ROW paralleling represents the total length of the segment that either parallels existing infrastructure (transmission lines, roads, and railroads) *or* follows division lines (field, parcel, and section lines). Some parts of a segment fall into both categories but are not double-counted in this total.

Because the entirety of Segment 3 would be double-circuited (Map 7), aesthetic impacts would be negligible because the existing transmission line is already part of the aesthetics of the area. The ROW has already been cleared, so there would be no impact from widening or further clearing of the ROW.

In addition to opportunities to share or parallel existing ROW, the degree of aesthetic impacts would also be dependent on the magnitude of viewer sensitivity and exposure. Visual impacts are expected to be minimal for those with low viewer sensitivity, such as people traveling to and from work. For those with high viewer sensitivity, for example, neighboring landowners or recreationalists, visual impacts are anticipated to be moderate to significant. Viewer exposure refers to variables associated with observing a viewshed, and can include the number of viewers, frequency and duration of views, and view location. Viewer exposure would typically be highest for views experienced by high numbers of people, frequently, and for long periods. To the extent these impacts can be quantified depends on the presence of several on-the-ground factors linked to the concepts of viewer quality, sensitivity, and exposure. These factors include:

- Proximity to residences, schools, churches, etc., where relatively more observers are present to experience aesthetic impacts;
- Views valued by the public at large, for example, scenic overlooks or scenic byways; or
- Locations where people recreate or otherwise enjoy leisure activities.

Appendix G summarizes human settlement features in the local vicinity of the route segments. The proximity of residential structures (homes, daycares, and nursing homes) and non-residential structures (for example, agricultural buildings and sheds) to route segments at various distances is shown in Figure 9-1 and Table 9-3, respectively. No residences are located within the ROW of Segment 3. It has 59 residences within 1,600 feet.

Figure 9-1 Segment 3, Proximity of Residential Structures

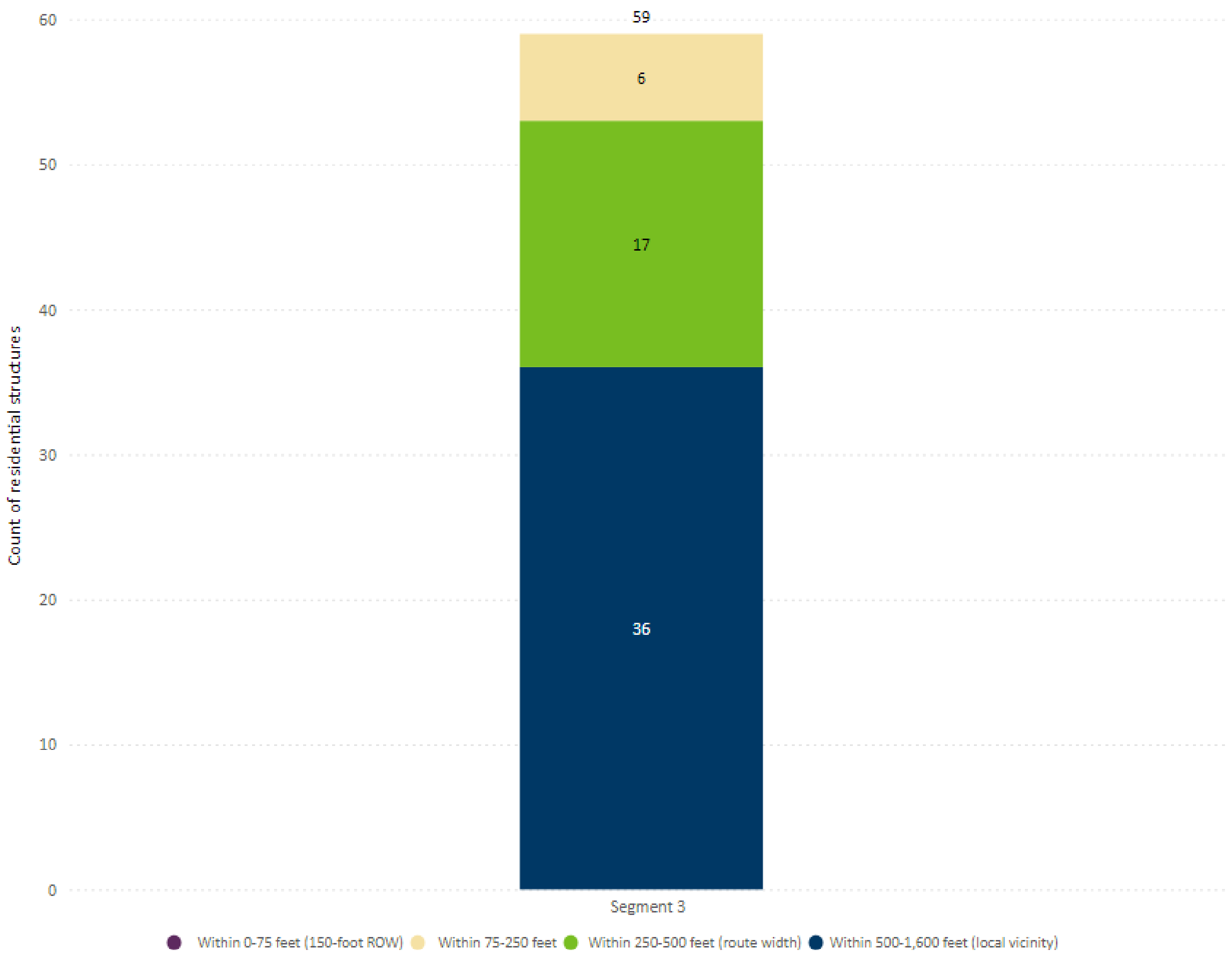


Table 9-3 Segment 3, Proximity of Non-Residential Structures

	Segment 3
Within 0-75 feet (150-ft ROW)	0
Within 75-250 feet	6
Within 250-500 feet (route width)	17
Within 500-1,600 feet (local vicinity)	36

Recreational resources are also considered in the aesthetic impacts analysis in that they might include certain landscapes with higher aesthetic value due to their scenic qualities and could also have the potential for higher viewer sensitivity, especially if people are expected to congregate in recreational areas. Impacts to recreationalists (e.g., those traveling the Zumbro River or Mississippi River) would be negligible to minimal.

9.5.1.3 Mitigation

The primary strategy for minimizing aesthetic impacts is prudent routing—that is, choosing routes where an HVTL is most harmonious with the landscape. For Segment 3, this includes double-circuiting the line in its entirety on existing structures.

The sample route permit (Appendix H, Section 5.3.7) contains the following mitigation related to aesthetics:

- "The Permittee shall consider input pertaining to visual impacts from landowners or land management agencies prior to final location of structures, rights-of-way, and other areas with the potential for visual disturbance."
- "The Permittee shall use care to preserve the natural landscape, minimize tree removal and prevent any unnecessary destruction of the natural surroundings in the vicinity of the Transmission Facility during construction and maintenance."
- "The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads."
- "The Permittee shall place structures at a distance, consistent with sound engineering principles and system reliability criteria, from intersecting roads, highways, or trail crossings."

9.5.2 Cultural Values

The ROI for cultural values is the project area. Impacts associated with rural character and sense of place are expected to be dependent on the individual. These impacts would be localized, short- and long-term, but might diminish over time. Impacts to community unity are not anticipated to occur. Impacts are minimal and unavoidable.

9.5.2.1 Existing Conditions

Cultural values are those community beliefs and attitudes which provide a framework for community unity and animate community actions. Cultural values can be informed by history and heritage, local resources, economy, local and community events, and common experiences. The project traverses land that has been home to a variety of persons and cultures over time.

The project area was populated primarily by Dakota and Ojibwe tribes in the early to mid-1800s. Most lands in the local vicinity of the project were ceded to the U.S. government during the 1851 treaty. Existing conditions are discussed for both the pre-contact period (prior to European settlement of the project area) and the post-contact period.

9.5.2.1.1 Tribal and Indigenous Peoples History within ROI

Segment 3 is within the Bdewakantunwan (those born of the waters) (Mdewakanton) Band of Eastern Dakota's, also commonly referred to as the Minnesota Sioux, ancestral lands. The Dakota people lived on the lands in this area long before European settlers arrived. The 1851 Treaty of Mendota and the Treaty of Traverse des Sioux of 1851 stripped the Dakota of these ancestral lands. The foundation of the Prairie Island reservation began forming in 1880 when 120 acres of land were purchased for the Dakota people who stayed in Minnesota by the Secretary of the Interior. In 1936 Prairie Island adopted its Constitution and By-laws, becoming a recognized by the federal government as a Tribe and establishing the Prairie Island Reservation.

The Treaty of Prairie du Chien in 1830 consisted of 320,000 acres of valuable land west of Lake Pepin. This treaty was written in a way that was aimed towards creating a reservation for the Dakota who had mixed-race relatives (because of this it was known as “half-breed tract”), specifically Dakota women and European or American fur traders. The reservation extended downriver from present-day Red Wing to Kellogg, and then 15 miles inland from the shore of Lake Pepin, which is in Wabasha County. The policy the treaty was built on led to confusion and exploitation, and intended beneficiaries frequently did not retain ownership (reference (273)).

The Treaty of Traverse des Sioux in 1851, between the Sioux-Sisseton and Wahpeton bands of the Dakota and the U.S. government, ceded much of the southeastern portion of the Minnesota territory. The Sisseton and Wahpeton bands of Dakota were in areas that had been overhunted and depleted of animals. While many of the Sisseton and Wahpeton Dakota leaders had concerns and did not support the treaties, a consensus was eventually reached that they believed would help supplement their struggling hunting and gathering economy (reference (13)). The land cession treaty offered annuity payments and a way to get through the hard times. When signed, the treaty ceded 24 million acres for $1,665,000. A reservation, including an area of land ten miles wide, was retained on each side of the Minnesota River for the tribal members (reference (14)). The U.S. government kept more than 80 percent of the money, leaving the Dakota to receive the interest on the amount, at five percent for 50 years (reference (15)). The Dakota Leaders also signed the “Traders Papers,” which unfairly siphoned substantial funds from the treaty to pay alleged Dakota debts to settler fur traders (reference (13)).

After the Treaty of Traverse de Sioux was signed by the upper bands of the Dakota, the treaty delegation traveled to lower bands of the Dakota. The Treaty of Mendota was also signed in 1851 between the Mdewakanton and Wahpekute bands of Dakota. The Mdewakanton and Wahpekute were not as in need of food and goods to support their tribes at the time as the upper bands were. The Leaders asked that the annuity from the Treaty of 1837 be paid before further discussion and attempted to change the boundaries of the proposed reservation. Under this treaty the bands were to receive annual annuities on $1,410,000 (reference (16)). The bands were given one year to move to the same reservation land along the Minnesota River outlined above in the Treaty with the Sioux-Sisseton and Wahpeton Bands (reference (14)).

9.5.2.1.2 Tribal and Indigenous Peoples within Present Day ROI

There are currently 11 federally recognized American Indian Tribes with reservations in Minnesota. Minnesota tribes are sovereign nations that operate their own natural resource departments that reflect their commitment to environmental preservation for future generations. Various restoration projects have been aimed at revitalizing bison, lake trout, sturgeon, and plant populations. Traditional ecological knowledge emphasizes that caring for the land means it will care for you in return. This belief is deeply rooted in the spiritual and cultural importance of flora and fauna, as well as sacred burial sites. Plants such as wild rice, cedar, sage, sweetgrass, and tobacco are considered sacred and used for ceremonial purposes and their healing properties (reference (17)).

According to the United States Department of Housing and Urban Development Tribal Directory Assessment Tool (reference (18)), Tribes with historic cultural interest or ancestral ties in Segment 3 include the following:

- Apache Tribe of Oklahoma
- Cheyenne and Arapaho Tribes, Oklahoma
- Flandreau Santee Sioux Tribe of South Dakota
- Lower Sioux Indian Community in the State of Minnesota
- Menominee Indian Tribe of Wisconsin
- Prairie Island Indian Community in the state of Minnesota
- Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
- Grand Portage Band of the Minnesota Chippewa Tribe
- Iowa Tribe of Kansas and Nebraska
- Sisseton-Wahpeton Oyate of the Lake Traverse Reservation, South Dakota
- Spirit Lake Tribe, North Dakota
- Santee Sioux Nation, Nebraska
- Upper Sioux Community, Minnesota

Within the present-day ROI, the federally recognized PIIC has an established reservation located within Goodhue County. The PIIC core values are bdewakantuŋwaŋ (those born of the water), woksape (wisdom), wowah̆bada (peace or calm), waciŋic'iya (self-dependence), akhidečheča (equality), wowacaŋtohnake (generosity), and oahe (foundation). It consists of approximately 534 acres of original reservation land, 2,774 acres of other trust land close to the existing reservation, and more than 1,700 acres of additional off-reservation properties that are not currently in federal trust. Within the reservation land the Prairie Island Edwin Buck Jr. Memorial Buffalo Project has restored nearly 200 buffalo to the pastures of Prairie Island (reference (200)). Preserving culture and historical treasures is a top priority for the PIIC, and in turn, Goodhue County is home to the largest concentration of untouched burial mounds in the state. Their partnership with Minnesota State University, Mankato, developed and is implementing a burial mound protection plan to preserve these sites (reference (20)). There are several Wacipi (the Dakota word for powwow) held throughout the year, with the largest celebration being held during the summer.

9.5.2.1.3 County Conditions within ROI

Today, Segment 3 goes through Goodhue, Olmsted, and Wabasha counties in the southeastern region of Minnesota. Southeastern Minnesota is known for its vast landscapes and wooded bluffs along the Mississippi Corridor (reference (20)). It is a health care and agricultural powerhouse, where advanced manufacturing is a strong industry (reference (21). Segment 3 is primarily in a rural setting, with two cities, Pine Island and Oronoco, along the route.

Goodhue County is a largely rural county with some industrious small river and mill towns. Landscapes feature agricultural areas and scenic natural features of the Mississippi River Valley. Goodhue County has many outdoor recreational opportunities with their many parks and trails. They also have a large County Fair and the Cannon Valley Fair. The county is on the ancestral homeland of the Mdewakanton Dakota Oyote, and the current day Prairie Island Indian Community reservation is located south of Hastings and north of Red Wing, along the Mississippi corridor (reference (201)). Segment 3 begins north of the city of Pine Island and continues across the southeastern corner of the county.

Olmsted County is on the southeastern border of Minnesota and Wisconsin. The county is home to Rochester, the third largest city in Minnesota and is unique considering the relative urban-rural divide surrounding the city. The County's employment industries are heavily focused on education, health care and social assistance, which make up 50% of the total employment (reference (217)). The Mayo Clinic is in the city of Rochester and offers three health care campuses and an academic medical center.

Wabasha County is also on the southeastern border of Minnesota and Wisconsin. With the Mississippi River running along its whole eastern border, the county is considered to be part of the Mississippi River Valley and Mississippi River Bluff Area. It is one of the original counties in the Minnesota Territory (reference (274)). Segment 3 crosses the southern portion of the county and ends at the Minnesota border near the city of Kellogg.

There are numerous natural amenities that would attract local and regional recreational users within and nearby the project area (discussed further in 9.5.8 and 9.9.6). These areas provide a variety of outdoor recreational opportunities, like fishing, hunting, boating, hiking, and snowmobiling which also contribute to the identity of area residents.

9.5.2.2 Potential Impacts

Construction, operation, and maintenance of Segment 3 is not anticipated to conflict with cultural values in the ROI. The area throughout Segment 3 is generally rural. There are no lakes that have shown historical wild rice growth within Segment 3, so no impacts to wild rice harvesting or production are anticipated. The project would not interfere with hunting or fishing in the area.

Transmission line and substation projects have the potential to impact community and regional events during construction, primarily due to the presence of equipment and supplies on local roadways and potential temporary road closures or detours. Impacts would be minor and temporary if they occur.

Impacts associated with rural character and sense of place are expected to depend on the individual. Because this portion of the project is already built, and Segment 3 would be double-circuited with existing structures, impacts are expected to be minimal.

9.5.2.3 Mitigation

There are no conditions included in the sample route permit that directly mitigate impacts to cultural values, sense of place, or community unity. Impacts could be minimized by sharing or paralleling existing ROW as it would minimize new routes across the landscape.

Impacts are unavoidable, and the applicant would continue to coordinate with potentially affected parties if further mitigation is requested.

9.5.3 Displacement

The ROI for displacement is the anticipated ROW. Displacement occurs when a residence or building is required to be removed for construction of the project. No displacement would occur for Segment 3.

9.5.3.1 Existing Conditions

Displacement is the removal of a residence or building to facilitate the operation of a transmission line. For electrical safety code and maintenance reasons, utilities generally do not allow residences or other buildings within the ROW of a transmission line. Any residences or other buildings within a proposed ROW have the potential to be removed or displaced. Displacements are relatively rare and more likely to occur in highly populated areas where avoiding all residences and businesses is not feasible.

There are no daycares, hospitals, schools, churches or nursing homes within the ROW of Segment 3. There are also no residences or non-residential structures within the ROW of Segment 3.

9.5.3.2 Potential Impacts

No displacement would occur for Segment 3 and there are no potential impacts.

9.5.3.3 Mitigation

No impacts are anticipated for displacement and no mitigation is proposed.

9.5.4 Environmental Justice

The ROI for EJ includes the census tracts that intersect the route width. Potential EJ impacts are assessed by first identifying if any census tracts meet a definition of an EJ area per its socioeconomic information. Second, census tracts meeting an EJ definition are reviewed to consider if those residents might be disproportionately affected. The project would not result in disproportionate adverse impacts to the EJ areas of concern within the ROI. Therefore, impacts are anticipated to be minimal.

9.5.4.1 Existing Conditions

The MPCA’s EJ Proximity Analysis tool is an online mapping tool that uses census data to identify areas for meaningful community engagement and additional evaluation for disproportionate effects from pollution (reference (35)). The tool identifies EJ areas of concern using the following four criteria, which align with the definition of an environmental justice area in Minnesota Statutes § 216B.1691, subdivision 1(e):

1. 40 percent or more of the area's total population is nonwhite;
2. 35 percent or more of households in the area have an income that is at or below 200 percent of the federal poverty level;
3. 40 percent or more of the area's residents over the age of five have limited English proficiency; or
4. The area is located within Indian country, as defined in United States Code, title 18, section 1151.

Using the above criteria, there were no census tracts in Goodhue, Olmsted, or Wabasha County within the project's ROI that were identified as EJ areas of concern.

9.5.4.2 Potential Impacts

Disproportionate impacts would not be anticipated.

9.5.4.3 Mitigation

As described in Section 2.4.2, several public meetings have been held in the counties the project crosses. There are upcoming meetings scheduled to occur throughout the process. The applicant initiated an outreach campaign in 2023 to Tribal contacts and federal, state, and local agencies through in-person meetings and project notification letters. The applicant met with tribal government contacts and state and local agencies as part of the outreach program for the project.

Meetings that were held in Segment 3's ROI included a scoping meeting held on July 9th, 2024 in Pine Island, and July 10th, 2024 in Kellogg.

No EJ impacts are anticipated; therefore, no additional mitigation outside of the resource-specific mitigation outlined above is proposed at this time.

9.5.5 Land Use and Zoning

The ROI for land use and zoning is the ROW. If a route permit is issued, it would supersede and preempt zoning restrictions, building, or land use rules. However, to assess human settlement impacts, potential land use and zoning impacts are addressed by evaluating the project against local land use and zoning ordinances. Impacts to planning and zoning are anticipated to be minimal and can be avoided through selection of alternatives.

9.5.5.1 Existing Conditions

Minnesota authorizes counties and cities to create their own zoning ordinances to implement and work in conjunction with their comprehensive plans. Zoning is a method to regulate the way land is used and create patterns in the way they are used. Zoning is a regulatory device used by local governments to geographically restrict or promote certain types of land uses. Minnesota Statutes provide local governments with zoning authority to promote public health and general welfare.

This project is subject to Minnesota's Power Plant Siting Act (Minnesota Statute § 216E.10). Under this Statute, the route permit issued for a transmission line "shall be the sole site or route approval required to be obtained by the utility. Such permit shall supersede and preempt zoning restrictions, building or land use rules, regulations or ordinances promulgated by regional, county, local and special purpose government." Therefore, the applicant is not required to seek permits or variances from local governments to comply with applicable zoning codes. Nonetheless, impacts to local zoning can clearly impact human settlements, and the Commission considers impacts to human settlements as a factor in selecting transmission line routes.

Publicly available zoning information was reviewed for each county and municipality crossed by the route alternatives. Segment 3 has three counties within its ROI, including Goodhue, Olmsted, and Wabasha. Map 54 shows the zoning district data that was gathered for the project.

9.5.5.1.1 Goodhue County Plan Analysis

The Goodhue County 2016-2040 Comprehensive Plan provides general guidelines to help manage growth and land use changes, and to promote sound management of the land and water resources within the County (reference (204)). The county's shared vision includes planning for stability and modest growth, and being aware of continued conversion of agricultural land to rural housing and environmental challenges associated with intense land uses and water resources. The Goodhue County Zoning Ordinance includes provisions for the following zoning districts: agricultural, agricultural protection, urban fringe, suburban residence, mixed use hamlet, business industry, wild and scenic river, commercial recreational, floodplains, parks and trails, and conservation subdivision (reference (205)). The project begins in this county, going through agricultural districts until reaching the next county.

9.5.5.1.2 Olmsted County Plan Analysis

The Olmsted County General Land Use Plan was adopted in 2022 (reference (234)). The plan includes land use policies that help to define the community's vision of "how, when, and where growth, redevelopment, and preservation should occur throughout the county (reference (234))." The Olmsted County Zoning Ordinance (reference (235)) was last updated in 2024. The zoning districts that are outlined in the ordinance are as follows: agricultural protection, agricultural, agricultural urban expansion, agricultural/resource commercial district – aggregate extraction and reuse, agricultural/resource commercial district – land intensive low impact uses, agricultural residential cluster, rural service center, rural residential, low density residential, mixed low density residential, recreational commercial, commercial service, highway commercial, industrial, medical institutional. The project goes through primarily agricultural areas, with some other smaller areas like residential and commercial zoning districts when going through the city of Pine Island and near the city of Oronoco.

9.5.5.1.3 Wabasha County Plan Analysis

The Wabasha County Land Use Plan was adopted in 1998 (reference (275)). The plan highlights four major issues of concern: the protection of private property rights; the conflicts caused by non-farm residential development in agricultural areas of the County; environmental issues (water quality and steep slope, feedlot, and blufftop development); the amount of land held and continued acquisition of land by the DNR. The Wabasha County Zoning Ordinance was established to "promote, preserve, and protect the public health, safety and general welfare of the citizens of Wabasha County, along with the integrity of the land and water resources (reference (276))." It was last updated in 2024. The zoning districts that are outlined in the ordinance as follows: agricultural protection, agriculture/urban fringe, agriculture/low-density residential, rural residential, floodplain overlay, shoreland overlay, and bluffland overlay. The project goes through only agricultural zoning districts in Wabasha County.

9.5.5.2 Potential Impacts

Transmission line and substation projects have the potential to be incompatible with existing land use patterns, local zoning requirements, and the future land use planning of local governments. Construction and operation of the project is not expected to have an impact on land use for Segment 3 because it would be located within existing ROW and be strung on existing structures.

Existing land uses along the HVTL would experience short-term impacts during the period of construction. When transmission line construction is complete, project workspaces would be restored as described in Section 3.4.5. Land uses which are consistent with the safe and reliable operation of the project would be allowed to continue as before.

9.5.5.3 Mitigation

No impacts to land use beyond short-term construction impacts would be anticipated, no mitigation is proposed.

9.5.6 Noise

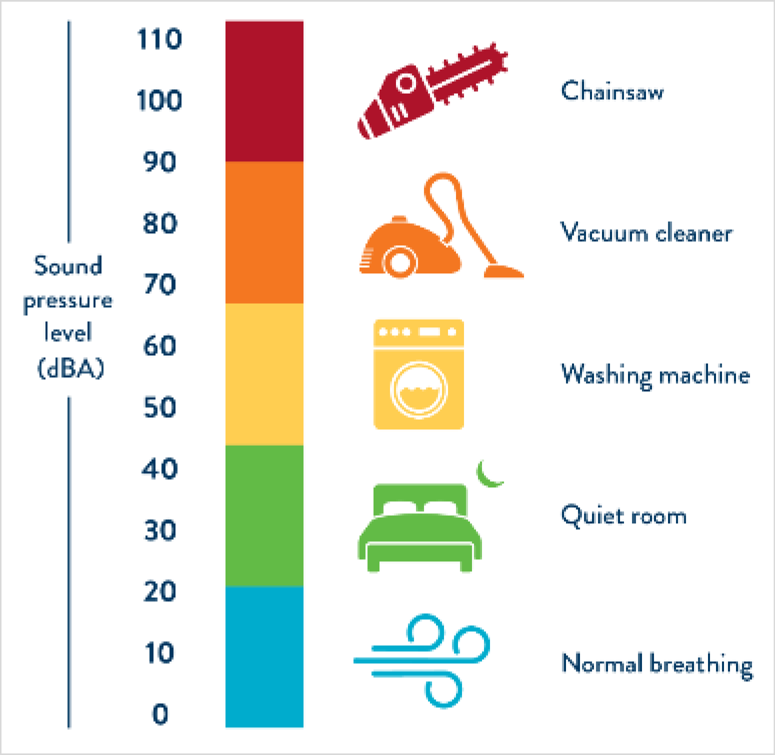
The ROI for noise is the local vicinity. Short-term noise impacts would occur during construction. Impacts would be minimal, and the applicant would be required to comply with state noise standards. Noise impacts during operation would be negligible except for perceptible noise impacts particularly during periods of foggy, damp, or light rain conditions. Operation of the project would meet state noise standards.

Noises from the project are associated with construction and operation. Noise created by construction activities is anticipated to be minimal for all route alternatives. Construction activity would occur during a specified time during the day, and only at a specific portion of the project for a few days to weeks at a time over the course of 24 to 27 months. Impacts are expected to be compliant with state noise standards.

9.5.6.1 Existing Conditions

Noise levels are measured in units of dB on a logarithmic scale and can be used to compare a wide range of sound intensities. Human hearing is not equally sensitive to all frequencies of sound, so certain frequencies are given more weight. The A-weighted dBA accounts for the sensitivity of the human ear. It puts more weight on the range of frequencies that the average human ear perceives, and less weight on those we don't, like higher or lower frequencies. An increase of 10 dBA sounds twice as loud, due to the way that the logarithmic scale functions in compressing the measurements associated with sounds (reference (52)). Figure 9-2 illustrates common noise levels at various levels of the dBA scale.

Figure 9-2 Common Activity Noise Levels



The MPCA has the authority to adopt noise standards pursuant to Minnesota Statute § 116.07, subpart 2. The adopted noise standards are set forth in Minnesota Rule 7030, which sets noise limits for different land uses (Table 9-4). These land uses are grouped by NAC and are separated between the daytime and nighttime noise limits. Residences are classified as NAC -- 1 and have the lowest noise limits of the four NACs. A complete list of all land use designations assigned to the NAC categories is available at Minnesota Rule 7030.0050. All project noises must comply with the MPCA noise standards (Table 9-4). The noise standards specify the maximum allowable noise volumes that may not be exceeded for more than 10 percent of any hour (L_{10}) and 50 percent of any hour (L_{50}) (reference (52)).

Table 9-4 Minnesota Noise Standards

	Daytime Limit (dBA)	Daytime Limit (dBA)	Nighttime Limit (dBA)	Nighttime Limit (dBA)
	L_{10}	L_{50}	L_{10}	L_{50}
NAC – 1: Residential and Other Sensitive Uses	65	60	55	50
NAC – 2: Non-Residential Uses (typical Commercial)	70	65	70	65
NAC – 3: Non-Residential Uses (typical Industrial, Agricultural)	80	75	80	75
NAC – 4: Undeveloped Uses	NA	NA	NA	NA

Source: reference (1)

The project is primarily in rural areas, with occasional more developed portions. Background noise has the potential to be higher in the more populated areas of the project. Rural areas without significant noise might be in the 30 to 40 dBA range, while noise could be in the 40 to 50 dBA range in the more developed portions of the project (reference(53)). The primary noise receptors within the project area are residences and farmsteads, which are classified as NAC – 1.

For most of the project, ambient noise levels are in the range of 30 to 50 dBA, with temporary, higher noise levels associated with wind, vehicular traffic, and the use of gas-powered equipment (for example, tractors or chain saws). Community noise levels are usually closely related to the intensity of human activity. Noise levels are generally considered low when below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. In rural areas, noise levels can be below 35 dBA. In small towns or wooded and lightly used residential areas, noise levels are more likely to range from 40 to 50 dBA. Levels around 75 dBA are more common in busy urban areas, and levels up to 85 dBA occur near major freeways and airports.

9.5.6.2 Potential Impacts

9.5.6.2.1 Construction Noise

During project construction, temporary, localized noise from heavy equipment and increased vehicle traffic is expected to occur along the ROW during daytime hours during implementation of the project. HVTL 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. Major noise producing activities are associated with clearing and grading, material delivery, augering foundation holes, setting structures, and stringing conductors.

Noise associated with heavy equipment can range between 80 and 90 dBA when operating at full power 50 feet from the source (reference (54)). Heavy equipment generally runs at full power up to 50 percent of the time. Point source sounds decrease six dBA at each doubling of distance (reference (52)); therefore, a 90 dBA sound at 50 feet is perceived as a 72 dBA sound at 400 feet and a 60 dBA sound at 1,600 feet.

Construction noise could reach levels above the state thresholds for short intervals at select times and locations. Any periods of sufficient duration to exceed the MPCA daytime noise limits would be temporary in nature and no exceedances of the MPCA nighttime noise limits are expected for the project. Construction noise could temporarily affect residences, schools, businesses, libraries, parks, recreational areas, and related public spaces that are close to the ROW. An exceedance of noise standards need not occur for a negative impact to occur. For example, interference with conversational speech typically begins at about 60 dBA (reference (55)). A 70 dBA sound interferes with telephone conversations, and an 80 dBA sound interferes with normal conversation. Distinct noise impacts during construction are anticipated to be minimal to moderate depending on proximity to receptors, the activity occurring and equipment being used. Construction noise impacts will be temporary, localized, and intermittent.

9.5.6.2.2 Transmission Line Noise

Noise from transmission lines (electrical conductors) is due to small electrical discharges which ionize surrounding air molecules. The level of noise from these discharges depends on conductor conditions, voltage levels, and weather conditions. Noise emissions are greatest during heavy rain events when the conductors are consistently wet. However, during heavy rains, the background noise level is usually greater than the noise from the transmission line. As a result, audible noise is typically not noticeable during heavy rains. In foggy, damp, or light rain conditions, transmission lines might produce audible noise higher than background levels. During dry weather, noise from transmission lines is a perceptible hum and sporadic crackling sound. The noise modeling for the proposed transmission line indicates that the noise generated by the project will not exceed the most stringent MPCA noise standards of NAC-1 at the edge of the ROW. Therefore, no mitigation is proposed.

9.5.6.3 Mitigation

The sample route permit (Section 5.3.6 of Appendix H) contains the following mitigation related to noise: "The Permittee shall comply with noise standards established under Minnesota Rules 7030.0010 to 7030.0080. The Permittee shall limit construction and maintenance activities to daytime working hours to the extent practicable."

Sound control devices on vehicles and equipment, for example, mufflers; conducting construction activities during daylight hours, and, to the greatest extent possible, during normal business hours; and running vehicles and equipment only when necessary are common ways to mitigate noise impacts. Impacts to state noise standards can be mitigated by timing restrictions if needed. During operation, permittees are required to adhere to noise standards. No additional mitigation is proposed.

9.5.7 Property Values

The ROI for property values is the local vicinity. Property values are impacted by many interconnected factors. If effects do occur due to transmission lines and substations, research has shown these effects to be almost always less than 10 percent. Impacts are anticipated to be minimal. However, it is acknowledged that every landowner has a unique relationship and sense of value associated with

their property and impacts. Impacts of the project would be minimized by selecting the route with the fewest residences nearby; residences are quantified as part of the aesthetics assessment.

9.5.7.1 Existing Conditions

The ROI for property values is the local vicinity. Residences located within the local vicinity of Segment 3 are summarized in the aesthetics impact analysis (Section 9.5.1). Map 55 includes residence locations within the route width of the route alternatives; they are also shown in Map 53. For a general sense of the number of residences within the ROI, Segment 3 has 59 residences within the ROI (Figure 9-1).

9.5.7.2 Potential Impacts

Potential impacts of overhead transmission lines on property values are generally connected to three main factors. First, how the transmission line affects the viewshed and aesthetics of a property. Second, the real or perceived risks that buyers have of EMF. Third, the effects to agricultural production on properties that are used for farming operations. The aforementioned factors are only some of the many interconnecting factors that affect property values. Because of this, it is difficult to measure how much and the numerous ways that transmission lines and property values are correlated.

A variety of methodologies have been used to research the relationship between transmission lines and property values. Some general conclusions can be drawn from this body of literature. This discussion highlights relevant outcomes of property value research with additional detail provided in Appendix I.

Research does not support a clear cause-and-effect relationship between property values and proximity to transmission lines, but has revealed trends that are generally applicable to properties near transmission lines:

- When negative impacts on property values occur, the potential reduction in value is in the range of one to 10 percent.
- Property value impacts decrease with distance from the line; thus, impacts are usually greater on smaller properties than on larger ones.
- Negative impacts 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 greater effect on sale price than the presence of a transmission line.
- The value of agricultural property decreases when transmission line structures interfere with farming operations.

Every landowner has a unique relationship and sense of value associated with their property. Thus, a landowner’s assessment of potential impacts to their property’s value is often a deeply personal comparison of the property “before” and “after” a proposed project is constructed. These judgments, however, do not necessarily influence the market value of a property. Rather, appraisers assess a property’s value by looking at the property “after” a project is constructed. Moreover, potential market participants likely see the property independent of the changes brought about by a project; therefore, they do not take the “before” and “after” into account the same way a current landowner might.

9.5.7.3 Mitigation

The sample route permit does not include any specificity around mitigation required for property values.

The applicant would be responsible for any construction-related damages and for returning affected property to its original condition, which would help maintain property value. As discussed in Section 3.3.2.2, for properties crossed by the ROW, the applicant would develop a fair market value offer and once ROW is acquired, would contact the landowner to discuss any special considerations that might be needed (for example, for fences, crops, or livestock). Impacts could also be mitigated by using the protections offered through Minnesota Statute § 216E.12 (commonly known as the “Buy the Farm” statute), where available, to move away from potential property value impacts.

9.5.8 Recreation

The ROI for recreation is the route width. Impacts to recreation are assessed through identification of recreational resources within the ROI and reviewing their use and proximity to the anticipated alignment in comparison to other features that are a part of the natural or built environment. Recreational resources that are present include a publicly accessible trail system (Snake Creek Management Unit Trails and Snake Creek Trail), public watercourses (including designated state water trails and wild and scenic river), snowmobile trails, and a state forest. The project also crosses a scenic byway. Intermittent and localized indirect impacts could occur during construction (for example – increased noise levels); long-term impacts during operation could occur in the form of aesthetic impacts (Section 9.5.1). Given that direct long-term effects are predominantly related to aesthetics, the indirect long-term repercussions on recreation are anticipated to be subjective, meaning that responses vary based on individual perspectives and experiences.

9.5.8.1 Existing Conditions

Recreation within Segment 3’s ROI consists primarily of outdoor recreational opportunities, including picnicking, hiking, cross country skiing, biking, bird watching, fishing, hunting, canoeing/kayaking, and snowmobiling. Publicly accessible recreational areas within the ROI are summarized in Table 9-5 shown in Map 50, and further discussed below. One additional recreational resource, the Lake Zumbro Park, is located north of Segment 3 but outside of the ROI (Map 50-2). Publicly accessible lands that may be used for recreational purposes but also serve to provide wildlife habitat are discussed further in Section 9.9.6.

Table 9-5 Recreational Resources within the ROI

Recreational Resource Type	Recreational Resource	Unit	Segment 3
State Trails	Snake Creek Management Unit Trails	miles	1.1
	Snake Creek Trail	miles	0.4
State Water Trails and Wild and Scenic Rivers	Mississippi River	crossing count	1
		linear feet	1,065
	Zumbro River	crossing count	2
		linear feet	2,785
Scenic Byway	Great River Road	miles	0.4
Snowmobile Trails	Goodhue County Trails	miles	0.5
	Zumbrowatha Trails	miles	6.9
	Total snowmobile trails	miles	7.4

The Snake Creek State Trail is located within the ROI of Segment 3 (Map 50-4 and Map 50-5). The trail is a 13-mile trail through Snake Creek Valley and other scenic bluff country areas (reference (277)). The trail is used for all-terrain vehicles and off-highway motorcycles (reference (277)). Existing infrastructure, including transmission lines, cross the trail in multiple locations. Snake Creek Management Unit State Trails are located further north and within the ROI of Segment 3 (Map 50-4). These trails create an approximately 4.4-mile loop (reference (278)). The trail is used for hiking, snowshoeing, running, and other foot traffic (reference (278)). Existing infrastructure, including transmission lines, crosses the trail in multiple locations.

Watercourses provide opportunities for recreation throughout the project area. Some watercourses hold special designations, such as state water trails and national or state wild and scenic rivers. State water trails are miles of waters publicized for canoeing, kayaking, and camping (reference (60)). National and state wild and scenic river designations preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations (reference (61)). The Mississippi River is designated as a state water trail and a wild and scenic river. Segment 3 ends as it crosses the Mississippi River. One additional state water trail is within the ROI. Segment 3 crosses the Zumbro River in two locations (Map 50-2 and Map 50-5). There are existing transmission lines at both crossings.

Segment 3 crosses one scenic byway, the Great River Road, at an existing crossing location (Map 50-4 and Map 50-5). National and state scenic byways are alternative road ROWs to major highways that have regionally outstanding scenic, natural, recreational, cultural, historic, or archaeological significance (reference (62)). The Great River Road Scenic Byway follows the Mississippi River for 3,000 miles from Minnesota down through Louisiana (reference (279)).

Several snowmobile trails are located within the ROI (Table 9-5; Map 53). The trails are maintained by the Zumbrota Covered Bridge Riders and Elba Snowbirds.

One state forest, the Richard J. Dorer Memorial Hardwood State Forest, is crossed by Segment 3. Beyond encompassing the Snake Creek State Trail and Snake Creek Management Unit State Trails, the Richard J. Dorer Memorial Hardwood State Forest includes recreational areas, campgrounds, a day-use area, and a multitude of additional trails (reference (280)). Segment 3 (and the existing 345 kV transmission line) crosses the Richard J. Dorer Memorial Hardwood State Forest for approximately 2.0 miles (Map 50-4 and Map 50-5).

9.5.8.2 Potential Impacts

Effects on recreation due to construction of the project are anticipated to be minimal and temporary in nature, lasting only for the duration of construction and are anticipated to include short-term disturbances, such as increased noise and dust, as well as visual impacts. Construction activities also could, depending on the timing, affect nearby hunting or wildlife viewing opportunities in public spaces by temporarily displacing wildlife. Wildlife, however, is expected to return to the area once construction has been completed.

9.5.8.3 Mitigation

Impacts can also be mitigated by reducing impacts to natural landscapes. The impacts of Segment 3 would be minimized by using an existing ROW and double-circuiting on structures that are already present. The applicant committed to coordinating with local governments, the DNR, and USFWS to ensure construction of the project will not significantly impact nearby natural resources that could influence recreation.

9.5.9 Socioeconomics

The ROI for socioeconomics is the three-county area. Impacts are qualitatively assessed based on the influx of workers during construction activities. Economic factors related to construction and operation of the project are anticipated to be short-term and positive, but minimal. Positive impacts come from increased expenditures at local businesses during construction, the potential for some materials to be purchased locally, and the use of local labor.

9.5.9.1 Existing Conditions

Segment 3 is in southeastern Minnesota. Labor force and unemployment data were used from the 2019-2023 American Community Survey, 5-Year Estimates from the US Census Bureau, and the Minnesota Department of Employment and Economic Development. Table 9-6 shows the compiled population and economic data on Minnesota and the counties that Segment 3 intersects, including Goodhue, Olmsted, and Wabasha Counties.

Table 9-6 Population, Income, and Employment

County	Population	Population Density (population/ sq. miles)	Labor Force Participation (%)	Labor Force	Labor Force Unemployment Rate (%)	Per Capita Income	Median Household Income
Minnesota	5,024,279	71.7	68.7	4,537,247	4.0	$44,947	$84,313
Goodhue	47,844	63.4	64.9	25,038	2.3	$42,254	$82,749
Olmsted	164,784	252.1	69.2	90,174	2.1	$51,880	$87,856
Wabasha	21,519	41.5	65.9	11,412	1.5	$42,262	$80,133

County populations within Segment 3 range from around 21,000 to 164,000. The highest populations and population densities within Segment 3 are where the project is closer to the metropolitan areas of Pine Island and Plainview, which include Olmsted and Wabasha Counties. At the county level, change in population between the 2010 and 2020 census saw the largest percent increase in Olmsted County (12.7 percent), with a more modest increase in Goodhue County (2.9 percent), and a decline in population in Wabasha County (1.3 percent).

The labor force unemployment rate in Segment 3 ranges from 1.5 percent in Wabasha County to 2.3 in Goodhue County. All counties in Segment 3 have an unemployment rate below the state of Minnesota. Per capita incomes for counties crossed by Segment 3 range from $42,254 to $51,880. The highest per capita income is in Olmsted County.

The median household income ranges from $80,133 in Wabasha County to $87,856 in Olmsted County. All of the counties, besides Olmsted, had a median income lower than the state of Minnesota, which has a median income of around $84,000.

According to the 2019-2023 American Community Survey, 5-Year Estimates from the US Census Bureau, Goodhue, Olmsted, and Wabasha Counties' largest industry in terms of employment is "Educational services, health care, and social assistance." The second largest industry in terms of employment for all counties was "Manufacturing."

9.5.9.2 Potential Impacts

Potential socioeconomic impacts would be short-term due to the time frame of construction (2-3 years). An influx of construction jobs and personnel, delivery of construction material, temporary housing, and other purchases from local businesses will occur during that time. Slight increases in retail sales in the project area are expected. These would include purchases of lodging, food, fuel, construction materials, and other merchandise. No long-term impacts are expected in transmission line and substation projects.

Construction of the transmission line would employ approximately 50-100 workers over the 2-3 years of the project, per the joint certificate of need application and route permit application. The applicant committed in the joint certificate of need application and route permit application to pay prevailing wages for applicable construction jobs. Local construction crew expenditures would result in temporary, positive impacts on local economies.

Workers would likely be commuting to the area instead of relocating to the project area. Construction workers traveling to the area might find temporary housing over the span of the project, but this might move with construction along the project area. The construction and operation of the project is not anticipated to create or remove jobs over the long-term or result in the permanent relocation of individuals to the area.

9.5.9.3 Mitigation

Adverse impacts are not expected; therefore, mitigation is not proposed.

9.5.10 Transportation and Public Services

The ROI for transportation and public services varies. For roadways and rail, the ROI is the local vicinity. For public utilities, the ROI is the ROW. For emergency services, the ROI is the three-county area. For airports, the ROI is within 3.78 miles. Impacts are expected to primarily be related to construction activities and would be short-term and minimal. Negative impacts, such as traffic delays, should be negligible. Long-term impacts to public services are also anticipated to be minimal. Impacts are unavoidable but can be minimized and mitigated.

9.5.10.1 Roadways and Railways Existing Conditions

Segment 3 crosses US Highway 52, US Highway 61, US Highway 63, and MN Highway 42. It also crosses the River Subdivision of the Soo Line Railroad (SOO).

9.5.10.2 Public Utilities Existing Conditions

Electric utilities near the project are provided by numerous entities (reference (64)), including:

- Northern States Power Company
- Dakota Electric Association
- Kenyon Municipal Utilities
- Goodhue County Coop Elec Assn
- People's Cooperative Services
- Rochester Public Utilities
- Lake City Public Works

Natural gas service in the project area is provided by several entities, including Northern States Power Company, Franklin Heating Station, Rochester Public Utilities, Westside Energy Station, Invenergy and Minnesota Municipal Power Agency. Segment 3 crosses three natural and utility pipelines.

Potable water in Segment 3 is largely supplied by local wells. Near urban areas, primarily within municipalities, water mains and other public utilities are provided. Goodhue , Olmsted, and Wabasha Counties have septic programs that conduct inspection services, issue permits, and oversee installation and maintenance of private septic systems and wells in Segment 3. Public works and utility departments design, construct, and maintain sanitary sewers, streets and sidewalks, storm sewers, and water mains.

9.5.10.3 Emergency Services Existing Conditions

Emergency services in Segment 3 are provided by local law enforcement and emergency response entities, fire departments, and ambulance services of various counties and communities. Sheriffs' offices and municipal police departments provide regional law enforcement to Goodhue, Olmsted, and Wabasha Counties and their respective cities in Segment 3 of Pine Island, Oronoco, Plainview, and Kellogg. Fire departments would provide emergency fire response services in Segment 3. Fire services are provided by city and community fire departments in Pine Island, Oronoco, Plainview, and Kellogg have volunteer fire departments. Ambulance districts provide emergency medical response services throughout Segment 3. Emergency medical response is available from local medical clinics. A list of emergency services for Segment 3 is as follows:

- Pine Island Police Department
- Plainview Police Department
- Goodhue County Sheriff Department
- Olmsted County Sheriff Department
- Wabasha County Sheriff Department
- Pine Island Fire Department
- Oronoco Fire Department
- Plainview Fire Department
- Kellogg Fire
- Zumbrota Volunteer Fire Department
- Mayo Clinic Hospital - Rochester
- Olmsted Medical Center – Wanamingo

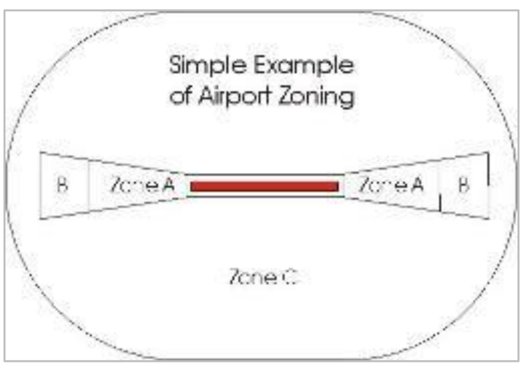
9.5.10.4 Airports Existing Conditions

Transmission line structures and conductors can conflict with the safe operation of an airport if they are located within applicable safety zones. Airports are defined by the state and the FAA as areas of land or water that are used or intended to be used for the landing and takeoff of aircraft, and includes the surrounding area used or intended to be used for airport buildings and facilities (14 C.F.R. Part 1, § 1.1 and Minn. R. 8800.0100, subp. 3). Different classes of airports have different safety zones depending on several characteristics, including runway dimensions, classes of aircraft they can accommodate, and navigation and communication systems (reference (65)). These factors determine the necessary take-off and landing glide slopes, which in turn determine the setback distance of transmission line structures.

The FAA and MnDOT have each established development guidelines on the proximity of tall structures to public-use airports. Transmission lines near public airports are limited by FAA height restrictions, which prohibit transmission line structures above a certain height, depending on the distance from the specific airport. FAR Part 77 and Minn. R. 8800.1200 establish guidelines on heights for any structures that could endanger aircraft, which includes either structures exceeding 200 ft above ground level (AGL) or the airport elevation, whichever is greater. These guidelines impose stricter regulations for structures within a maximum distance of 20,000 ft (3.78 miles) of a public use or military airport. Regulatory obstruction standards only apply to those airports that are available for public use and are listed in the FAA airport directory. Per Minnesota Rules 8800.2400, private airstrips and personal use airstrips cannot be used in commercial transportation or by the public and are not subject to FAA regulatory obstruction standards.

In addition, MnDOT has established separate zoning areas around airports, as shown in Figure 9-3. The most restrictive safety zones are safety zone A, which does not allow any buildings, temporary structures, places of public assembly, or transmission lines, and safety zone B, which does not allow places of public or semi-public assembly such as churches, hospitals, or schools. Permitted land uses in both zones include agricultural uses, cemeteries, and parking lots. Safety zone C, the horizontal airspace obstruction zone, encompasses all land enclosed within the perimeter of the imaginary horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs of specified radii (5,000 to 10,000 feet) from the center of each end of the primary surface of each runway, and which is not included in zone A or zone B. As with FAA regulations and per Minnesota Rules 8800.2400 subpart 1, MnDOT zoning requirements only apply to public airports and are recommended for private airports (reference (66)).

Figure 9-3 MnDOT Example of Airport Zoning



Source: reference (67))

There are no public airports within 20,000 feet of Segment 3. There are two private airstrips that are located within 20,000 feet of Segment 3. The Nietz Airstrip (FAA identifier MN32) is a private use airstrip just east of the Zumbro River (Map 52-2). The Christison Airport (FAA identifier 85MN) is a private use airstrip that is around 10,200 feet south of the route and just west of Plainview (Map 52-3).

9.5.10.5 Potential Impacts

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

Construction could cause moderate, localized impacts to roadways that would be short-term in nature. Construction activities occasionally cause lanes or roadways to be closed. These closures would only last for the duration of the construction activity in a given area. Construction equipment and delivery vehicles would increase traffic along roadways throughout project construction, with effects lasting from a few minutes to a few hours, depending upon the complexity and duration of the construction activities. Drivers could experience increased travel times as a result. Construction vehicles could temporarily block or alter public access to streets and businesses. Lane closures and traffic management might pose safety concerns to workers and the public as active traffic and workers move throughout the construction space. Additionally, construction along roadways can increase dust as grading occurs, which can obscure road lines or vision.

Vehicles and equipment that would be used for construction of the transmission line (for example, overhead line cranes, concrete trucks, construction equipment, and material delivery trucks) are generally heavy load vehicles and can cause more damage to road surfaces. Oversized/overweight load permits must be obtained from MnDOT and county road authorities when size and/or weight limits would be exceeded.

During operation, severe weather, including high winds, ice, snowstorms, and tornadoes, could result in structure damage. If structures and lines fall over or otherwise reach the ground, they would create safety hazards on any roadways located within the designed fall distance of an overhead transmission line parallel to existing roadways. Snow and ice accumulation and high winds could make the transmission line more susceptible to failure or collapse.

The applicant indicated that its design standards would meet or surpass NESC requirements for the safe design and operation of transmission lines. These standards include designing transmission lines to withstand severe winds from summer storms and the combination of ice and strong winds from winter weather.

Potential impacts to railways would be limited to short-term construction impacts and would be coordinated directly with the railroad operator. Impacts of stringing HVTL lines and maintenance of structures can include delays and safety concerns as trains are temporarily rerouted or crossings are postponed. Safety measures would be implemented during active construction around railroads. Construction workers would maintain regular contact with railroad personnel as electrical conductor stringing occurs over spanned rail lines to ensure appropriate safety standards are maintained throughout construction and operation. Negligible impacts during operation would be anticipated to railroads.

Potential impacts to the electrical grid and other utilities during construction are anticipated to be short-term, intermittent, and localized. In some areas, the project could cross over existing transmission lines, follow existing transmission line ROW, or cross or parallel electric distribution lines. An overarching project objective is to provide additional transmission capacity to reduce congestion and to improve electric system reliability throughout the region as more renewable energy resources are added to the high voltage transmission system. Project operations would, therefore, have long-term beneficial impacts by providing additional transmission line capacity in the project area.

The project crosses pipeline ROWs in three locations in Segment 3. Potential pipeline impacts are expected to be avoided and mitigated by coordinating with the appropriate pipeline companies. The applicant indicated that they would use the Gopher State One-Call system to locate and mark underground utilities prior to ground-disturbing activities. Transmission lines have the ability to cause AC interference on pipelines. Engineering analysis and induction study can be done to determine the extent of possible impacts and determine if co-location is feasible and reasonable.

The project is not anticipated to impact emergency services. Construction and operation of the project is not expected to impact heliports operating from hospitals. Temporary road closures required during construction would be coordinated with local jurisdictions to provide for safe access of police, fire, and other emergency service vehicles. Accidents that might occur during construction would be handled through local emergency services. Given the limited number of construction workers involved in the project and the low probability of a construction-related accident, the existing emergency services should have sufficient capacity to respond to emergencies. During operation, emergency services providers could receive 911 phone calls in the event of a fallen transmission line structure.

Potential airport impacts, as they exist today, are anticipated to be minimal as there are mitigation measures that can be employed to avoid these impacts, such as routing away from the airport, the use of appropriate height structures to avoid impact to glide or approach slopes, and structure marking or lighting. Potential impacts to public airports would occur if the project were of a certain height and located within close proximity, thereby limiting the potential for safe operations, including aircraft takeoff and landing. Potential impacts to public airports would be determined in relation to safety zones and through adherence to FAA design criteria and recommended setbacks. Height restrictions could apply if/when the airport’s airstrips are within 3.78 miles. The Nietz and Christinson Airports are located within 3.78 miles of Segment 3. Potential impacts to private airstrips would be determined through an analysis of proximity and location in relation to the airstrips, as well as discussions with landowners.

9.5.10.6 Mitigation

The sample route permit (Sections 5.3.4 and 5.3.14 of Appendix H) contains the following mitigation related to transportation:

“The Permittee shall cooperate with county and city road authorities to develop appropriate signage and traffic management during construction.”

“The Permittee shall keep records of compliance with this section and provide them upon the request of Commerce or Commission staff.”

“The Permittee shall advise the appropriate governing bodies having jurisdiction over all state, county, city, or township roads that will be used during the construction phase of the Transmission Facility. Where practical, existing roadways shall be used for all activities associated with construction of the Transmission Facility. Oversize or overweight loads associated with the Transmission Facility shall not be hauled across public roads without required permits and approvals.”

“The Permittee shall promptly repair private roads or lanes damaged when moving equipment or when accessing construction workspace, unless otherwise negotiated with the affected landowner.”

The applicant committed to attempt to avoid or limit roadway closures to the maximum extent practicable and use conductor safety guides over roads, or utilize helicopters for stringing activities where possible. The applicant also noted impacts to traffic would be mitigated by limiting construction traffic to the project right-of-way and existing access points to the maximum extent feasible and minimizing impacts related to dust by proper use of BMPs (e.g., soil matting, wetting) to reduce the potential for dust. The applicant also committed to utilizing appropriate safety measures such as use of safety signage, installation of temporary barrier structures, and employing spotters during clearing or stringing activities. Finally, the applicant would meet with MnDOT, county highway departments, township road supervisors, and/or city road personnel to address any issues that occur during roadway construction.

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to public services and utilities: “During Transmission Facility construction, the Permittee shall minimize any disruption to public services or public utilities. To the extent disruptions to public services or public utilities occur, these shall be temporary, and the Permittee shall restore service promptly. Where any impacts to utilities have the potential to occur, the Permittee would work with both landowners and local entities to determine the most appropriate mitigation measures if not already considered as part of this route permit.”

In the joint certificate of need application and route permit application, the applicant committed to ongoing coordination with MnDOT, local and county road authorities, railroad companies, and the FAA.

MnDOT and rail operator design guidelines would need to be met for any utility occupation of road and railroad ROW, and a permit from MnDOT would be required to use any state highway ROWs. MnDOT has a formal policy and procedures for accommodating utilities within or as near as feasible to highway ROWs. The applicant would continue to work with MnDOT and as noted in Section 2.7.3, has completed

ENMs and will be required to complete a constructability report. Additionally, the applicant has committed to coordinating with county and township road departments to minimize impacts on local roads and highways. The applicant also noted in the joint certificate of need application and route permit application that, at the suggestion of MnDOT, they met with the Mississippi River Parkway Commission to discuss the crossing of Minnesota Highway 61, or the Great River Road, and explained that the crossing location would use existing structures.

If issued a route permit, the applicant would need to file notice with the FAA and work with both the FAA and MnDOT for compatibility between the transmission line and any airport and to identify appropriate mitigation measures. If it was determined necessary to construct any structures with a height greater than 200 feet AGL, those structures would be marked and lighted in accordance with FAA Advisory Circular 70/7460-1K, Obstruction Marking and Lighting.

Where the project crosses pipeline ROWs, mitigation might be required. If induction mitigation is necessary, the pipeline company would have to approve the mitigation being installed and the applicant would be responsible for the added project costs.

The applicant committed to coordinating with local emergency services to ensure that emergency access to areas near construction activities is maintained.

No other mitigation is proposed for emergency services.

9.6 Human Health and Safety

The ROI for electric and magnetic fields (EMF) is the ROW. Impacts to human health from possible exposure to EMFs are not anticipated. The HVTL would be constructed to maintain proper safety clearances. EMF associated with the project are below Commission permit requirements, and state and international guidelines. Potential impacts would be long-term and localized. These unavoidable impacts would be of a small size and can be mitigated. Impacts would be minimized by appropriate placement and adhering to electric field standards for transmission lines.

9.6.1 Electric and Magnetic Fields (EMF)

The ROI for electric and magnetic fields (EMF) is the ROW. Impacts to human health from possible exposure to EMFs are not anticipated. The HVTL would be constructed to maintain proper safety clearances. EMF associated with the project are below Commission permit requirements, and state and international guidelines. Potential impacts would be long-term and localized. These unavoidable impacts would be of a small size and can be mitigated. Impacts would be minimized by appropriate placement and adhering to electric field standards for transmission lines.

9.6.1.1 Existing Conditions

The term “EMF” is typically used to refer to electric and magnetic fields that are coupled together. EMF is associated with natural sources such as lightning and sunlight. EMFs are also invisible lines of force that surround electrical devices (for example, power lines, electrical wiring, and electrical equipment) which are produced through the generation, transmission, and use of electric power (reference (70)). However, for lower EMF frequencies associated with power lines, electric and magnetic fields are relatively decoupled. Generally, electric fields are dependent on the voltage of a transmission line and magnetic fields are dependent on the current carried by a transmission line.

Electric fields are the result of electric charge, or voltage, on a conductor. Using a garden hose as an analogy, voltage is equivalent to the pressure of the water moving through the hose. The intensity of an electric field is related to the magnitude of the voltage on the conductor and is measured in kV per meter (kV/m). Magnetic fields are created and increase from the strength of the flow of current through wires or electrical devices. Using the same analogy, current is equivalent to the amount of water moving through the garden hose. The intensity of a magnetic field is related to the magnitude of the current flow through the conductor and is measured in units of Gauss (G) or milliGauss (mG).

Because the EMF associated with a transmission line is proportional to the amount of electrical current passing through the power line, it will decrease as distance from the line increases (reference (71)). This means that the strength of EMF that reaches a house adjacent to a transmission line ROW will be significantly weaker than it would be directly under the transmission line. Electric fields are easily shielded by conducting objects, such as trees and buildings, further shielding electric fields.

Magnetic fields, unlike electric fields, are not shielded or weakened by materials that conduct electricity (for example, trees, buildings, and human skin). Rather, they pass through most materials. Both magnetic and electric fields decrease rapidly with increased distance from the source. Electric and magnetic fields are invisible, just like radio, television, and cellular phone signals, all of which are part of the electromagnetic spectrum (reference (70)).

Electric and magnetic fields are found anywhere there are energized, current-carrying conductors, such as near transmission lines, local distribution lines, substation transformers, household electrical wiring, and common household appliances. The frequency from transmission lines is considered “non-ionizing, low-level radiation which is generally perceived as harmless to humans” (reference (70)). Table 5-8 illustrates the typical ranges of electric and magnetic fields of frequently and commonly used appliances that would be in a home (reference (70)).

Table 9-7 Electric and Magnetic Field Ranges for Common Household Appliances

Electric Field [1]		Magnetic Field [2]			
Appliance	kV/m	Appliance	mG		
	1 foot		1 inch	1 foot	3 feet
Stereo	0.18	Circular saw	2,100 to 10,000	9 to 210	0.2 to 10
Iron	0.12	Drill	4,000 to 8,000	22 to 31	0.8 to 2
Refrigerator	0.12	Microwave	750 to 2,000	40 to 80	3 to 8
Mixer	0.10	Blender	200 to 1,200	5.2 to 17	0.3 to 1.1
Toaster	0.08	Toaster	70 to 150	0.6 to 7	< 0.1 to 0.11
Hair Dryer	0.08	Hair dryer	60 to 200	< 0.1 to 1.5	< 0.1
Television	0.06	Television	25 to 500	0.4 to 20	< 0.1 to 1.5
Vacuum	0.05	Coffee maker	15 to 250	0.9 to 1.2	< 0.1

[1] German Federal Office for Radiation Safety
[2] Long Island Power Institute

Research on whether exposure to magnetic fields causes biological responses and health effects has been performed since the 1970s. The U.S. National Institute of Environmental Health Sciences and the World Health Organization's research does not support a relationship or association between exposure to electric power EMF and adverse health effects. The U.S. National Institute of Environmental Health Science evaluated numerous epidemiologic studies and comprehensive reviews of scientific literature regarding association of cancers with living near power lines, with magnetic fields in the home, and with exposure of parents to high levels of magnetic fields in the workplace. They concluded that "no consistent evidence for an association between any source of non-ionizing EMF and cancer has been found" (reference (72)).

Minnesota, Wisconsin, and California have performed literature reviews and research examining EMF. In 2002, Minnesota formed an Interagency Working Group to evaluate EMF research and develop public health policy recommendations for any potential problems arising from EMF effects associated with high-voltage transmission lines. The Working Group included staff from a number of state agencies and published its findings in a White Paper titled *EMF Policy and Mitigation Options*. Their research found that some epidemiological studies have shown no statistically significant association between exposure to EMF or health effects, and some have shown a weak association. Studies have not been able to establish a biological mechanism for how magnetic fields could cause cancer (reference (73)).

There is no federal standard for transmission line electric fields. The Commission has imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground (reference (74)). The Commission has not adopted a magnetic field standard for transmission lines. Appendix J provides detailed background on EMF health impact research.

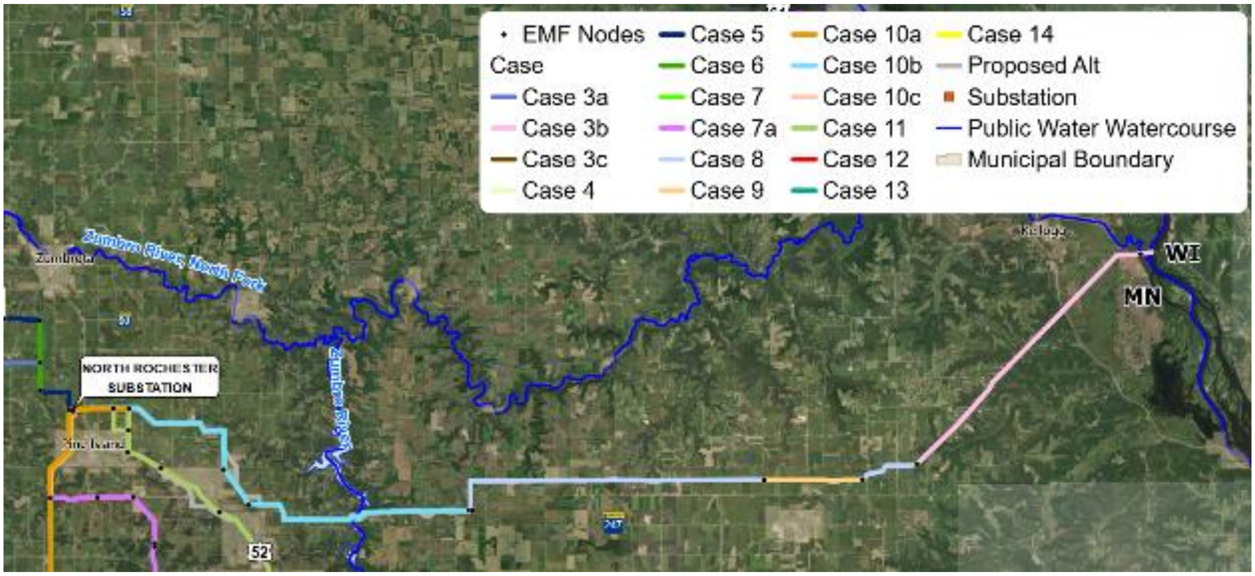
9.6.1.2 Potential Impacts

The magnitude of the voltage on a transmission line is near-constant and ideally within plus or minus five percent of the designed voltage. Because of this, the magnitude of the electric field will also be near constant regardless of the power flowing down the line. The maximum electric field associated with the project and measured at one meter (3.28 feet) above the ground, is calculated to be 6.9 kV/m. The strength of electric fields diminishes rapidly as the distance from the conductor increases. The maximum electric field values are provided in Table 5-9 and the corresponding case number is shown in Figure 9-4.

Table 9-8 Electric Field Calculations

Structure Type	Circuits Present	Case	Maximum within ROW
Single Pole, Davit Arm, 345 kV Single Circuit	Wilmarth – North Rochester 345 kV	Case 1	6.2 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild	Wilmarth – North Rochester 345 kV & Line 832 115 kV	Case 2	2 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild	Wilmarth – North Rochester 345 kV & Line 706, 707 or 708 69 kV	Case 3a, Case 3b, Case 3c	1.5 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit	Wilmarth – North Rochester 345 kV / Line 964 345 kV	Case 4	6.4 kV/m
Single Pole, Tangent/Dav it Arm, 345 kV Double Circuit	Wilmarth – North Rochester 345 kV & Line 964 345 kV	Case 5	5.2 kV/m
Single Pole, Tangent/Dav it Arm, 345 kV Double Circuit with 69 kV Underbuild	Wilmarth – North Rochester 345 kV, Line 964 345 kV & Line 739 69 kV	Case 6	1.2 kV/m
Single Pole, Davit, 161/69 kV Double Circuit	North Rochester – Chester 161 kV & Peoples Line 69 kV	Case 7	1.5 kV/m
Single Pole, Tangent, 345 kV Double Circuit	North Rochester – Tremval 345 kV, Line 965 345 kV	Case 8	6.3 kV/m
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 9	1.3 kV/m
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit	North Rochester – Chester 161 kV & Line 979 345 kV	Case 10a	6.9 kV/m
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit	North Rochester – Chester 161 kV / Line 965 345 kV, North Rochester – River 345 kV	Case 10b	6.2 kV/m
Single Pole, Davit, 161 kV Single Circuit	North Rochester – Chester 161 kV	Case 11	2.7 kV/m
Single Pole, Tangent, 345 kV Double Circuit Single Circuit	Wilmarth – North Rochester 345 kV	Case 12	6.2 kV/m
Single Pole, Tangent, 345 kV Double Circuit	Wilmarth – North Rochester 345 kV, Line 979 345 kV	Case 13	4.9 kV/m
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit	North Rochester –Chester 161 kV, Line 5310 161 kV / Wilmarth –North Rochester 345 kV, Line 979 345 kV	Case 14	5.0 kV/m

Figure 9-4 Segment 3, EMF Nodes



The projected magnetic fields are provided in Table 5-10 and the corresponding case number is shown in Figure 9-4. Because magnetic fields are dependent on the current flowing on the line, calculations were based on two typical system conditions that are likely to occur during the project's first year in service. The two scenarios are system peak energy demand and system average energy demand.

Table 9-9 Calculated Magnetic Flux density (mG)

Structure Type	Circuits Present	Case	Maximum within ROW (mG)
Single Pole, Davit Arm, 345 kV Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV	Case 1	77
Single Pole, Davit Arm, 345 kV Single Circuit (Max Loading)		Case 1	167
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 832 115 kV	Case 2	65
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild (Max Loading)		Case 2	114
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 708 69 kV	Case 3a	55
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3a	96
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 707 69 kV	Case 3b	27
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3b	59

Structure Type	Circuits Present	Case	Maximum within ROW (mG)
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 706 69 kV	Case 3c	31
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3c	62
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV /Line 964 345 kV	Case 4	78
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit (Max Loading)		Case 4	246
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit (Average Loading)	Wilmarth – North Rochester 345 kV & Line 964 345 kV	Case 5	74
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit (Max Loading)		Case 5	224
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV , Line 964 345 kV & Line 739 69 kV	Case 6	19
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit with 69 kV Underbuild (Max Loading)		Case 6	59
Single Pole, Davit, 161/69 kV Double Circuit (Average Loading)	North Rochester – Chester 161 kV & Peoples Line 69 kV	Case 7	5 mG
Single Pole, Davit, 161/69 kV Double Circuit (Max Loading)			21 mG
Single Pole, Tangent, 345 kV Double Circuit with 69 kV Underbuild (Average Loading)	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 8	105 mG
Single Pole, Tangent, 345 kV Double Circuit with 69 kV Underbuild (Max Loading)			190 mG
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild (Average Loading)	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 9	23 mG
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild (Max Loading)			41 mG
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit (Average Loading)	North Rochester – Chester 161 kV & Line 979 345 kV	Case 10a	150 mG
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit (Max Loading)			400 mG
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit (Average Loading)	North Rochester – Chester 161 kV / Line 965 345kV, North Rochester – River 345 kV	Case 10b	111 mG
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit (Max Loading)	North Rochester – Chester 161 kV / Line 965 345kV, North Rochester – River 345 kV		205 mG
Single Pole, Davit, 161 kV Single Circuit (Average Loading)	North Rochester – Chester 161 kV	Case 11	8 mG

Structure Type	Circuits Present	Case	Maximum within ROW (mG)
Single Pole, Davit, 161 kV Single Circuit (Max Loading)	North Rochester – Chester 161 kV		27 mG
Single Pole, Tangent, 345 kV Double Circuit Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV	Case 12	76 mG
Single Pole, Tangent, 345 kV Double Circuit Single Circuit (Max Loading)			164 mG
Single Pole, Tangent, 345 kV Double Circuit (Average Loading)	Wilmarth – North Rochester 345 kV, Line 979 345 kV	Case 13	85 mG
Single Pole, Tangent, 345 kV Double Circuit (Max Loading)			222 mG
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Average Loading)	North Rochester –Chester 161 kV, Line 5310 161 kV / Wilmarth –North Rochester 345 kV, Line 979 345 kV	Case 14	85 mG
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Max Loading)			222 mG

System peak energy demand represents the current flow on the line during the peak hour of system-wide energy demand. Peak demand is 1,200 amps on both conductors. Whereas system average energy demand represents the current flow on the line during a non-peak time, average demand is 560 amps on both conductors. For both scenarios, the magnetic field values were calculated at a point where the conductor is closest to the ground. Like electric fields, magnetic field levels decrease rapidly as the distance from the centerline increases. In addition, because the magnetic field produced by the transmission lines is dependent on the current flow, the actual magnetic fields when the project is placed in service would vary as the current flow on the line changes throughout the day.

9.6.1.3 Mitigation

The sample route permit (Section 5.4.2 of Appendix H) states: “The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms.”

Mitigation of magnetic field strength would be achieved by increasing distance from the HVTL to the receptor. The Commission has, however, 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.

9.6.2 Implantable Medical Devices

The ROI for implantable medical devices is the ROW. Potential impacts associated with the project are anticipated to be negligible. If impacts occur, they can be mitigated. Impacts would be minimized by appropriate grounding and adherence to electric field standards for transmission lines.

9.6.2.1 Existing Conditions

Implantable medical devices, such as an implantable cardioverter defibrillator (ICD) or a pacemaker, are battery-powered devices that help keep a person's heartbeat in a regular rhythm. These devices are implanted into the heart tissue and can deliver electrical shocks to correct the heart's rhythm to prevent sudden cardiac issues and help people at risk for recurrent, sustained ventricular tachycardia or ventricular fibrillation (reference (75)). Instances of interference attributed to EMF are recognized, commonly referred to as electromagnetic interference (EMI). EMF exposure produced by transmission lines generally does not affect implantable devices.

Electromechanical implantable medical devices, such as cardiac pacemakers, ICDs, neurostimulators, and insulin pumps could be subject to interference from EMF, which could mistakenly trigger a device or inhibit it from responding appropriately (reference (76)). While EMI can result in either inappropriate triggering or inhibition of a device from responding properly, only a small percentage of these occurrences are caused by external EMI. Electrical interference at levels above 1.5 kV/m have the potential to interfere with modern, bipolar pacemaker behavior, but some models have been unaffected at as high as 20 kV/m (reference (77)). There is the potential for interference at lower levels, as differing manufacturers vary in susceptibility to EMI (reference (78)). During the peak hour of system-wide energy demand, the maximum electric field within the ROW was calculated to be 6.9 kV/m.

Workers who have cardiac pacemakers have separate guidelines for EMF exposure. The American Conference of Governmental Industrial Hygienists (ACGIH) recommended magnetic and electric field exposure limits for workers who have ICDs are 1 G and 1 kV/m, respectively (reference (79)). While ICD's vary and questions and concerns should be directed to the specific manufacturer, ICD manufacturers' recommended threshold for modulated magnetic fields is 1 G (reference (76)). One gauss is five to 10 times greater than the magnetic field likely to be produced by a high-voltage transmission line (references (76); (80)). During the peak hour of system-wide energy demand, the maximum magnetic field was calculated to be 0.246 G.

It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line, inducing a voltage on the object. Induced voltage is further discussed in Section 5.6.5.

9.6.2.2 Potential Impacts

While EMI can result in either inappropriate triggering or inhibition of a device from responding properly, only a small percentage of these occurrences are caused by external EMI. The project is under ACGIH and ICD manufacturers' recommended threshold for magnetic fields. Additionally, shocks from induced voltage from transmission lines are considered more of a nuisance than a danger. Impacts of induced voltage are further discussed in Section 5.6.5.

In the event ICDs are impacted by EMF, it generally results in a temporary asynchronous pacing (reference (76)). Therefore, health impacts or permanent impacts on implantable medical devices could be possible.

9.6.2.3 Mitigation

The sample route permit (Section 5.4.1 of Appendix H) contains the following mitigation related to grounding, electric field, and electronic interference: “The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the National Electric Safety Code. The Permittee shall address and rectify any induced current problems that arise during transmission line operation.”

“The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms.”

Electric and magnetic field strength is mitigated by increasing the distance from the transmission line and structures. Workers with ICDs should consult with their doctors directly with concerns about work in electrical or magnetic environments (references (81); (82)). Medical devices will return to normal operation when the person moves away from the source of the EMF (reference (76)). Transmission lines will not be energized during construction; therefore, construction workers would not be at risk of EMF or magnetic field exposure. The project would be designed in accordance with applicable NESC standard and to keep electric fields below the 8 kV/m standard set by the Commission. Individuals are expected to follow the recommendations of their medical provider.

9.6.3 Public and Worker Safety

The ROI for public and worker safety is the ROW. Any construction project has potential risks, which can include potential injury from falls, equipment and vehicle use, and electrical accidents. Risks for the public involve electrocution. Potential impacts are anticipated to be minimal, short- and long-term, and can be mitigated. Impacts would be minimized by appropriate adherence to relevant local and state codes, the NESC, and NERC requirements.

9.6.3.1 Existing Conditions

The most recent data from the Bureau of Labor Statistics for injuries and illnesses was used to find the recent number of injuries and illnesses for Power and Communication Line and Related Structures Construction (North American Industry Classification System Code No. 237130). From 2021 to 2022 there were a total of 4,520 nonfatal occupational injuries and illnesses, with around four percent of them being classified as traumatic. From 2021 to 2022 there were 18 fatal injuries, 10 fatal transportation incidents (roadway accident or being struck by a vehicle), and four fatal incidents from coming into contact with an object or equipment (being hit, crushed, caught, struck, etc. by an object or equipment) associated with Power and Communication Line and Related Structures Construction (reference (83)).

9.6.3.2 Potential Impacts

As with any construction project, there are construction-related risks. These could include potential injury from falls, equipment and vehicle use, and electrical accidents. There is potential for construction to disturb existing environmental hazards.

Electrocution is a risk that could occur with direct contact to lines. Between 2011 and 2015, power-line installers in the U.S. had 32 deaths related to electrocution, a rate of 29.7 deaths per 100,000 full-time workers (reference (84)). It could also happen when working near power lines, like when using heavy equipment. Electrocution could occur when there is electrical contact between an object on the ground and an energized conductor, but this situation is most likely with distribution lines (reference (76)).

Any accidents that might occur during construction of the project would be handled through local emergency services. Existing emergency services should have sufficient capacity to respond to any emergencies.

9.6.3.3 Mitigation

The sample route permit (Section 5.5.1 of Appendix H) contains the following mitigation related to safety: "The Permittee shall design the transmission line and associated facilities to meet or exceed all relevant local and state codes, the National Electric Safety Code, and NERC requirements. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, strength of materials, clearances over roadways, ROW widths, and permit requirements."

Proper safeguards would be implemented for construction and operation of the transmission line. The project would be designed to meet or exceed local, state, and the applicant's standards regarding clearance to the ground, clearance to crossing utilities, strength of materials, and ROW distances.

The project must comply with the NESC.89 and Occupational Safety and Health Administration standards (reference (85)). Construction crews and contract crews would also comply with local, state, and NESC standards for installation and construction practices. The applicant would use their established safety procedures, as well as industry safety procedures, during and after installation of the transmission line, including appropriate signage during construction.

9.6.4 Stray Voltage

The ROI for stray voltage is the ROW. Potential impacts to residences and farming operations from stray voltage are not anticipated. Transmission lines do not produce stray voltage during normal operation, as they are not directly connected to businesses, residences, or farms. The project would be constructed to NESC standards, and therefore, impacts are anticipated to be minimal. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

9.6.4.1 Existing Conditions

"Stray voltage" is a condition that can potentially occur on a property or on the electric service entrances to structures from distribution lines connected to these structures. The term generally describes a voltage between two objects where no voltage difference should exist. The source of stray voltage is a voltage that is developed on the grounded neutral wiring network of a building and/or the electric power distribution system. Stray voltage is not created by transmission lines, as they do not directly connect to businesses or residences (reference (86)).

Where utility distributions systems are grounded, a small amount of current will flow through the earth at those points. This is called neutral-to-earth voltage (NEV), which is voltage that is associated with distribution lines and electrical wiring within buildings and other structures (reference (87)). Electrical systems that deliver power to end-users and electrical systems within the end-user's business, home, farm, or other buildings are grounded to the earth for safety and reliability reasons. Stray voltage could arise from neutral currents flowing through the earth via ground rods, pipes, or other conducting objects, from faulty wiring or faulty grounding of conducting objects in a facility. Thus, stray voltage could exist at any business, house, or farm which uses electricity, independent of whether there is a transmission line nearby. Site-specific mitigation measures are required to address potential stray voltage impacts.

Stray voltage is a natural phenomenon that can be found at low levels between two contact points at any property where electricity is grounded; it is measured between two points that livestock can simultaneously touch (reference (87)). Stray voltage and its effects on farms have been studied for nearly 30 years. Numerous studies have found that though it is likely to exist on farms, it is rarely strong enough to affect the behavior or production of dairy cattle (reference (88)). The Commission issued a report in 1998 supporting the conclusion that no credible scientific evidence has been found to show that currents in the earth or associated electrical parameters, such as voltages, magnetic fields, and electric currents, are causes of poor health and mild production in dairy herds (references (88)).

9.6.4.2 Potential Impacts

Stray voltage is, generally, an issue associated with electrical distribution lines and electrical service at a residence or on a farm. Under normal operating conditions, transmission lines do not create stray voltage as they do not directly connect to businesses, residences, or farms. The project would not directly connect to businesses or residences in the area and would not change local electrical service. Accordingly, impacts due to stray voltage are anticipated to be negligible.

Transmission lines, however, can induce voltage on a distribution circuit that is parallel and immediately under the transmission line. This is discussed in Section 5.6.5.

9.6.4.3 Mitigation

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to grounding, electric field, and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between the ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the NESC. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

The sample route permit (Section 5.4.2 of Appendix H) contains the following mitigation related to electric fields: "The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms." The applicant has committed to work with landowners that have any issues with stray voltage following construction of the project.

9.6.5 Induced Voltage

The ROI for induced voltage is the ROW. It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line. This could induce a voltage on the object. Smaller conductive objects near the line could cause a nuisance shock to a person, but it is not a potential safety hazard. Metal buildings within the ROW might require grounding. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

9.6.5.1 Existing Conditions

It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line. Conductive objects include vehicles, including tractors and automobiles, in part because tires are made electrically conductive to eliminate static discharge building up when moving (reference (89)). This might induce a voltage on the object; the magnitude of the voltage depends on several factors, such as the size, shape, and orientation of the object along the ROW. Smaller conductive objects near the transmission line that are insulated or semi-insulated from the ground could cause a nuisance shock to a person from a small current passing through the person's body to the ground. If there were insulated pipelines, electric fences, telecommunication lines, or other conductive objects such as tractors or automobiles with greater lengths and sizes, induced voltage from a transmission line could produce a larger shock. This larger shock has not been found to be a health safety hazard (reference (90)). Similar to stray voltage, transmission lines could cause additional current on distribution lines where they parallel. If the distribution lines are not properly wired or grounded, induced voltage could be created.

9.6.5.2 Potential Impacts

Shocks from induced voltage from transmission lines are considered more of a nuisance than a danger. The transmission line would follow NESC standards, which require the steady-state (continuous) current between the earth and an insulated object located near a transmission line to be below 5 milliamps (mA). A shock at 5 mA is considered unpleasant, not dangerous, and allows for a person to still release the energized object that they are holding that is causing the shock (reference (91)). In addition, the Commission imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground. The standard is designed to prevent serious hazards from shocks when touching large objects parked under AC transmission lines of 500 kV or greater (reference (73)). In the Brookings County to Hampton 345 kV transmission line project (Commission docket number TL-08-1474), the ALJ and Commission determined that Minnesota's current electric field exposure standard of 8 kV/m is adequately protective of human health and safety (references (92); (93)).

9.6.5.3 Mitigation

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to grounding, electric field, and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the NESC. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

The applicant committed to meeting electrical performance standards. Appropriate measures would be taken to prevent induced voltage problems when the project parallels or crosses objects. Metal buildings might have unique issues due to induction concerns. For example, conductive buildings near power lines of 200 kV or greater must be properly grounded. Any person with questions about a new or existing metal structure can contact the applicant for further information about proper grounding requirements.

9.6.6 Electronic Interference

The ROI for electronic interference is the ROW. Transmission lines do not generally cause interference. If electronic interference does occur, in most cases it can be mitigated by either increasing the distance or adjusting the placement of the device to the transmission line or other transmission line structure. If ongoing interference due to a transmission line does occur, the applicant would be required to take feasible actions to restore electronic reception to pre-project quality. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

9.6.6.1 Existing Conditions

Electronic Interference refers to the disturbance of electrical circuits or equipment caused by electromagnetic radiation emitted from external sources, in this case, high-voltage transmission lines. Transmission lines generate EMFs depending on the distance from sources and the type of line configuration. The EMFs decrease as the distance increases from the conductors (reference (94)).

There are a number of FM and AM radio broadcasting stations that operate or can be heard within the project area, such as KYSM (103.5) FM, KJLY (104.5) FM, KBGY (107.5) FM, KMSU (89.7) FM, KNGA (90.5) FM, KRUE (92.1) FM, KATO (93.1) FM, KCHK (95.5) FM, KQCL (95.9) FM, K250CD (KDHL-AM) (97.9) FM, KEEZ (99.1) FM, KDHL (920) AM, KFOW (1170) AM, KFSP (1230) AM, KTOE (1420) AM.

There are also many television channels that broadcast throughout the project area. These channels are received from cable, satellite providers, and/or digital antennas.

Wireless internet and cellular phones use frequencies in the 900 MHz ultra-high frequency (UHF) range—a range for which impacts from corona-generated noise are anticipated to be negligible.

Global positioning systems (GPS) is used in daily life, aviation, vehicle navigation, surveying, aerial drones, and agricultural activities. GPS works by sending radio-frequency signals from a network of satellites to the receiver. Because of this, buildings, trees, and other physical structures have the potential to interfere with a GPS signal. GPS provides locational information for navigation between endpoints, as well as geographic orientation for farm and other equipment. GPS is used throughout the project area.

The Continuously Operating Reference Station (CORS) Network is a cooperative effort between MnDOT, other state agencies and institutions, counties, cities, and private enterprises, with the goal of providing Global Navigation Satellite System (GNSS) corrections statewide. Using signals from all available GNSS satellites and receivers at over 140 known positions, MnCORS is able to continuously provide survey-grade positioning corrections via the internet. Users with Real-Time Kinematic (RTK) capable equipment can receive real-time corrections to their geospatial positions, yielding a more accurate horizontal and vertical measurement.

9.6.6.2 Potential Impacts

No impacts to electronic devices are anticipated. No GPS impacts are expected from the construction or operation of the project. Research evaluating the potential for interference in the use of GPS satellite-based microwave signals under or near power line conductors indicates it is unlikely that there would be electronic interference while using GPS (reference (95)). Interference would be more likely near a transmission line structure and unlikely under a transmission line (reference (96)) due to shadow effects.

Electronic interference from HVTLs can impact electronic communications like radios, television, and microwave communications in three ways: corona noise, shadowing effect, and gap discharge.

Corona "noise" primarily occurs in the radio frequency range of amplitude modulated (AM) signals. This generated noise typically occurs underneath a transmission line. It dissipates rapidly as the distance increases from the transmission line. FM radio receivers usually do not pick up interference from transmission lines because corona-generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (reference (97)). In most cases, the strength of the radio or television broadcast signal within a broadcaster's primary coverage area is great enough to prevent interference. Additionally, due to the higher frequencies of television broadcast signals (54 MHz and above), a transmission line seldom causes reception problems within a station's primary coverage area. Anticipated electric fields are below levels expected to produce significant levels of corona.

Shadowing effect comes from physically blocking communication signals. This primarily can impact two-way mobile radio communications and television signals. Digital and satellite television transmissions are more likely to be affected by shadowing generated by nearby towers. Interference could occur if the device was located immediately adjacent to a tower structure, blocking its signal. While television interference is rare, it can happen when a structure is aligned between a receiver and a weak, distant signal. Telecommunication towers can be susceptible to the shadowing effect.

Gap discharge interference is the most noticed form of power line interference with radio and television signals, and typically the most easily fixed. Gap discharges are usually caused by hardware defects or abnormalities on a transmission or distribution line, causing small gaps to develop between mechanically connected metal parts. As sparks discharge across a gap, they create the potential for electrical noise, which, in addition to audible noise, can cause interference with radio and television signals. The degree of interference depends on the quality and strength of the transmitted communication signal, the quality of the receiving antenna system, and the distance between the receiver and the power line. Because gap discharges are a hardware issue, they can be repaired relatively quickly once the issue has been identified.

9.6.6.3 Mitigation

The sample route permit (Section 5.4.3 of Appendix H) contains the following mitigation related to electronic interference: "If interference with radio or television, satellite, wireless internet, GPS-based agriculture navigation systems or other communication devices is caused by the presence or operation of the Transmission Facility, the Permittee shall take whatever action is necessary to restore or provide reception equivalent to reception levels in the immediate area just prior to the construction of the Transmission Facility. The Permittee shall keep records of compliance with this section and provide them upon the request of Commerce or Commission staff."

The applicant committed to taking feasible action to restore electronic reception to pre-project quality in the case of electronic interference. Interference could be due to line-of-sight obstruction (shadowing) in select areas but could be mitigated by either increasing the distance or adjusting the placement of transmission line structures and electronic antennas. For example, if interference occurs for an AM radio station within a station's primary coverage area where good reception existed before the project was built, reception can be regained by adjusting or moving the receiving antenna system. This is unlikely to occur to AM radio frequency, except for immediately under a transmission line, and interference would dissipate rapidly with increasing distance from the line.

9.7 Land-Based Economies

The ROI for land-based economies is the route width, except for tourism, which is the local vicinity. The ROI for recreation is more localized (the route width) as potential impacts to the tourism economy would be experienced at a broader scale. The short and long-term impacts of land-based economies are assessed for agriculture, forestry, mining, and tourism.

Constructing and operating the project could potentially affect land-based economies in the project area. Transmission lines are a physical, long-term presence on the landscape which could prevent or otherwise limit use of land for other purposes. The primary land-based economic activity in the project area is agriculture. Other potential economic activities connected to land usage in the project area include forestry, mining, and tourism. The primary means of mitigating impacts to land-based economies is prudent routing (that is, by choosing route alternatives that avoid such economies).

9.7.1 Agriculture

Agriculture is the predominant land use within the ROI. Structures are already present, and when they are within an agricultural field, they would interfere with farming operations. Impacts to agriculture would be mitigated through implementation of an Agricultural Impact Mitigation Plan and prudent routing.

9.7.1.1 Existing Conditions

Segment 3's predominant land cover (approximately 73% of its ROI) is agriculture (Map 48). In each of the counties within the ROI, crops account for more than half of the share of sales by type, and the average farm size is less than 320 acres (Table 9-10). As noted in the joint certificate of need application and route permit application, principal crops include grain, soybeans, hay/haylage, sweet corn, corn for silage, green peas, corn for grain, and oats for grain. Farmers in the area also raise livestock, including hogs and pigs, dairy cows, beef cattle, and poultry.

Table 9-10 Segment 3 Agricultural Products Sold and Average Size of Farm

County	Market Value of Agricultural Products Sold (percent)		Average size of farm (acres)
	Crops	Livestock	
Goodhue [1]	57	43	300
Olmsted [2]	67	33	279
Wabasha [3]	40	60	317

[1] Source: reference (209)
[5] Source: reference (243)
[3] Source: reference (281)

There are no apiaries, center pivot irrigation systems, or private airstrips used for agricultural purposes in the ROI of Segment 3.

Three categories of soils identified by the Soil Survey Geographic Database (SSURGO) database are subject to protection under the FPPA: prime farmland, prime farmland when drained, and farmland of statewide importance. Prime farmland is defined by the NRCS as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Prime farmland, when drained, includes soils that have the potential to be prime farmland but require drainage or hydrologic alteration to achieve high productivity. Farmland of statewide importance includes soils that are nearly prime, but are not as productive due to permeability, slope, erosion potential, or some other soil property.

The ROI includes areas of prime farmland, prime farmland if drained, and farmland of statewide importance (Map 56). Approximately 43% of Segment 3's ROI is designated prime farmland (Appendix G).

The 2024 directory of Minnesota organic farms from the MDA lists 29 potential organic farms in the three-county area (reference (100)). However, because organic farmers are not required to register with the MDA, there could be additional, unregistered organic farms within the project area. In addition, organic farm registration does not give the precise location of organic fields, only the registrant's mailing address.

Agriculture in this area also includes precision farming practices. Precision farming involves the use of global positioning systems (GPS) to guide farming equipment. One of the most precise types of GPS systems is known as real-time kinematic GPS (RTK GPS). Precision farming minimizes the potential for waste from, for example, duplicate row seeding or overlap in fertilizer or pesticide application.

9.7.1.2 Potential Impacts

Transmission lines have the potential to impact agriculture both temporarily and permanently. Temporary impacts result from transmission line construction, the extent of which is limited to the duration of construction, and annual transmission line inspections, the extent of which is temporary and periodic during operation. Impacts could include limiting the use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Temporary impacts from annual transmission line inspections might include pedestrian or light vehicle access, which would be limited to the ROW and areas where obstructions might require access from off the ROW. Impacts associated with annual transmission line inspections would be coordinated as part of easement negotiations between the applicant and the landowner before construction of the project.

Permanent transmission line impacts result from the placement of transmission line structures within crop, pasture, and other agricultural lands. The footprint of the transmission line structures is land that can no longer be used for agricultural production. This footprint can adversely impact farm income and property values depending on placement, structure type, and a variety of other factors. Permanent structures can have varying sized footprints due to the structure design and distance from each other.

Structures can impede the efficient use of farm equipment and can significantly limit the management options for agricultural operations. Presence of structures can also impede the efficiency of a farming operation, as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields. Transmission line structures in agricultural fields could also potentially impede the use of irrigation systems such as center pivot 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 using the same practice.

While the presence of the project on or near an unregistered 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. For example, construction vehicles would need to be cleaned prior to entering organic farms to prevent tracking offsite soil or plant material onto the farm, and throughout operational maintenance of the ROW, certain herbicides or pesticides could not be used on or near the organic farm. These measures would need to be coordinated on an individual basis between the applicant and the affected organic farm owner.

Livestock operations are present within the project area and could be temporarily affected during construction of the project. Construction activities could temporarily disrupt livestock access to pasture lands, and construction noise might disturb livestock. In addition, poultry could be sensitive to disease caused by pathogens introduced by offsite soils tracked on-site during construction.

Though stray voltage impacts are not anticipated to be caused by the project, stray voltage could be of concern to livestock farmers, particularly on dairy farms. NEV is by and large an issue associated with distribution lines and electrical service at a residence or on a farm (Section 5.6.4). Transmission lines do not create NEV stray voltage as they do not directly connect to businesses, residences, or farms (Section 5.6.4).

Transmission lines have the potential to interfere with RTK and standard GPS used for precision farming in two ways: (1) electromagnetic noise from a transmission line could potentially interfere with the frequencies used for RTK and standard GPS signals and (2) transmission line structures could cause line-of-site obstructions or create multi-path reflections such that sending and receiving of signals would be compromised. Interference could occur where the spectrum of transmission line electromagnetic noise overlaps the frequency spectrum used by RTK or standard GPS systems. As discussed earlier in this chapter, no GPS impacts are expected from the construction or operation of the project (Section 5.6.6).

Interference due to line-of-sight obstruction or multi-path reflection could occur in two ways: (1) obstruction of, or other reflection interference with, a GPS satellite signal, and (2) obstruction of radio transmissions from an RTK base station to a mobile receiving unit. GPS uses information from multiple satellite signals to determine specific locations. Interference with one signal would not cause inaccurate navigation; however, simultaneous interference with two signals could lead to inaccurate navigation.

Because simultaneous interference with two signals is relatively unlikely and any line-of-sight obstruction would be resolved with movement of the GPS receiver (for example, tractor) such that proper GPS reception would be quickly restored, line-of-sight obstruction impacts to precision farming systems are anticipated to be minimal and temporary.

A transmission line structure located very near an RTK base station could cause a line-of-sight obstruction in the signal from a base station. A transmission line structure near an RTK base station (within 100 feet) could also cause multi-path reflections that interfere in the signal from a base station. An RTK base station would need to be at least outside of the transmission line ROW, or 75 feet away. Multi-path reflections can also be caused by other structures and landscape features, including homes, trees, sheds, and sudden changes in ground elevation.

9.7.1.3 Mitigation

Mitigation and restoration measures for vegetation on landowner property are standard Commission route permit conditions. The sample route permit (Section 5.3.7 of Appendix H) contains the following mitigation related to land-based economies: "The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads."

The applicant would implement an AIMP and reasonably restore and/or compensate landowners, as appropriate, for damages caused by the applicant as a result of transmission line construction. A draft version of the AIMP is provided in Appendix K. The applicant would work with landowners to determine whether to restore land and/or compensate landowners after discussions with them. The applicant would also implement a vegetation management plan to reduce impacts on agriculture, as appropriate.

To further mitigate impacts to agriculture and as described in the AIMP (Appendix K), the applicant would implement measures to reduce compaction, soil erosion, and sedimentation and would compensate producers for crop or livestock loss or damage. Post-construction restoration efforts would include restoration of any temporary access modifications and deep plowing to remove compaction. Both crop and livestock activities would be able to continue around project structures and facilities after construction.

The applicant notes in the joint certificate of need application and route permit application that no impacts are anticipated to affect agricultural activities during winter, as the crop fields are unplanted and the ground is frozen. Construction is anticipated to occur year-round, and impacts to agriculture could be avoided in winter months.

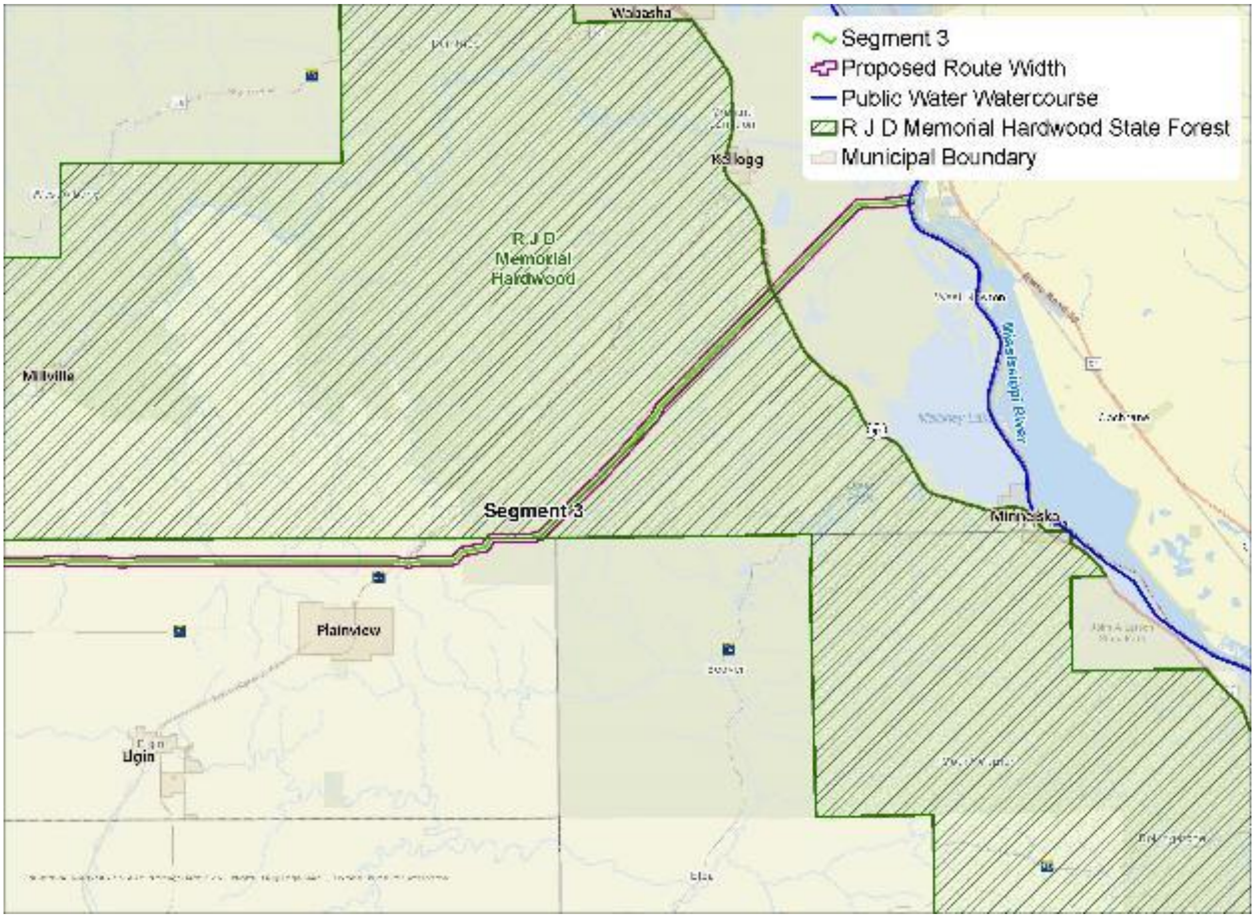
9.7.2 Forestry

9.7.2.1 Existing Conditions

The ROI for the land-based economy of forestry is the route width. The Richard J. Dorer Memorial Hardwood State Forest is present within Segment 3's ROI. New impacts to forestry resources or operations are not anticipated.

Segment 3 would cross the Richard J. Dorer Memorial Hardwood State Forest for approximately 2.0 miles. The state forest is discussed further in Section 9.5.8 and shown in Figure 9-5.

Figure 9-5 Richard J. Dorer Memorial Hardwood State Forest



9.7.2.2 Potential Impacts

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

The ROW of Segment 3 has been cleared, and Segment 3 would result in continued permanent loss of forestry resources. No new loss of forestry resources is anticipated.

9.7.2.3 Mitigation

Impacts on forested areas would be reduced by minimizing the tree clearing to the extent feasible; however, tall-growing vegetation within the ROW would be cleared.

9.7.3 Mining

The ROI for the mining land-based economy is the route width. Potential impacts are assessed through identification of known, existing mining operations and assessing potential impacts to those operations given the potential introduction of the HVTL. Documented prospect mines are also noted where present within the ROI. No impacts to active facilities are anticipated. If the potential for impacts to mining operations would occur, the applicant would be required to coordinate those impacts with the mining operator.

9.7.3.1 Existing Conditions

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.

Mining operations are prevalent in the project area and consist of aggregate mining operations and bedrock quarries owned either by individuals, private companies, or MnDOT. No aggregate operations were identified within the route widths of Segment 3.

9.7.3.2 Potential Impacts

No mining operations were identified within the ROI and therefore no impacts are anticipated.

9.7.3.3 Mitigation

No impacts are anticipated. If the potential for impacts to mining operations would occur, the applicant would be required to coordinate those impacts with the mining operator.

9.7.4 Tourism

The ROI for the tourism land-based economy is the local vicinity. Potential impacts are assessed through identification of known resources utilized by non-residents that would likely be recreating in the area and bringing in non-local revenue (or tourism dollars) to the area. Most opportunities for tourist activities within the ROI include use of publicly accessible lands and water for outdoor activities (Section 9.5.8). Impacts to tourism are anticipated to be negligible to minimal.

9.7.4.1 Existing Conditions

Tourism opportunities within the ROI beyond outdoor activities were not identified. Human-built tourism in the counties includes county fairs, arts and crafts fairs, farmers markets, and smaller community events. These events and other opportunities for tourism are advertised in nearby incorporated towns, and the activities are not located within the ROI.

Recreational opportunities identified within the ROI include publicly accessible lands and waters used for outdoor activities (Section 9.5.8). Nonresidents or tourists could visit the project area to take advantage of the area's hunting and fishing opportunities or visit the state park. Public and designated lands are discussed in Section 9.9.6.

9.7.4.2 Potential Impacts

Impacts to the tourism economy are anticipated to be negligible to minimal.

9.7.4.3 Mitigation

If the potential for temporary interference with public access to trails (i.e., Snake Creek Management Unit Trails and Snake Creek Trail) is identified, the applicant would attempt to avoid or limit trail closures to the maximum extent practicable. No restricted access to other recreational areas that may be used by tourists is anticipated.

9.8 Archaeological and Historic Resources

The ROI for archaeological and historic resources is the route width. Direct and indirect impacts could occur from construction and operation of the project. Direct impacts to archaeological and historic resources could result from construction activities such as ROW clearing, placement of structures, temporary construction areas, and vehicle and equipment operation. Direct impacts could also result from the removal of historic buildings or structures. Direct impacts to historic resources could occur if the project is located near or within view of a resource (typically a historic building, structure, or traditional cultural properties (TCP)).

Potential impacts are assessed through identification of documented archaeological and historic resources within one mile of the route alternatives. An emphasis is placed on resources within the route widths, which could have the most potential impact.

9.8.1 Existing Conditions

Cultural resources consist primarily of archaeological sites and historic architectural resources. Archaeological sites are defined as the material remains of past human life or activities (reference (109)). Historic architectural resources are sites, buildings, and structures greater than 45 years in age that "create tangible links to the American past, whether in relation to historical events and people, traditional ways of life, architectural design, or methods of construction," as defined in the Minnesota Historic and Architectural Survey Manual (reference (110)). Traditional Cultural Properties (TCP) are also considered cultural resources. TCPs are defined as locations of significance to a community because of their association with important cultural practices and beliefs (reference (111)).

Federal laws and regulations, including Section 106 of the National Historic Preservation Act (NHPA) of 1966, its implementing regulations found in 36 CFR 800, and the Archaeological Resources Protection Act of 1979, provide the standards for cultural resources identification, evaluation, and mitigation of impacts. Pursuant to Section 106 of the NHPA, a historic property is any archaeological site, historic architectural resource, or traditional cultural property included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Potential cultural resources investigations that could be required under Section 106 include archaeological surveys, historic architectural surveys, and/or TCP surveys, which serve to identify TCPs. Section 106 applies to all undertakings that take place on federal lands, require federal permitting, and/or utilize federal funds.

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

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

Coordination with the Tribal Historic Preservation Offices (THPO) prevents impacts from the project to known TCPs. THPOs are officially designated by Tribes and serve the same function as a SHPO (reference (112)). THPOs assist with the preservation of Tribal historic properties and cultural traditions. They are also available to advise federal, state, and local agencies on the management of tribal interests. As noted in Section 8.1.1 of the joint certificate of need application and route permit application, the applicant has engaged with multiple tribes and is committed to continued engagement and consultation.

Minnesota is divided into nine Archaeological Regions, which were defined by former State Archaeologist Scott Anfinson (reference (113)), as part of a framework for building a predictive model developed by the Minnesota Department of Transportation (MNDOT) for the presence of archaeological sites, called the MnModel (reference (113)). These regions characterize features of the natural environment that have been fairly stable throughout precontact and contact periods. The distribution of resources among the nine regions is assumed to have influenced the distribution of precontact peoples (reference (113)).

Segment 3 falls within the Southeast Riverine Archaeological Region (Region 3). Region 3, the Southeast Riverine Archaeological Region, includes Dodge, Fillmore, Goodhue, Houston, Mower, Olmsted, Wabasha, and Winona counties, and portions of Dakota, Freeborn, Rice, and Waseca counties. This region was not glaciated during the Late Wisconsin Ice Age. The region is dominated by a stream-dissected landscape and contains three major river systems: the Cannon, Zumbro, and Root Rivers. No natural lakes are found within Region 3; however, valley bottom lakes are present along the Mississippi River. The climate is mild in the Southeast Riverine Region compared to the rest of the state. The average high temperature is 23 degrees Fahrenheit in January and 85 degrees Fahrenheit in July. Annual precipitation ranges between 28-30 inches. Faunal resources in this region during the late Holocene included deer and elk, with a small number of bison present in the upland areas. Aquatic resources could be found in the region's rivers and tributaries, and plant resources, such as prairie turnips and acorns, were also present (reference (113)).

Human occupation of the Southeast Riverine Region, which remained unglaciated, occurred by approximately 11,200 BC. Early hunter gatherers maintained small group sizes and were very mobile, with subsistence patterns centered on hunting large and medium sized game animals. This period, known as the early Paleoindian, spanned from approximately 11,200 to 10,500 BC, and is characterized by its distinctive fluted projectile points (e.g., Clovis, Folsom, Holcombe). Early prehistoric artifacts (fluted and Plano projectile points) have been recovered in this region, though primarily as surface collections. There is potential for deeply buried precontact sites of all periods in floodplain alluvium. The late Paleoindian/early Archaic period (10,500 to 7,500 BC) saw an increase in subsistence diversification, evidenced in part in the archaeological record by a more diverse and specialized tool assemblage (reference (114)).

During this period and continuing into the Middle Archaic (7,500 to 3,000 BC), gradually increasing population sizes resulted in decreased, but still expansive, 'home range' areas for these hunter gatherers, who still relied heavily on larger forest game animals for subsistence. The suite of stone tools continued to increase during this period, and copper tools made their first appearance at the end of the middle Archaic (reference (114)).

The Late Archaic period (approximately 3,000 to 500 BC) is characterized by the appearance of exotic materials, such as marine shells, communal burial sites, and a more diverse material culture, including tools used in the manufacturing of dugout canoes. Copper tools were also prevalent during this time period. Lifeways during the late Archaic period relied more heavily on second-order foods, such as fish and other aquatic resources, as well as plant life (e.g., wild rice). The Late Archaic was a period of resource intensification and, therefore, saw a decrease in mobility and home range areas, and an increase in group sizes (reference (114)). In Region 2, many sites in the middle prehistoric period are located on islands and peninsulas on larger-sized lakes or along major rivers. Lifeways continued to evolve during the Woodland period (between 1,000 to 500 BC to approximately 1650 AD). The Woodland period is generally characterized by the appearance of pottery and burial mounds. Later, Woodland habitation sites in the Prairie Lakes region are most likely in river valleys, in sheltered, wooded areas.

Contact period sites (circa 1700) are mostly associated with the Santee Dakota tribes, and with French and Euroamerican fur traders (reference (113)).

The ROI for archaeological and historic architectural resources is the route width. However, for the purposes of analysis, documented archaeological and historic architectural resources were reviewed to understand the broader potential for archaeological and/or historic architectural resources within a one-mile buffer of Segment 3.

Because proximity to fresh water and food resources was vital to the survival of the early inhabitants of Minnesota, archaeological sites are typically concentrated on well-drained upland terraces along bodies of water. In the project area for Segment 3, previously identified archaeological sites are mostly concentrated in the Mississippi River Valley near the eastern terminus of the segment.

To determine potential cultural resource impacts on cultural resources, known archaeological sites and historic architecture in or adjacent to the project were identified through a review of the OSA's online portal and MnSHIP, the Minnesota SHPO's online portal. MnSHIP is a comprehensive database of documented historic architectural resources for the entire state, while the OSA portal is a database of previously recorded archaeological sites in the state. The OSA portal was also reviewed for estimated locations of historic cemeteries, as recorded in 2011 by Vermeer and Terrell (reference (115)). This study identified unrecorded historic cemeteries based on various forms of documentation, such as historic maps and aerial imagery. These cemeteries are often mapped to a much larger area, such as the PLS section or township level, than their actual locations, as the exact locations might not be known or verified. Therefore, even in cases wherein an unrecorded historic cemetery appears to intersect the segment's route width, the resource may not be present in this location. These unrecorded Euroamerican cemeteries are therefore discussed as an added precaution.

Documented archaeological and historic resources within the study area of Segment 3 are summarized in the following tables.

- Table 9-11 summarizes the number of archaeological and historic resources within the project area (which is within one mile of the anticipated alignments) and the ROI (route width).
- Table 9-12 provides descriptions of the resources located within the route width.

Map 57 shows the location of cultural resources within the ROI of Segment 3.

Section 9.8.1.1 provides further detail on the cultural resources within the ROI that are listed, or eligible for listing, on the NRHP. Additional cultural resources, beyond those summarized below, might be located during future survey efforts prior to construction.

Table 9-11 Segment 3, Number of Archaeological and Historic Resources within the Project Area and Route Width

	Segment 3 Route Width	Segment 3 Study Area
Archaeological Sites	4	24
Historic Architecture	11	109
Historical Cemeteries	1	9

Table 9-12 Segment 3, Summary of Archaeological and Historic Resources within the Route Width

Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
21GD0248	Archaeological Site	Goodhue Good View	Recommended Eligible	Precontact lithic scatter. Located in Section 28 of Township 109N, Range 15W.
21OL0058	Archaeological Site	Zumbro Lake Ring	Unevaluated	Stone ring, approximately 1 meter in diameter, charcoal deposits. Undetermined time period [1]
21WB0084	Archaeological Site	Unnamed	Unevaluated	Single artifact find consisting one precontact Prairie due Chien Chert flake.
21WhB	Archaeological Site	Fitzgerald	Unevaluated	Alpha site[18] reported by landowner consisting of a precontact burial mound group and artifact scatter [2]
GD-PIT-00030	Historic Architecture	Farmstead	Unevaluated	Constructed 1960
OL-FRM-00027	Historic Architecture	Reinke Farmstead	Not eligible	Constructed 1950/Demolition 2005
OL-ORT-00023	Historic Architecture	Gould Farmstead	Unevaluated	Constructed 1878
OL-ORT-00042	Historic Architecture	Bridge 55520	Not eligible	
WB-PLT-00012	Historic Architecture	Bridge 8147	Unevaluated	
XX-ROD-00006	Historic Architecture	U.S./Trunk Highway 61	Not eligible	Formerly State Road/Trunk Highway 1 and 3
XX-ROD-00011	Historic Architecture	U.S./Trunk Highway 61	Not eligible	Formerly State Road/Trunk Highway 1 and 3: Wabasha to La Crescent
XX-ROD-00019	Historic Architecture	U.S./Trunk Highway 61	Not eligible	Constructed 1921-1928. Formerly State Road/Trunk Highway 1 and 3: La Crescent to Duluth

[18] Alpha sites are archaeological sites that have been recorded based on historic maps, documentation and/or reporting, but have not been investigated by a qualified archaeologist.

Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
XX-ROD-00065	Historic Architecture	U.S./Trunk Highway 42	Not eligible	
XX-ROD-00185	Historic Architecture	U.S. Trunk Highway 52	Not eligible	Constructed 1920/1955
XX-RRD-CSP044	Historic Architecture	St. Paul and Chicago Railway Company/Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company, River Division Railroad Corridor Historic District	Eligible	The River Division Mainline was constructed from 1869 to 1872 and was first determined eligible for the NRHP in 2008.[3] The resources intersect Segment 3 in Section 2 of Township 109N, Range 10W.
Cemetery ID 20716	Historic Cemetery	Catholic Cemetery	N/A	Mapped at the PLS Township level in Township 109N.

[1] Source: reference (282)
[2] Source: reference (283)
[13]Source: reference (284)

9.8.1.1 NRHP-Eligible Resources

There are two NRHP-eligible cultural resources within the ROI of Segment 3, including one archaeological site and one historic architectural resource.

9.8.1.1.1 NRHP-Eligible Archaeological Site: 21GD0248/Goodhue Good View

Site 21GD0248/Goodhue Good View is a precontact lithic scatter on an upland hilltop consisting of 32 artifacts, including debitage, two cores, and a Turin projectile point dating to the late Archaic Period (reference (285)). It was identified by David W. Kluth, Foth & Van Dyke Consultants during a Phase I and II archaeological investigation along Trunk Highway 52 in 2004. The consultants recommended the site be eligible for listing on the NRHP due to its potential to yield information about the Middle Archaic period. However, because the site did not intersect the ROW, no additional work was recommended at that time (reference (285)). This site intersects the route width east of the Rochester substation, in Goodhue County.

9.8.1.1.2 NRHP-Eligible Historic Architecture: XX-RRD-CPS044/ St. Paul and Chicago Railway Company/Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company: River Division Mainline Railroad Corridor Historic District

Resource XX-RRD-CPS044 is the historic River Division Mainline railroad corridor district. The Minnesota route consists of the railroad ROW between Union Depot in St. Paul, MN, and the Mississippi River crossing near La Crescent, MN, and was constructed between 1869 and 1872 by the St. Paul and Chicago Railroad Company. The railroad corridor has been determined eligible for listing on the NRHP under Criterion A, for its significance in the development of transportation and commerce in the nineteenth and twentieth centuries by connecting the Twin Cities region with industrial and commercial centers in Milwaukee and Chicago (reference (284)). This resource intersects Segment 3 in Section 2 of Township 109N, Range 10W.

9.8.2 Potential Impacts

Potential impacts are assessed through identification of documented archaeological and historic resources within one mile of the anticipated alignments. An emphasis is placed on resources within the route width (i.e., the ROI), which could have the most potential impact. The entirety of Segment 3 would be double circuited along the existing transmission line, which would minimize impacts to archaeological resources.

Direct impacts to archaeological and historic architectural resources could result from construction activities, such as ROW clearing, placement of structures, new access roads, temporary construction areas, vehicle and equipment operation, and removal of historic buildings or structures. Additional direct impacts can result from transmission line location and operation, such as placement within view of a resource (typically a historic building, structure, or TCP) that results in a negative effect on the setting, feeling, and/or association of the resource in the viewshed. This issue is particularly applicable when considering cultural resources where the surrounding environment plays an essential role in defining the character.

Within the route width of Segment 3, there are three previously identified archaeological sites that are unevaluated for listing on the NRHP, and one that has been recommended as eligible. The route width also contains one previously identified NRHP-eligible and three unevaluated historic architectural resources. One unrecorded Euroamerican cemetery may intersect the route width (Catholic Cemetery); however, this resource is mapped at the PLS Township level, and the exact location is unknown.

9.8.2.1 Archaeological Sites

Four known archaeological sites intersect the route width of Segment 3, one recommended eligible and three unevaluated for the NRHP. Site 21GD0248/Goodhue Good View site is a precontact artifact scatter surveyed in 2004.

The three unevaluated sites include site 21WHb, which is an alpha site that consists of a precontact burial mound and associated artifact scatter. Burial mounds have the potential to be culturally significant to tribal communities; thus, THPOs, MIAC, and/or tribal community members may have an interest in consultation pertaining to the site. The applicant has therefore been engaged in consultation with THPO and MIAC throughout the project planning process and has committed to continued engagement with these groups. The remaining two unevaluated sites consist of a single precontact lithic flake and a stone ring of an undetermined time period.

The majority of the study area for Segment 3 is of unknown potential for the presence of archaeological sites, according to the Survey Implementation Model (MnModel 4) available on the OSA portal (reference (130)). However, this model shows high potential for sites on uplands along the Mississippi River, an area which has been fairly well-surveyed.

9.8.2.2 Historic Architecture

Of the 11 historic previously documented architectural resources that intersect the route width, one is eligible for listing on the NRHP: XX-RRD-CSP044 (a railroad corridor historic district). This resource is an active railroad and crosses the route width near its eastern terminus along the Mississippi River, at U.S. Highway 65. The project would not affect this resource's functioning as an active railroad, and because the entirety of Segment 3 would employ double-circuiting on the existing transmission line, and the project would not affect the functioning of this resource as an active freight carrying railroad, no impacts to this resource are anticipated.

There are 3 unevaluated resources consisting of two nineteenth and twentieth century farmsteads, and one Bridge (No. 8147) along MN Highway 42. Minimal impacts to the character and setting around these resources are anticipated, as this segment would be double-circuited along the existing transmission line.

9.8.3 Mitigation

As noted in the joint certificate of need application and route permit application, the applicant designed routes to avoid physical impacts to known cultural resources. If a Route Permit is issued, and upon route selection, the applicant would consult with SHPO concerning additional required mitigation measures, and would develop a Phase I Cultural Resource Survey Strategy and associated Cultural Resource Survey Reconnaissance survey to identify unknown cultural resources along the proposed route for areas not previously surveyed. All investigations would be conducted by a professional archaeologist meeting the Secretary of the Interior's Standards for Archaeology as detailed in the Title 36 Code of Federal Regulations, Part 6. SHPO and interested Tribes will be consulted on methodology prior to completing the study.

As noted in Section 7.5.2 of the joint certificate of need application and route permit application, the applicant will develop an Unanticipated Discoveries Plan, which will outline protocol and mitigation measures, should archaeological resources or human remains be encountered during project construction. The plan will include contact information for SHPO officials, environmental inspectors, archaeologists, geologists, and county sheriffs.

The applicant has engaged, and will continue to engage, with THPOs and interested Tribes to share project information and to glean information about resources of tribal significance that may be impacted by the project.

MIAC provided the following comments regarding site 21WBh on October 1, 2024 (reference (286)):

- Consult and work closely with all Tribal nations with interests in this area.
- If no previous archaeological survey has been done, conduct a survey to determine whether the project will impact any unrecorded or disturbed archaeological features or cemetery related features (Please take into consideration impact to site from machinery and staging site needs).
- Monitoring during all earth moving activities within and adjacent to the boundaries of burial site.
- An unanticipated discovery plan should be developed.

MIAC also recommended the following actions prior to and during project construction:

- Monitoring
- Avoidance
- Phase Ia-Literature Review
- Phase I Reconnaissance Survey

9.9 Natural Environment

9.9.1 Air Quality

The ROI for air quality is the project area. Impacts can occur during construction and operation of a transmission line and substation. Potential impacts to air quality during construction would be intermittent, localized, short-term, and minimal. Impacts are associated with fugitive dust and exhaust and can be mitigated. Long-term impacts to air quality would also be minimal and are

associated with the creation of ozone and nitrous oxide emissions along the HVTL and substations. These localized emissions would be below state and federal standards. Impacts are unavoidable and do not affect a unique resource.

9.9.1.1 Existing Conditions

The Clean Air Act is a federal law that regulates air emissions from stationary and mobile sources. The Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to set (NAAQS for six common air pollutants, referred to as "criteria pollutants". The six criteria pollutants are ground-level ozone O_3, PM_{10} and $PM_{2.5}$, SO_2, nitrogen dioxide (NO_2), carbon monoxide (CO), and lead (Pb) (reference (131)). NAAQS are set to address the public health and welfare risks posed by certain widespread air pollutants (references (132); (133)).

The Clean Air Act identifies two classes of NAAQS: primary standards, which are limits set to protect the public health of the most sensitive populations, such as asthmatics, children, and the elderly; and secondary standards, which are limits set to protect public welfare, such as protection against visibility impairment or damage to vegetation, wildlife, and structures. Compliance with the national and state air quality standards in the state of Minnesota is assessed at the county level. Minnesota's state air quality standards align with NAAQS. The EPA designates all counties traversed by Segment 3 to be in attainment for all NAAQS.

In Minnesota, air quality is monitored using stations located throughout the state. The MPCA uses data from these monitoring stations to calculate the Air Quality Index (AQI) on an hourly basis for O_3, $PM_{2.5}$, SO_2, NO_2, and CO. Each day is categorized based on the pollutant with the highest AQI value for a particular hour (reference (134)).

The Rochester air quality monitoring station is in Olmsted County, approximately 10 miles south of Segment 3. The station monitors for O_3 and $PM_{2.5}$. Table 9-12 summarizes the days in each AQI category at the Rochester monitoring station for the most recent five-year period, 2019-- 2023.

Table 9-13 Days in Each Air Quality Index Category - Rochester Monitoring Station

Year	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy
2023	190	160	14	1	0
2022	280	78	1	0	0
2021	275	84	2	0	0
2020	292	73	1	0	0
2019	271	93	0	0	0

Air quality at the Rochester monitoring station has been considered "good" for the majority of the past five reported years. The reporting period 2023 had the largest number of days classified as moderate or worse, with 160 days classified as moderate, 14 days classified as unhealthy for sensitive groups, and one day classified as unhealthy.

9.9.1.2 Potential Impacts

Air emissions during construction would primarily consist of emissions from construction equipment and vehicles and would include pollutants such as CO_2, nitrogen oxides (NO_x), and PM. Dust generated from earth disturbing activities also gives rise to PM_{10}/$PM_{2.5}$. Double-circuiting with an existing transmission line would result in less PM_{10}/$PM_{2.5}$ emissions due to less ground disturbance. Adverse effects on the surrounding environment are expected to be negligible due to the temporary disturbance during construction and the intermittent nature of the emission- and dust-producing construction phases.

During operations, air emissions would not require any air quality permits. Small amounts of emissions would be associated with the intermittent project operation and maintenance activities via mobile combustion and particulate roadway dust generation.

During operation, small amounts of NO_X and O_3 would be created due to corona from the operation of transmission lines. The production rate of O_3 due to corona discharges decreases with humidity and less significantly with temperature. Rain causes an increase in O_3 production. In addition to weather conditions, design of the transmission line also influences the O_3 production rate. The O_3 production rate decreases significantly as the conductor diameter increases and is greatly reduced for bundled conductors over single conductors. Conversely, the production rate of O_3 increases with applied voltage (reference (135)). The emission of O_3 from the operation of a transmission line of the voltages proposed for the project would be minimal.

Emissions would be generated from fuel combustion during routine inspection and maintenance activities. The applicant would perform an annual aerial inspection of the line. Once every four years, crews would visually inspect the lines from the ground. Additionally, vegetation maintenance would generally occur once every four years. Emissions from routine inspection and maintenance activities would be minimal.

9.9.1.3 Mitigation

As noted in the joint certificate of need application and route permit application, if construction activities generate problematic dust levels, the applicant would employ construction-related practices to control fugitive dust as needed. This could include application of water or other commercially available non-chloride dust control agents on unpaved areas subject to frequent vehicle traffic, reducing the speed of vehicular traffic on unpaved roads, and covering open-bodied haul trucks.

As also noted in the route permit application, corona effects would be minimized during operation by using good engineering practices, such as the use of bundled conductors. A corona signifies a loss of electricity, so the applicant would engineer the transmission lines to limit corona.

9.9.2 Climate

The ROI for climate change is the project area. The impact analysis for climate considers existing patterns in the ROI and how the project could be impacted by climate change, as well as how the project could affect climate change. For the counties crossed by Segment 3, flood risk is moderate or major, and fire risk is moderate. The project would minimally contribute to climate change impacts as a result of GHG emissions. The project would be engineered to be resilient under changing climatic factors, including increased average temperatures and changes in precipitation intensities and quantities.

9.9.2.1 Existing Conditions

Climate change is observed as changes in temperature and precipitation patterns, increases in ocean temperatures and sea levels, changes in extreme weather events, and ecosystem changes. These changes are largely attributed to the greenhouse effect. As the amount of greenhouse gases (GHGs) in the Earth's atmosphere increases, the greenhouse effect causes the Earth to become warmer (reference (136)).

There are also naturally occurring climate variations. These are cyclical patterns caused by variations in ocean circulation and atmospheric pressure patterns that occur on timescales of weeks to decades. Increased global surface temperatures could change these natural climate patterns and the resulting impact on regional precipitation and temperature anomalies (reference (137)).

Warmer and wetter conditions have been observed in Minnesota since observations first began in 1895, especially in the past several decades. An increase in precipitation volume and intensity has also been observed, including large-area extreme rainstorms. A rise in temperatures, particularly during the winter season in Minnesota, has been occurring as well. These trends are expected to continue (reference (138)).

To understand how climate change is anticipated to affect the project area, historical and projected climate data is considered, as well as climate hazard projections.

Climate projections are based on the Minnesota dynamically downscaled climate model data that was developed by the University of Minnesota and are summarized in three scenarios: Shared Socioeconomic Pathway (SSP) 245, SSP370, and SSP585. SSP is a measure adopted by the Intergovernmental Panel on Climate Change (IPCC) to represent various greenhouse gas concentration pathways as well as social and economic decisions (reference (139)).

SSP245 represents a "Middle of the Road" scenario where economic, social, and technological trends follow historical patterns, population growth is moderate, and inequality persists. Additionally, SSP245 includes an intermediate emissions scenario, where a net radiative forcing of 4.5 watts per meter squared (W/m^2) is received by the earth due to the greenhouse gas (GHG) effect and emissions begin to decrease around 2040 (reference (139)).

SSP370 represents a “Regional Rivalry” scenario where nations focus on regional issues instead of cross-collaboration and development. SSP370 also includes a high emissions scenario, where a net radiative forcing of 7.0 W/m^2 is received by the earth (reference (139)).

SSP585 represents a “Fossil-fueled Development” scenario where there is increased development in competitive markets driven by an increased global consumption of fossil fuels. SSP585 also includes a very high emissions scenario, where a net radiative forcing of 8.5 W/m^2 is received by the earth and no emissions are reduced through 2100 (reference (139)).

Table 9-14 shows the modeled historical and projected temperature values for the project.

Table 9-14 Modeled Historical and Projected Temperature Trends for the Project

Scenario	Time Period	Average Daily Temperature (°F) – Ensemble Mean	Minimum Daily Temperature (°F) – Ensemble Mean	Maximum Daily Temperature (°F) – Ensemble Mean
Historical	1995-2014	44.9	35.4	57.3
SSP245	2040-2059	48.6 (3.7)	39.2 (3.9)	60.8 (3.5)
SSP245	2060-2079	49.9 (5.0)	40.6 (5.3)	62.0 (4.7)
SSP245	2080-2099	51.6 (6.7)	42.2 (6.8)	63.8 (6.5)
SSP370	2040-2059	50.0 (5.1)	40.2 (4.9)	62.7 (5.4)
SSP370	2060-2079	52.0 (7.2)	42.4 (7.0)	64.6 (7.3)
SSP370	2080-2099	53.9 (9.0)	44.5 (9.1)	66.1 (8.8)
SSP585	2040-2059	49.2 (4.3)	39.8 (4.4)	61.4 (4.1)
SSP585	2060-2079	51.9 (7.0)	42.6 (7.3)	63.9 (6.6)
SSP585	2080-2099	56.2 (11.3)	47.3 (11.9)	67.9 (10.6)

[1]Values in parentheses represent the difference from the modeled historical value.

Table 9-15 shows the model historical and projected precipitation values for the project.

Table 9-15 Modeled Historical and Projected Precipitation Trends for the Project

Scenario	Time Period	Total Annual Precipitation (in) - Ensemble Mean
Historical	1995-2014	35.3
SSP245	2040-2059	37.1 (1.8)
SSP245	2060-2079	36.3 (1.1)
SSP245	2080-2099	34.3 (-1.0)
SSP370	2040-2059	30.0 (-5.3)
SSP370	2060-2079	31.6 (-3.7)
SSP370	2080-2099	34.6 (-0.7)
SSP585	2040-2059	35.3 (0.1)
SSP585	2060-2079	38.6 (3.3)
SSP585	2080-2099	40.6 (5.3)

[1] Values in parentheses represent the difference from the modeled historical value.

The EPA CREAT provides 100-year storm intensity projections to help with planning for water, wastewater, and stormwater utilities (references (140); (141)). A 100-year storm is an event that has a one percent chance of occurring in a given year. The CREAT tool considers two time periods, 2035 and 2060. For each time period, two scenarios are considered, from a 'Not as Stormy' future to a 'Stormy' future. Within the counties traversed by the project, the 2035 time period shows a 1 to 5 percent increase in the 100-year storm intensity for the 'Not as Stormy' scenario, and an 11 to 20 percent increase for the 'Stormy' scenario. The 2060 time period shows a 6 to 10 percent increase in the 100-year storm intensity for the 'Not as Stormy' scenario, and a 26 to 30 percent increase for the 'Stormy' scenario.

The EPA Streamflow Projections Map summarizes general projections related to streamflow under climate change (reference (142)). The EPA Streamflow Projections Map for 2071 to 2100 (RCP 8.5) anticipates a general change in average streamflow of streams within the Segment 3 project area by a ratio of 1.21 to 1.26 (90th percentile) under wetter projections and a ratio of 0.83 (10th percentile) under drier projections when compared to baseline historical flows (1976 to 2005).

The First Street Risk Factor risk assessment and map tool was used to determine a risk assessment for each of the counties traversed by Segment 3 to help identify current and future climate change risks (reference (143)). Table 9-16 summarizes risks for flood, fire, wind, air quality, and heat as defined by Risk Factor (144); (145); (146); (147); (148)).

Table 9-16 Climate Change Risks for Counties Traversed by Segment 3

County	Flood Risk	Fire Risk	Wind Risk	Air Quality Risk	Heat Risk
Goodhue	Moderate	Moderate	Minor	Minor	Minor
Olmsted	Moderate	Moderate	Minor	Minor	Minor
Wabasha	Major	Moderate	Minor	Minor	Minor

Flood risk is moderate or major for all counties. The fire risk is moderate for all counties. The wind risk, air quality risk, and heat risk are all minor for all counties.

9.9.2.2 Potential Impacts

The project would result in GHG emissions that could minimally contribute to climate change impacts such as changes in temperature, precipitation, and extreme weather events. These emissions are discussed in Section 9.9.4. Double-circuiting with an existing transmission line would result in less GHG emissions from land use change. The climate change risks most susceptible to the project include increases in 100-year storm frequencies and soil erosion from increased storm intensities. The project could also be susceptible to more frequent wildfires.

9.9.2.3 Mitigation

The project would be engineered to be resilient under changing climatic factors, including increased average temperatures and changes in precipitation intensities and quantities.

There may be periods of dry weather and concerns of wildfires. However, the transmission lines would be maintained following or exceeding NERC reliability standards that address vegetation management, including the increase of noxious weeds that could occur from changed conditions that allow them to spread. Surface water temperatures could increase in locations where the project requires tree clearing along shorelines, increasing sun exposure. This would be exacerbated by increased temperatures.

9.9.3 Geology and Topography

The ROI for geology and topography is the route width. Structure foundations have the potential to impact bedrock including karst. To minimize impacts, micrositing and structure foundation design would account for the presence of karst if present, the applicant would adhere to temporary dewatering and stormwater runoff regulations as required. Minimal impacts are anticipated to topography along the route width given that original surface contours are regraded and revegetated to the extent feasible.

9.9.3.1 Existing Conditions

Surface geology near Pine Island consists of thick quaternary-aged glacial deposits from the most recent Wisconsin glaciation and includes loamy diamicton and associated outwash of the Browerville Formation. To the east, surface geology is dominated by thin layers of pre-Wisconsin "old tills" and sediment covered bedrock. Clay loam diamicton deposited by pre-Illinoian ice is also present. Colluvium, floodplain alluvium and terrace alluvium are also common (reference (149)). Thickness of the surface deposits varies depending on the location and type of deposit; thickness generally ranges from less than 10 feet to over 300 feet (reference (150)). The project area is underlain by bedrock formed primarily during the Cambrian and Ordovician periods in the Paleozoic Era, and consists of sandstone, siltstone, shale and dolostone (reference (151)).

Karst features are common in southeast Minnesota. Surface karst features include, but are not limited to, sinkholes, caves, stream sinks, and springs. Several karst features, including eleven sinkholes and one spring, are located within the route width (Table 9-17; references (152); (153)).

Table 9-17 Karst Features Within Route Width

Segment	Karst Feature	Karst Feature ID	Map
Segment 3	Sinkhole	79D0000113	Map 49-1
Segment 3	Sinkhole	55D0000769	Map 49-2
Segment 3	Sinkhole	55D0000755	Map 49-2
Segment 3	Sinkhole	55D0000756	Map 49-2
Segment 3	Sinkhole	55D0000757	Map 49-2
Segment 3	Sinkhole	55D0000758	Map 49-2
Segment 3	Sinkhole	55D0000759	Map 49-2
Segment 3	Sinkhole	55D0000760	Map 49-2
Segment 3	Sinkhole	55D0000761	Map 49-2

Segment	Karst Feature	Karst Feature ID	Map
Segment 3	Sinkhole	55D0000762	Map 49-2
Segment 3	Sinkhole	55D0000763	Map 49-2
Segment 3	Spring	MN55:A00127	Map 49-2

Elevation is relatively flat around 1,100 feet AMSL and decreases to about 680 feet AMSL near Kellogg to the Mississippi River.

The project area seismic risk is very low; it is located within an area rated as less than a two-percent chance of damage from natural or human-induced earthquake in 10,000 years (reference (154)).

The type of landslide most common in Minnesota is shallow slope failure triggered by a heavy rain event. This slope failure is generally less than 3 feet deep but can erode the entire length of a slope. Deeper landslides, mudflows, and debris flows are much less common in Minnesota than in more mountainous areas. Less destructive landslides, such as slow-moving earthflows and soil creep, can also occur when soil moisture and shallow groundwater saturate sediments during heaving rain events or snowmelt. Human factors, including inadequate storm water management, undercutting of slopes, placement of artificial fill, and land-use changes, such as urbanization and agricultural practices, can lead to erosion and landslides (reference (155)). The USGS United States Landslide Inventory includes records of landslide activity within the Segment 3 route width, between E County Road 14 and 590th Street in Wabasha County (Figure 9-6; reference (156)).

9.9.3.2 Potential Impacts

Thick glacial deposits on the west near Pine Island thin out towards the east within the "driftless area," where glacial drift deposits are uncommon or absent and bedrock is present just below the ground surface. Construction and operation of transmission line projects can impact geology through temporary, construction-related impacts and/or long-term impacts.

Karst features identified within the route width include eleven sinkholes and one spring. The presence of sinkholes is an indication of active karst. Active karst is a terrain having distinctive landforms and hydrology created primarily from the dissolution of soluble rocks within 50 feet of the land surface. Pollutants being carried by stormwater runoff can pass rapidly through the subsurface into the groundwater, creating a greater risk of groundwater contamination than is found in other soil types (reference (271)).

Impacts to topography, such as the creation of abrupt elevation changes are not expected. Changes in slope are not anticipated during the project, so there would be limited risk of landslides.

Figure 9-6 USGS United States Landslide Inventory: Activity Documented Within Segment 3 Route Width

9.9.3.3 Mitigation

Should grading occur, it would be restricted to establishing a flat, safe workspace. Major topographical changes to the landscape would not occur. Once construction is complete, disturbed areas would be regraded to restore original surface contours and revegetated to the maximum extent feasible.

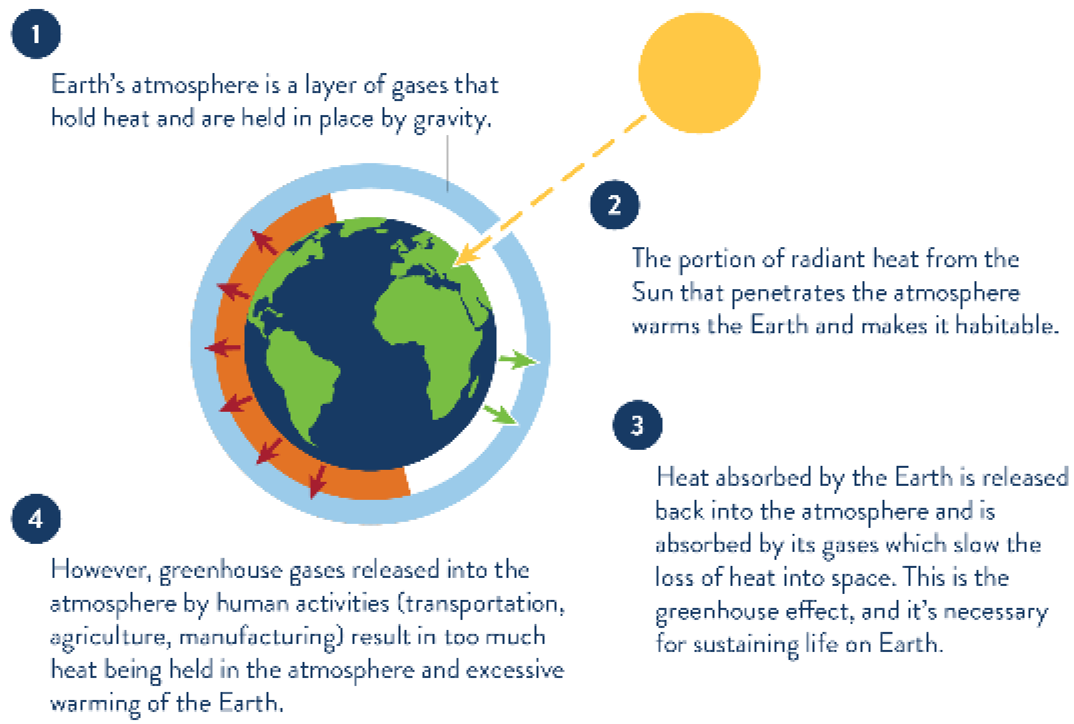
9.9.4 Greenhouse Gases

The ROI for greenhouse gas (GHG) emissions is the ROW. Construction activities would result in short-term increases in GHG emissions because of the combustion of fossil fuels in construction equipment and vehicles. These emissions would be short-term and dispersed over the ROI; therefore, total emissions would be minimal and not result in a direct impact to any one location. Maintenance activities would also cause GHG emissions, but to a much lesser extent. Operational impacts from formation of nitrous oxide and release of sulfur hexafluoride would be minimal. Impacts are unavoidable but can be minimized.

9.9.4.1 Existing Conditions

GHGs are gases that trap heat in the atmosphere. Some of the solar radiation that reaches Earth's surface radiates back toward space as infrared radiation. GHGs trap heat in the atmosphere from the absorption of this infrared radiation, which causes a rise in the temperature of Earth's atmosphere as illustrated in Figure 9-7. This warming process is known as the greenhouse effect (reference (157)).

Figure 9-7 Greenhouse Gases and Earth's Atmosphere



The most common GHGs include carbon CO_2, CH_4, N_2O, and fluorinated gases. GHG emissions are calculated as CO_2e, which is equal to the global warming potential (GWP) for each pollutant multiplied by the potential pollutant emissions. CO_2e normalizes all GHGs emissions to CO_2 for comparability across different pollutants. Human GHG emissions are responsible for about two-thirds of the energy imbalance that is causing Earth's temperature to rise, which has direct and cascading effects on weather and climate patterns, vegetation, agriculture, disease, availability of water, and ecosystems (reference (158)).

Climate change and decarbonization have been discussed for decades at all levels of government, as well as in global, national, and local institutions. The state of Minnesota has established a goal for the reduction of GHG emissions, set forth in Minnesota Statute § 216H.02:

> *It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions by at least the following amounts, compared with the level of emissions in 2005: (1) 15 percent by 2015; (2) 30 percent by 2025; (3) 50 percent by 2030; and (4) to net zero by 2050.*

Minnesota Statute § 216B.1691 Renewable Energy Objectives, which became effective in 2023, requires all electric utilities to generate or procure 100 percent of electricity sold to Minnesota customers from carbon-free sources by 2040, with an interim goal of 80 percent (for public utilities) and 60 percent (for

other electric utilities) carbon-free electricity by 2030. Carbon-free sources are those that generate electricity without emitting CO_2. Electric utilities are also required to generate or procure 55 percent of electricity sold to Minnesota customers from an eligible energy technology by 2035. Eligible energy technology includes technology that generates electricity from solar, wind, and certain hydroelectric, hydrogen, and biomass sources (Minnesota Statute §216B.1691).

9.9.4.2 Potential Impacts

GHG emissions associated with the construction and operation of the project consist of direct emissions generated from combustion sources (for example, mobile on- and off-road sources) and land use change. Double-circuiting with an existing transmission line would result in less GHG emissions from land use change. Indirect emissions associated with the operation of the project include the GHG emissions associated with electrical consumption.

Construction emissions from mobile combustion were calculated for on-road vehicles and off-road construction equipment. Construction emissions from combustion sources are anticipated to be similar for each alternative. Therefore, the total construction combustion emissions and length of the applicant-proposed segments were used to calculate an emission rate per segment length, in metric tons CO_2e/mile, to quantify combustion emissions for each alternative. Construction emissions from temporary land use changes were calculated with an assumed construction duration of 60 days for each land use change area. The calculated emission rate per segment length is 70.86 metric tons CO_2e/mile. GHG emissions calculations are summarized in Appendix L.

Identified GHG emissions associated with operation of the project include direct emissions generated from combustion sources (for example, mobile on- and off-road sources) and land use change, and indirect emissions from electrical consumption. Operational emissions from mobile combustion are anticipated to be similar for each alternative. Therefore, operational emissions from mobile combustion have only been calculated for the applicant-proposed segments. Operational emissions from temporary land use changes were calculated with the assumption that forest land, cropland, and settlement land would be converted to grassland following completion of the project and for the duration of operations. Operational emissions from electrical consumption are assumed to be negligible and have not been calculated.

The Prevention of Significant Deterioration (PSD) is a Clean Air Act permitting program for new or modified major sources of air pollution in attainment areas. It is designed to prevent NAAQS violations, preserve and protect air quality in sensitive areas, and protect public health and welfare (reference (159)). The current threshold for new facilities with operational GHG emissions is 100,000 tons CO_2e per year. Estimated project GHG emissions are below this threshold.

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

routinely because they are largely attributed to faulty equipment and leakage. Equipment containing SF_6 is designed to avoid SF_6 emissions (reference (160)).

9.9.4.3 Mitigation

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

The project would ultimately result in a net decrease of GHG emissions during operation, as it would facilitate the replacement of legacy fossil fuel generation with renewable resources. The project would also increase regional transmission reliability and allow additional carbon-free energy sources to be integrated into the power supply. The project will therefore assist in achieving climate goals.

9.9.5 Groundwater

The ROI for groundwater is the ROW. Potential impacts to groundwater could also occur during construction (specifically installation of foundations) if artesian groundwater conditions are present and the confining layer is breached. Artesian groundwater conditions can be found throughout the state of Minnesota and are not limited to certain areas of geography. Provided the pressurized conditions and extents are identified, understood, and a plan is implemented to manage pressurized groundwater conditions should they be encountered, impacts would be minimized and/or mitigated.

9.9.5.1 Existing Conditions

The DNR divides Minnesota into six groundwater provinces based on bedrock and glacial geology. The aquifers within these provinces occur in two general geologic settings: bedrock and unconsolidated sediments deposited by glaciers, watercourses, and waterbodies. The ROW crosses the Karst Province. Sediment in these provinces is thin or absent and, therefore, not used or relatively unimportant as aquifers, except in major river valleys where sediment thickness is greater. The Karst Province is underlain by productive bedrock aquifers. However, those closest to the land surface are susceptible to impacts by human activities (reference (161)).

Groundwater flow direction in these shallow, unconsolidated sediments is expected to follow surface topography and surface water flow. However, groundwater flow direction could vary depending on factors such as the presence of shallow bedrock, underground utilities, and/or other surficial features. The depth to the water table ranges from less than 10 feet to greater than 50 feet below ground surface along the ROW (reference (162)).

The EPA defines a SSA or principal source aquifer area as:

- One that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer

- Where contamination of the aquifer could create a significant hazard to public health
- Where there are no alternative water sources that could reasonably be expected to replace the water supplied by the aquifer.

There are currently no EPA-designated SSAs along the ROW (reference (163)).Wells are abundant within the project area. The MWI, which is managed by the MDH, provides information about wells and borings such as location, depth, geology, construction, and static water level at the time of construction. According to the MWI, there are no wells within the ROW (reference (164)).

The WHPA program administers the public and non-public community water supply SWP in Minnesota. WHPAs are areas surrounding public water supply wells that contribute groundwater to the well. In these areas, contamination on the land surface or in water can affect the drinking water supply. WHPAs for public and community water-supply wells are delineated based on a zone of capture for 10-year groundwater time-of-travel to the well and are available through a database and mapping layer maintained by MDH (reference (165)). The viewer also includes the DWSMA and DWSMA Vulnerability. DWSMAs are delineated areas within the WHPA and are managed in a wellhead protection plan, usually by a city. According to the MDH database, there are no DWSMAs/WHPAs crossed by ROW.

A Special Well and Boring Construction Area, or well advisory, is a mechanism which provides for controls on the drilling or alteration of public and private water-supply wells, and environmental wells in an area where groundwater contamination has, or might, result in risks to the public health. There are no MDH-designated Special Well and Boring Construction Areas along the ROW (reference (166)).

Flowing wells and borings are drilled holes that encounter an aquifer with sufficient natural pressure to force water above the ground surface, so that water will flow without pumping. Flowing artesian conditions exist when a low permeability confining layer, such as clay or shale, overlies the aquifer. This puts the groundwater under pressure because the material doesn’t permit water to flow through it. When a well or boring is completed, the confining layer is breached, creating a pressure relief valve that allows the water to rise above the top of the aquifer. If the pressure in the aquifer is great enough to force water to rise above the land surface, the well flows. Flowing conditions can also occur in an unconfined aquifer, most often at lower elevations in groundwater discharge areas near rivers, lakes, or other waterbodies. These unique features can be found throughout the state of Minnesota and are not limited to certain areas or geography (reference (167)).

9.9.5.2 Potential Impacts

When an unexpected artesian condition is found, it can have a substantial impact that could compromise the condition and use of the area in which the flow is encountered, and could cause challenges with construction of transmission line tower foundations along the routes. Artesian groundwater conditions, when unintentionally encountered, can cause excavation stability issues and uncontrolled release of groundwater at the ground surface and to surface waters. If uncontrolled, artesian groundwater conditions can be extremely difficult to repair and in some instances are un-repairable. However, subsurface investigations and construction in artesian groundwater conditions can be completed successfully provided the pressurized conditions and extents are identified, understood, and a plan implemented to manage pressurized groundwater conditions should they be encountered.

9.9.5.3 Mitigation

The applicant would assess any wells identified within the ROW during project construction to determine if they are open, and seal them, if necessary, in accordance with MDH requirements.

Indirect impacts to groundwater can be mitigated by avoiding or minimizing impacts to surface waters. Measures to control soil erosion and sedimentation would be implemented during construction activities.

During construction, the applicant would store materials, including fuel and gasoline, in sealed containers to prevent spills, leaks, or other discharges to soil and groundwater in accordance with the SWPPP.

9.9.6 Public and Designated Lands

The ROI for public and designated lands is the ROW. Public and designated lands often involve unique resources intended for protection, preservation and/or recreational use. Public lands (local, state, or federal level) and conservation easements within the ROI are identified and qualitatively assessed for potential impact (e.g., vegetation clearing). Public lands within the ROI include a state forest, one WMA, and a wildlife refuge. No other public lands such as local parks were identified.

9.9.6.1 Existing Conditions

Public lands include those owned at the local, state, and federal levels. No locally-owned (city or county) are present within the ROI.

State public lands within the ROW of Segment 3 includes one WMA and a state forest. The McCarthy Lake WMA is shown on Map 53-16 and the Richard J. Dorer Memorial Hardwood State Forest is shown on Map 53-15. The applicant would have obtained easements with DNR for these crossing locations where needed (some parts of the state forest are privately owned) prior to the installation of the Hampton – La Crosse Project.

Federally-owned public land within the ROW of Segment 3 includes the Upper Mississippi River National Wildlife and Fish Refuge, which is owned by the U.S. Fish and Wildlife Service and shown on Map 53-17. The applicant would have obtained easements with USFWS for this crossing location prior to the installation of the Hampton – La Crosse Project.

Privately held land could also be subject to special designations. The project crosses lands that are part of various conservation easement programs, including the Reinvest in Minnesota (RIM) Reserve program and Conservation Reserve Enhancement Program (CREP). The Minnesota BWSR acquires, on behalf of the state, conservation easements to permanently protect, restore, and manage critical natural resources without owning the land outright. The RIM Reserve program compensates landowners for granting conservation easements and establishing native vegetation habitat on economically marginal, flood-prone, environmentally sensitive, or highly erodible lands (reference (171)).

Segment 3's anticipated alignment crosses RIM land once (Map 53-3) in a location where the project would be double-circuited with an existing 345 kV line.

9.9.6.2 Potential Impacts

Public lands and the lands subject to conservation easement programs aim to establish native and permanent plant species and/or conserve and protect the natural habitat. Permanent clearing of vegetation would impact the function and intent of these areas and potentially have long-term effects to the unique resources. For Segment 3, the clearing of the ROW has already occurred.

9.9.6.3 Mitigation

The sample route permit (Section 5.3.17 of Appendix H) contains the following mitigation related to public and designated lands: "The Permittee shall restore the ROW, temporary workspaces, access roads, abandoned ROW, and other public or private lands affected by construction of the Transmission Facility." The applicant avoided areas with designated easements as practicable and identified these areas as a routing constraint in the joint certificate of need application and route permit application. If easements are crossed, the applicant would work with landowners to determine measures to avoid and minimize impacts on these agricultural resources and to avoid interfering with landowner participation in the CREP or /PWP RIM programs. Additionally, the applicant would continue to coordinate potential easement crossings with BWSR.

9.9.7 Rare and Unique Natural Resources

Rare and unique natural resources include federally and state protected species and sensitive ecological resources. The ROI for protected species is the project area (1 mile), and the ROI for sensitive ecological resources is the route width. Impacts to protected species are evaluated by reviewing documented occurrences of these species within the ROI. Potential impacts to sensitive ecological resources, which could provide suitable habitat for protected species, are evaluated by assessing the presence of these resources within the ROI.

Several state protected species, but no federally protected species, have been documented within the ROI for Segment 3. Potential direct or indirect impacts to protected species could occur should they be present within or near the ROW during construction or maintenance activities. While more mobile species would leave the area for nearby comparable habitats, non-mobile species, such as vascular plants or nesting birds, could be directly impacted. Several sensitive ecological resources, such as native plant communities, intersect the ROI for Segment 3. Construction activities also have the potential for direct impacts to sensitive ecological resources if they are present within the area subject to construction disturbance. Long-term impacts would involve permanent clearing of

vegetation in areas identified as sensitive ecological resources, which could indirectly impact any protected species associated with these habitats.

Several measures could be implemented to avoid, minimize, or mitigate impacts to protected species and sensitive ecological resources, including those provided in the DNR's Natural Heritage Review response (Appendix M**). Some measures are specific to the protected species and their associated habitats and could include rare species surveys to confirm ahead of construction activities or monitoring during construction. Measures to avoid, minimize, or mitigate impacts include, but are not limited to, prudent routing, implementation of BMPs, working in already disturbed areas, and working in frozen ground conditions. The applicant committed to continuing to work with the DNR to minimize and mitigate potential impacts.**

9.9.7.1 Existing Conditions

Federally endangered or threatened species are protected under Section 7 of the ESA of 1973 and are typically evaluated and protected by the USFWS. Data on federal protected species were reviewed using the USFWS IPaC online tool.

At the state level, the evaluation and protection of Minnesota's rare and unique natural resources are overseen by the DNR Division of Ecological and Water Resources through the identification and evaluation of threatened and endangered species and sensitive ecological resources. State endangered or threatened species are protected under the Minnesota Endangered Species Statute (Minnesota Statute § 84.0895).

The DNR Natural Heritage Inventory System (NHIS) database (License Agreement #2022-008) was used to assess the presence of state protected species within the Segment 3 project area. Although the NHIS database does not represent a comprehensive survey, it provides information on the potential presence of protected species. The NHIS is continually updated as new information becomes available and is the most complete source of data on Minnesota's protected species. Although reports or queries might not show records for state-protected species within the vicinity of a project, it does not necessarily mean that they are not present. It could simply mean that the area has not been surveyed or that records have not been reported to the DNR.

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

Map 58 provides an overview of sensitive ecological resources within Segment 3. In order to protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on any maps.

9.9.7.1.1 Federal Protected Species

The USFWS IPaC online tool was queried on January 17, 2025, for a list of federally threatened and endangered species, proposed species, candidate species, and designated critical habitat that may be present within the vicinity of Segment 3 (Appendix M). Segment 3 would not traverse any federally designated critical habitat or proposed critical habitat. The IPaC query identified 12 federal species that could potentially be in the Segment 3 project area, including six endangered species, two threatened species, three proposed endangered or threatened species, and an experimental population, nonessential species. The species identified in the IPaC query and their typical habitats are summarized in Table 9-18.

Table 9-18 Federal Species Potentially Present within Vicinity of Segment 3

Scientific Name	Common Name	Federal Status	State Status	Habitat
Myotis septentrionalis	Northern long-eared bat	Endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Bombus affinis	Rusty Patched bumble bee	Endangered	Watchlist	Areas with consistent flowering vegetation throughout the growing season. Overwinter in upland forests and woodlands.[1]
Lampsilis higginsii	Higgins eye pearlymussel	Endangered	Endangered	Mississippi River and the lower portion of some of its large tributaries.[1]
Plethobasus cyphyus	Sheepnose mussel	Endangered	Endangered	Large rivers.[1]
Cumberlandia monodonta	Spectaclecase mussel	Endangered	Endangered	Large rivers with moderate to swift currents.[1]
Plebejus samuelis	Karner blue butterfly	Endangered	Endangered	Mosaic of oak savanna and sand barrens, where wild blue lupine is common.[1]
Lespedeza leptostachya	Prairie bush clover	Threatened	Threatened	Bedrock outcrop prairie or north-, northeast, or northwest-facing mesic prairie to dry prairie.[1]
Sistrurus catenatus	Eastern rattlesnake	Threatened	Endangered	Marshes, bogs, swamps, old fields, woods, and pastures.[1]
Perimyotis subflavus	Tri-colored bat	Proposed endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Argynnis idalia occidentalis	Western regal fritillary	Proposed threatened	Not listed	Tall grass prairie, wet fields, meadows, marshes.[2]

Scientific Name	Common Name	Federal Status	State Status	Habitat
Danaus plexippus	Monarch butterfly	Proposed threatened	Not listed	Areas with a high number of flowering plants. Presence of milkweed (*Asclepias* spp.) to complete the caterpillar life stage.[3]
Grus americana	Whooping crane	Experimental population, non-essential	Not listed	Wetlands, lakes, ponds, rivers, and agricultural fields.[4]

[1] Habitat information from reference (175)).
[2] Habitat information from reference (176)).
[3] Habitat information from reference (177)).
[4] Habitat information from reference (178)).

Federally proposed threatened or endangered species are species that the USFWS has determined are in danger of extinction throughout all or a significant portion of their range and has proposed a draft rule to list them as threatened or endangered. Proposed species are not protected by the take prohibitions of the federal ESA. A non-essential experimental population is a designation that refers to a population that has been established within its historical range under Section 10(j) of the ESA to aid in recovery of the species. Species designated as non-essential experimental populations are only protected by the federal ESA within a national wildlife refuge or a national park; the route width and ROW of Segment 3 intersects the Upper Mississippi River National Wildlife and Fish Refuge (Map 58-5).

9.9.7.1.2 State Protected Species

The DNR's NHIS database was queried in January 2025 (Barr License Agreement LA-2022-008), to determine if any state endangered, threatened, or special concern species have been documented within 1 mile of Segment 3; the DNR uses a 1 mile buffer as a standard distance to capture the range of species that have already been documented and could be present in a particular area, given presence of suitable habitat. The NHIS database identified records for six state endangered species, 16 state threatened species, and 32 state special concern species within 1 mile of Segment 3. State endangered and threatened species documented in the NHIS database, along with their typical habitats, are summarized in Table 9-19. State special concern species documented in the NHIS database within 1 mile of Segment 3 are summarized in Appendix M. While these species are tracked by the DNR, they are not legally protected under the Minnesota Endangered Species Statute.

Table 9-19 Natural Heritage Information System Database Records of State or Federally Threatened or Endangered Species within 1 Mile of Segment 3

Scientific Name	Common Name	Type	Federal Status[1]	State Status[2]	Habitat[3]	Segment 3		
						ROW	Route width	1 mile
Crystallaria asprella	Crystal darter	Fish	Not listed	END	Medium to large rivers.	X	X	X
Hasteola suaveolens	Sweet-smelling Indian plantain	Vascular plant	Not listed	END	Moist riverbanks, wet meadows along stream courses, and the edge of riparian marshes.			X
Hybopsis amnis	Pallid shiner	Fish	Not listed	END	Medium and large rivers.		X	X
Megalonaias nervosa	Washboard	Mussel	Not listed	END	Large rivers.			X
Reginaia ebenus	Ebonyshell	Mussel	Not listed	END	Large rivers.			X
Tritogonia verrucosa	Pistolgrip	Mussel	Not listed	END	Large rivers.			X
Actinonaias ligamentina	Mucket	Mussel	Not listed	THR	Medium to large rivers.			X
Alasmidonta marginata	Elktoe	Mussel	Not listed	THR	Medium to large rivers.			X
Arnoglossum plantagineum	Tuberous Indian-plantain	Vascular plant	Not listed	THR	Native mesic prairie.	X	X	X
Asclepias amplexicaulis	Clasping milkweed	Vascular plant	Not listed	THR	Dry, sandy and sparsely vegetated soil in savannas and upland prairies.			X
Carex davisii	Davis' sedge	Vascular plant	Not listed	THR	Mature alluvial forests associated with major river valleys of the Mississippi River drainage.			X
Crotalus horridus	Timber rattlesnake	Snake	Not listed	THR	Forested bluffs, south-facing rock outcrops, and bluff prairies.	X	X	X
Ellipsaria lineolate	Butterfly	Mussel	Not listed	THR	Large rivers.	X	X	X
Emydoidea blandingii	Blanding's turtle	Turtle	Not listed	THR	Calm, shallow waters with rich, aquatic vegetation for foraging and adjacent sandy uplands for nesting.	X	X	X

Scientific Name	Common Name	Type	Federal Status[1]	State Status[2]	Habitat[3]	Segment 3		
						ROW	Route width	1 mile
Eurynia dilatate	Spike	Mussel	Not listed	THR	Small to large rivers.			X
Glyptemys insculpta	Wood turtle	Turtle	Not listed	THR	Small to medium fast-moving rivers and streams with adjacent deciduous and coniferous forests.			X
Lasmigona costata	Fluted-shell	Mussel	Not listed	THR	Medium to large rivers.			X
Napaea dioica	Glade mallow	Vascular plant	Not listed	THR	Stream banks, floodplains, and terrace forests in the valleys of small to medium sized streams.			X
Orobanche uniflora	One-flowered broomrape	Vascular plant	Not listed	THR	Woodlands and bluff prairies.			X
Theliderma metanevra	Monkeyface	Mussel	Not listed	THR	In Minnesota, the St. Croix River is the only large river that supports a population of this species.			X
Truncilla donaciformis	Fawnsfoot	Mussel	Not listed	THR	Large rivers.			X
Venustaconcha ellipsiformis	Ellipse	Mussel	Not listed	THR	Headwater reaches of rivers in gravel riffles.			X

[1] "END" = endangered
[2] "THR" = threatened; "WL" = watchlist (tracked by the DNR but not protected at the state level)
[3] Habitat information from reference (175)).

9.9.7.1.3 Sensitive Ecological Resources

The DNR has established several classifications for sensitive ecological resources across the state, many of which are scattered throughout the Segment 3 geographic area (Map 58). Some of these sensitive ecological resources are crossed by the ROI for Segment 3, including Sites of Biodiversity Significance (SBS), native plant communities, and a Lake of Biological Significance.

The DNR maps SBS and assigns a biodiversity significance rank to sites surveyed across the state. These ranks are used to communicate statewide native biological diversity of each site and help to guide conservation and management activities (reference (180)). As shown on Map 58, several SBS intersect the ROI for Segment 3. The DNR assigns biodiversity significance ranks as follows:

- **Outstanding** – best occurrences of the rarest species and native plant communities.
- **High** – good quality occurrences of the rarest species and high-quality examples of native plant communities.
- **Moderate** – occurrences of rare species, moderately disturbed native plant communities.
- **Below** – sites with moderately disturbed native plant communities, but lacking occurrences of rare species).

The DNR identifies and maps areas containing native plant communities across the state. A native plant community is a group of native plants that interact with each other and their environment in ways that have not been greatly altered by modern human activity or introduced organisms (reference (181)). The DNR provides a state conservation status to each native plant community, as follows:

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

As shown on Map 58, several native plant communities intersect the ROI for Segment 3, including the following types and associated state conservation status (or range of statuses if multiple subtypes):

- Calcareous Fen (Southeastern); S1
- Red Oak – White Oak Forest; S3
- Silver Maple – Green Ash – Cottonwood Terrace Forest; S3
- Sedge Meadow; S4 or S5
- Dry Bedrock Bluff Prairie (Southern); S3
- Silver Maple – (Virginia Creeper) Floodplain Forest; S3
- Red Oak – White Oak - (Sugar Maple) Forest; S4

The DNR maps certain waterbodies as Lakes of Biological Significance based on the unique presence of aquatic plants or animals (reference (182)). The DNR assigns biological significance classes (outstanding, high, or moderate) to these waterbodies based on a variety of factors, such as the quality of the lake/habitat and presence of certain plants and animals. As shown on Map 58-5, the ROI for Segment 3 intersects the Mississippi River U.S. Lock and Dam #5, which is a Lake of Biological Significance ranked Outstanding.

State and federal lands that are preserved or managed for wildlife are scattered throughout Segment 3; these areas would also be considered sensitive ecological resources and are discussed in Section 9.9.12.1.

9.9.7.2 Potential Impacts

Project construction and operation have the potential to impact protected species and sensitive ecological resources. Construction-related potential short-term impacts on federally or state protected wildlife species would be similar to those described for non-listed species in Section 9.9.12.2 and could include displacement during construction activities that generate noise, dust, or disturbance of habitat. Ground disturbing activities (e.g., grading), ongoing clearing of vegetation, and construction activities in areas identified as sensitive ecological resources could impact protected species associated with these habitats.

9.9.7.2.1 Federal Protected Species

The species identified in the IPaC query are potentially present within the vicinity of Segment 3, where suitable habitat is present.

The NHIS database does not document the presence of northern long-eared bats, maternity roost trees, or hibernacula within 1 mile of Segment 3. However, suitable forested habitat is present in the route width of Segment 3. Impacts to northern long-eared bats could occur if tree clearing or construction takes place during the bat's active season, when the species are breeding, foraging, or raising pups in forested habitat. Bats could be injured or killed if occupied trees are cleared during the active season, and the species could be disturbed during clearing or construction activities due to noise or human presence.

The NHIS database does not identify any records of tricolored bats within 1 mile of Segment 3; however, forested areas within the route width of Segment 3 could provide suitable habitat for the species. Potential impacts to tricolored bats would be similar to those described for northern long-eared bats.

The NHIS database does not identify any records of Higgins eye, sheepnose, or spectaclecase mussels within 1 mile of Segment 3; however, these species could be present in the Mississippi River, which intersects the eastern extent of Segment 3. However, watercourses would be spanned and appropriate BMPs would be employed; as such, impacts to these mussel species or other aquatic protected species are not anticipated.

The NHIS database does not identify any records of prairie bush clover within 1 mile of Segment 3. No DNR-mapped prairie native plant communities or railroad rights-of-way prairies intersect the ROW.

Although prairie bush clover is unlikely to be present in the ROW, impacts to this species could occur should it or suitable habitat be present in areas undergoing grading or clearing activities associated with project construction.

The NHIS database does not identify any documented records of rusty patched bumble bees within 1 mile of Segment 3. Although the route width of Segment 3 is primarily agricultural, suitable foraging habitat for rusty patched bumble bees is present in non-agricultural areas with flowering plants, and suitable overwintering habitat is present in the forested areas. In addition, as shown on Map 58-4 and Map 58-5, Segment 3 intersects rusty patched bumble bee high potential zone, an area identified by the USFWS where rusty patched bumble bees are likely to be present. Potential impacts to rusty patched bumble bees could occur as a result of ground disturbing activities and/or removal of vegetation that serves as habitat.

The NHIS database does not identify any documented records of eastern rattlesnakes within 1 mile of Segment 3. However, suitable habitat for this species is present within wetland and forested areas within the ROW. Impacts to eastern rattlesnakes could occur should they or suitable habitat be present in areas undergoing grading or clearing activities associated with project construction.

The NHIS database does not identify any documented records of Karner blue butterflies within 1 mile of Segment 3. Suitable oak savanna and sand barrens habitat does not appear to be present within the ROW. Potential impacts to Karner blue butterflies could occur as a result ground disturbing activities and/or removal of vegetation that serves as habitat.

The NHIS database does not track documented records of western regal fritillary. Suitable habitat for western regal fritillary is present in the wet meadows and marshes that intersect the route width or ROW of Segment 3. Potential impacts to western regal fritillary could occur as a result ground disturbing activities and/or removal of vegetation that serves as habitat.

The NHIS database does not track documented records of monarch butterflies. Suitable habitat for monarch butterflies is present in the non-agricultural parts of the Segment 3 route width and ROW. Potential impacts to monarch butterflies could occur as a result ground disturbing activities and/or removal of suitable reproductive (milkweed plants) or feeding (flowering plants) habitat.

Whooping cranes are rare in the state of Minnesota, and the NHIS database does not track documented records of them. Potential impacts to whooping cranes would be similar to those described for other waterfowl/avian species in Section 9.9.12.2. As discussed in Section 9.9.7.1.1, the eastern extent of Segment 3 intersects the Upper Mississippi River National Wildlife and Fish Refuge (Map 58-5) and any whooping cranes documented within the national wildlife refuge would be protected under the federal ESA.

9.9.7.2.2 State Protected Species

The state threatened and endangered species identified in Table 9-19 and special concern species identified in Appendix M are known to occur in the in the vicinity of Segment 3 where suitable habitat is present. The discussion below is focused on potential impacts to state threatened and endangered species; however, impacts to and mitigation measures for special concern species would generally be similar for many species occupying similar habitats.

As noted in Table 9-19, six state endangered or threatened vascular plant species have been documented within 1 mile of Segment 3; if present, these species and/or their habitats could be impacted as a result of grading and/or clearing activities associated with project construction. As indicated in Table 9-19, one of these vascular plant species, tuberous Indian-plantain, was documented within the ROW of Segment 3. Impacts to this vascular plant species or the other endangered or threatened vascular plant species in Table 9-19 could occur should they or suitable habitat for them be present in areas undergoing grading or clearing activities associated with project construction.

Timber rattlesnakes have been documented within the ROW of Segment 3. Potential impacts to timber rattlesnakes could occur during project construction as a result of construction equipment ground disturbing activities in forested bluffs or south-facing rock outcrops.

Blanding's turtles have been documented within the ROW of Segment 3. Potential impacts to Blanding's turtles could occur during project construction as a result of construction equipment and ground disturbing activities in wetland habitat and adjacent sandy upland nesting habitat.

The wood turtle has been documented within 1 mile of Segment 3 but has not been documented within its route width or ROW. Wood turtle habitat generally includes fast moving streams, which would be spanned by Segment 3. However, wood turtles are also found foraging and basking in adjacent forested or agricultural uplands. Potential impacts to wood turtles could occur during project construction as a result of construction equipment and ground disturbing activities should they be present in suitable upland habitat adjacent to streams.

All watercourses would be spanned by Segment 3; as such, direct impacts to the state protected mussel and fish species identified in Table 9-19 are not anticipated.

9.9.7.2.3 Sensitive Ecological Resources

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

Creation of new transmission line rights-of-way or expanding existing rights-of-way through sensitive ecological resources could impact protected species associated with habitats within them. This could occur as a result of habitat conversion or fragmentation, or due to the placement of structures and other infrastructure within them. The route width and ROW of Segment 3 would intersect sensitive ecological resources, as summarized in Table 9-20 and shown on Map 6. However, as discussed in Section 9.4, Route Segment 3 would be double-circuited with existing transmission lines for its entire length, thereby minimizing new impacts to sensitive ecological resources in the area.

The route width of Segment 3 would intersect several SBS and native plant communities and its ROW would intersect these resources while double-circuiting with the existing transmission line. As such, Segment 3 would traverse sensitive ecological resources that have already been fragmented, thereby minimizing the potential for new impacts.

Table 9-20 Sensitive Ecological Resources within the Route Width and ROW of Segment 3

Resource	Units	Segment 3	
		Route width	ROW
Sites of Biodiversity Significance	Outstanding rank (acres)	61	9
	High rank (acres)	112	16
	Moderate rank (acres)	164	19
	Below rank (acres)	154	25
	Total acres	491	69
Native Plant Communities	Conservation Status S1 (community is critically imperiled), S2 (community is imperiled), or S3 (community is vulnerable to extirpation or extinction) (acres)	79	8
	Conservation Status S4 (community is apparently secure) and S5 (community is demonstrably widespread, abundant, and secure) (acres)	64	8
	Total acres (Conservation Status S1-S5)	143	16
Lakes of Biological Significance	Outstanding rank (count)	1	1

The ROW of Segment 3 intersects the Mississippi River U.S. Lock and Dam #5, a Lake of Biological Significance. The anticipated alignment would cross this Lake of Biological Significance but would be double-circuited.

9.9.7.3 Mitigation

Through prudent routing and implementation of BMPs and mitigation measures, impacts to federally or state protected species and sensitive ecological resources can be minimized. The primary means to mitigate potential impacts to federally and state protected species is to avoid routing through habitat used by these species. Additionally, impacts can be mitigated by incorporating species (or species type) specific BMPs in coordination with the USFWS and/or the DNR. The primary means to mitigate impacts to sensitive ecological resources is by avoiding and/or spanning these communities if possible. In addition, double-circuiting and/or paralleling existing rights-of-way would reduce the potential for fragmentation of these resources.

Mitigation and minimization measures for potential impacts to rare and unique natural resources are not standard Commission route permit conditions. However, as noted in Appendix H, there are standard route permit conditions to minimize potential impacts to vegetation and avian species, which would be applicable to minimizing impacts to federal and state protected species and sensitive ecological resources; these are summarized in Section 9.9.10.3 and Section 9.9.12.3, respectively.

As summarized in their route permit application, the applicant has committed to the following measures to minimize the potential for impacts to federal and state protected species and sensitive ecological resources:

- Obtaining available USFWS and DNR rare species databases prior to construction activities to determine locations where the routes and structures are near or adjacent to known locations of listed species.
- Conducting rare species surveys in those areas and similar high-quality habitats preferred by listed species.
- Avoiding impacts to federal- and state-listed species to the maximum extent practicable and coordinating with the appropriate federal and/or state agency in the unlikely event of unavoidable impacts to listed species.
- Continuing to work with the DNR to refine the final alignments and reduce impacts to natural resource sites.
- Potentially incorporating some seasonal restrictions, such as fencing of rare features, and vegetation restoration as applicable.
- Working with the DNR to refine the final alignments and reduce impacts to SBS and native plant communities.
- Implementation of integrated vegetation management plans associated with its existing pollinator initiative, which was created to enhance pollinator habitat.

In their Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR recommended the following to minimize potential impacts to sensitive ecological resources:

- Avoid working in Minnesota Biological Survey and rare (S1-S3) native plant communities.
- As much as possible, operate within already-disturbed areas.
- Retain a buffer between proposed activities and Minnesota Biological Survey Sites.
- Confine construction activities to the opposite side of the road from Minnesota Biological Survey Sites. If this is not feasible, confine construction activities to the existing road rights-of-way.
- Minimize vehicular disturbance in the area (allow only vehicles necessary for the proposed work).
- Do not park equipment or stockpile supplies in the area.
- Do not place spoil within Minnesota Biological Survey Sites or other sensitive areas.

- If possible, conduct the work under frozen ground conditions.
- Inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of invasive species.
- Use effective erosion prevention and sediment control measures.
- Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible.
- Use only weed-free mulches, topsoils, and seed mixes. Of particular concern is birdsfoot trefoil (*Lotus corniculatus*) and crown vetch (*Coronilla varia*), two invasive species that are sold commercially and are problematic in prairies and disturbed open areas, such as roadsides.

In their Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR recommended the following to minimize potential impacts to state-listed species:

- To minimize potential impacts to loggerhead shrike, tree and shrub removal must not occur within potential habitat during the breeding season, April through July. If avoiding tree or shrub removal within potential habitat from April through July is not feasible, a qualified surveyor will need to conduct a survey for active nests before any trees or shrubs will be removed.
- To avoid impacts to Blanding's turtles, the following avoidance measures are required:
    - Avoid wetland and aquatic impacts during hibernation season, between September 15th and April 15th, if the area is suitable for hibernation.
    - Erosion and sediment control should be limited to wildlife friendly erosion control to avoid the inadvertent take of Blanding's turtles.
    - Hydro-mulch products should not contain any materials with synthetic (plastic) fiber additives, as the fibers can re-suspend and flow into waterbodies.
    - Construction areas, especially aquatic or wetland areas, should be thoroughly checked for turtles before the use of heavy equipment or any ground disturbance.
    - Check any holes that have been left unattended for prolonged periods for turtles before being filled.
    - The DNR's Blanding's turtle flyer must be given to all contractors working in the area (reference (183)).
    - Illegal collection is a concern with wood turtles; therefore, no signs that would bring attention to the presence of wood turtles should be posted.
    - Monitoring during construction should be completed, and any sightings should be reported to Reports.NHIS@state.mn.us including date, observer, location, and photograph of the Blanding's turtle.
    - If turtles are in imminent danger, they must be moved by hand out of harm's way, otherwise they are to be left undisturbed. Directions on how to move turtles safely are found in reference (184)).

- To avoid impacting timber rattlesnakes, the following avoidance measures are required:
    - Crews working the area should be advised that if they encounter any snakes, the snakes should not be disturbed.
    - Erosion and sediment control should be limited to wildlife friendly erosion control to avoid the inadvertent take of timber rattlesnakes.
- Timber rattlesnake precautions may include, but are not limited to, the following recommendations:
    - Wear appropriate personal protection equipment, such as thick pants, boots, and leather gloves.
    - Care should be taken around stockpiled materials as snakes may be using these materials for shelter.
    - Sightings should be reported to Reports.NHIS@state.mn.us; including date, observer, location, and photograph of the timber rattlesnake.
- To avoid impacts to aquatic species, stringent erosion prevention and sediment control practices should be maintained throughout the duration of the project to prevent adverse debris and material from impacting downstream populations.
- To avoid impacting state protected plants, all known occurrences of state protected plant species and all potential habitats must be avoided. If this is not feasible, a qualified surveyor will need to (1) resurvey known occurrences and (2) determine if suitable habitat exists within the activity impact area and, if so, conduct a survey prior to any project activities.
- To minimize impacts to northern long-eared bats and other bat species, tree removal should be avoided from June 1 through August 15.

9.9.8 Soils

The ROI for soils is the ROW. Existing soil types and associated qualities are reviewed to better understand the most likely impacts to occur as a result of construction activities. Nearly all soils within the ROI have a moderate or severe rutting hazard rating. Common soil impacts include rutting, compaction, and erosion. Potential impacts would be short-term during construction, localized, and can be minimized. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicant would obtain a NPDES/State Disposal System Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicle trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored in a suitable location. Disturbed areas would be promptly seeded after construction.

9.9.8.1 Existing Conditions

Soil information for Segment 3 was obtained from the USDA-Natural Resource Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database. Map 32 shows the surface soil textures across Segment 3. Soil types within the ROI of Segment 3 were reviewed to identify soil characteristics that could be more prone to impacts in some areas versus others (Table 9-21).

Table 9-21 Segment 3 NRCS Mapped Soils within ROI

Segment ID	Buffer Width (ft.)	Total Acreage	Compaction Prone *Medium or higher rating (acres (%))*	Erosion Hazard *Moderate or higher rating (acres (%))*	Rutting Hazard *Moderate or severe rating (acres (%))*	Hydric Soils[1] *67-99% or 100% (acres (%))*	Revegetation Concerns[2] *NCC class of 3 or greater (acres (%))*
Segment 3	75	789	710 (90%)	635 (80%)	782 (99%)	36 (5%)	149 (19%)

[1] A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil profile. Hydric soils are typically associated with lowlands and wetlands and are rated by their proportion of hydric soil in the map unit.
[2] Soils with a non-irrigated land capability classification of 3 or greater were considered to have low revegetation potential.

Nearly all of the soils within the ROI of Segment 3 have a moderate or severe rutting hazard rating. Ratings in this hazard category indicate the potential of surface rut formation through the operation of heavy, wheeled equipment. Ratings are based on depth to the water table, rock fragments on or below the surface, the classification of the soil material based on the Unified Soil Classification System, depth to a restrictive layer, and slope. A rating of "moderate" indicates that rutting is likely, and "severe" indicates that ruts form readily.

Most of the soils within the ROI of Segment 3 have a medium or higher soil compaction rating. Soil compaction occurs when moist or wet soil particles are pressed together, reducing pore space between them, and is primarily caused by heavy vehicular traffic or permanent structure placement. Soils are rated based on their susceptibility to compaction from the operation of ground-based equipment for planting, harvesting, and site preparation activities when soils are moist. A “medium” rating means that after the initial compaction (that is, the first equipment pass), the soil can support standard equipment with only minimal increases in soil density. A “high” rating means that the soil will continue to compact after each equipment pass.

9.9.8.2 Potential Impacts

Transmission line projects have the potential to impact soils during construction and operation of the project. Construction might require some amount of grading to provide a level surface for safe operation of construction equipment. Localized soil erosion, compaction, and topsoil and subsoil mixing could affect revegetation within temporary work areas.

9.9.8.3 Mitigation

The sample route permit (Section 5.3.8 of Appendix H) includes the following measures to mitigate impacts to soils:

> *"The Permittee shall implement those erosion prevention and sediment control practices recommended by the MPCA Construction Stormwater Program. If construction of the Transmission Facility disturbs more than one acre of land or is sited in an area designated by the MPCA as having potential for impacts to water resources, the Permittee shall obtain a National Pollutant Discharge Elimination System/State Disposal System Construction Stormwater Permit from the MPCA that provides for the development of a Stormwater Pollution Prevention Plan that describes methods to control erosion and runoff.*
>
> *The Permittee shall implement reasonable measures to minimize erosion and sedimentation during construction and shall employ perimeter sediment controls, protect exposed soil by promptly planting, seeding, using erosion control blankets and turf reinforcement mats, stabilizing slopes, protecting storm drain inlets, protecting soil stockpiles, and controlling vehicle tracking. Contours shall be graded as required so that all surfaces provide for proper drainage, blend with the natural terrain, and are left in a condition that will facilitate re-vegetation and prevent erosion. All areas disturbed during construction of the Transmission Facility shall be returned to pre-construction conditions."*

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicant would obtain a NPDES/State Disposal System Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicle trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored in a suitable location. Disturbed areas would be promptly seeded after construction. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

9.9.9 Surface Water

The ROI for surface water is the route width. Impacts to surface waters were assessed by identifying watercourses and waterbodies and considering their proximity to the project and special designations. Segment 3's anticipated alignment crosses watercourses and waterbodies but would be double-circuited with an existing transmission line at the crossing locations. Direct impacts to other resources can cause indirect impacts to surface waters. For example, construction activities near surface waters could cause riparian vegetation disturbance and surface erosion, which can lead to runoff impacting surface waters. In addition to spanning surface water crossings, impacts to surface waters would be mitigated through implementation of the SWPPP, AIMP, and VMP.

9.9.9.1 Existing Conditions

Several federal and state laws regulate watercourses and waterbodies. The Clean Water Act (CWA) establishes the structure for regulating the discharge of materials into waters of the United States and for developing water quality standards for surface waters (U.S. Code [USC]: Chapter 33 § 1311 and 1344). The CWA could potentially regulate several types of activities and their impacts associated with the project.

Watercourses and waterbodies may be regulated under Section 10 of the Rivers and Harbors Act (USC Chapter 33 § 401) and Section 404 of the CWA (USC Chapter 33 § 328.3 and 1344). The Rivers and Harbors Act regulates activities such as excavating, dredging, and altering the course of Section 10 designated waters (USC Chapter 33 § 403). Section 404 of the CWA prohibits discharge of dredged or fill materials without a permit. It provides legal protection to more waterbodies than the Rivers and Harbors Act, namely all jurisdictional waters of the United States, including navigable waters, interstate waters, and wetlands with a significant nexus to navigable waters (USC Chapter 33 § 320). The USACE holds both Section 10 and Section 404 permitting authority.

Activities regulated under either Section 10 or Section 404 must obtain a Section 401 water quality certification to confirm that the project would comply with state water quality standards. Section 401 of the CWA is administered by the United States EPA. The CWA, however, gives the EPA the authority to delegate 401 certification to the states. In Minnesota, the EPA has delegated Section 401 certification to the Minnesota Pollution Control Agency (MPCA).

Section 303(d) of the CWA requires states 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. Waters that do not meet their designated uses because of water quality standard violations are listed as impaired. In Minnesota, the MPCA has jurisdiction over determining 303(d) waters which are described and listed as impaired.

Some watercourses and waterbodies are designated as public waters and are listed in the PWI by the state of Minnesota. The statutory definition of a public water is found in Minnesota Statute § 103G.005, Subdivision 15a (Minnesota Statute §103G.005). These water resources are under the jurisdiction of the DNR, and a DNR license to cross public waters would be required when an activity would cross, change, or diminish the course, current, or cross-section of public waters by any means, including filling, excavating, or placing materials in or on the beds of public waters. PWI watercourse crossings are unavoidable, and the applicant would be required to coordinate with the DNR to obtain licenses to cross.

Minnesota regulates trout streams according to Minnesota Statute § 6264.0050. As provided by Minnesota Rules 6135.1100, subpart 4, item B: Crossings on or under the beds of streams designated by the commissioner of natural resources as trout waters shall be avoided unless there is no feasible alternative. When unavoidable, maximum efforts shall be taken to minimize damage to trout habitat.

Minnesota designates some water resources as Outstanding Resource Value Waters because of their exceptional qualities. Minnesota Statute § 7050.0180 prohibits, or stringently controls, new or expanded discharges from either point or nonpoint sources to outstanding resource value waters.

Segment 3 is in the Minnesota River and Lower Mississippi River Basins and crosses two major watersheds, as delineated by the USGS: Zumbro River (8-digit Hydrologic Unit Code (HUC) 07040004) and Buffalo Whitewater River (8-digit HUC 07040003). According to the WHAF, the mean watershed score for these two major watersheds ranges from 41 to 50 on a 100-point scale (reference (185)). The mean watershed score is the average score of five separate components: hydrology, geomorphology, biology, connectivity, and water quality. At the state scale, mean watershed scores tend to decrease further downstream. Urban watershed degradation is attributed, in part, to impervious surfaces, intensity of water use, and point source pollution (reference (186)).

Map 49 shows the watercourses in the route width of Segment 3. Surface waters in the route width of Segment 3 include rivers and streams (watercourses) and lakes and ponds (waterbodies). Major watercourses within the route width of Segment 3 include, but are not limited to: East Indian Creek, Long Creek, Middle Creek, Mississippi River, Old Channel Zumbro River, Silver Spring Creek, West Indian Creek, Zumbro River, and an unnamed watercourse. A few of these watercourses are designated as public watercourses in the PWI, and a couple are also classified as impaired waters (Map 49). None of the other watercourses crossed by Segment 3 are designated as an Outstanding Resource Value Water. Segment 3 crosses the Mississippi River, which is a Section 10 navigable water (reference (187)). Segment 3 has eight trout stream crossings, which include East Indian Creek, Snake Creek, and an unnamed creek.

Map 49 shows the waterbodies in the route width of Segment 3. The route width of Segment 3 includes waterbodies identified by the NHD, including Zumbro Lake, Pool 5 of the Mississippi River, and an unnamed waterbody. Of these waterbodies, none are designated as trout lakes by the DNR, two are designated as public waters in the PWI, and one is listed as an impaired water.

The DNR Shallow Lakes Program works to protect and enhance wildlife habitat on larger lakes that are dominated by shallow water; these shallow lakes serve as important habitat to wildlife species (reference (188)); designated shallow wildlife lakes are discussed in Section 9.9.12. The DNR maps certain waterbodies as Lakes of Biological Significance based on the unique presence of aquatic plants or animals (reference (182)). Lakes of Biological Significance are discussed in Section 9.9.7.

The route width of Segment 3 includes one 100-year floodplain designated by the FEMA (Map 49). The route width of Segment 3 includes the 100-year floodplain of the Zumbro River, a public watercourse.

9.9.9.2 Potential Impacts

Segment 3 crosses NHD, PWI, and impaired watercourses. The PWI watercourses and impaired streams crossed by the anticipated alignments for Segment 3 include the following:

- **Public Watercourses:** Segment 3 crosses Silver Spring Creek, East Indian Creek, Snake Creek, Gorman Creek, Zumbro River, Mississippi River, and unnamed watercourses.
- **Impaired Watercourses:** Segment 3 crosses Zumbro River and Mississippi River.

Segment 3 crosses PWI, NHD, and impaired waterbodies. The PWI waterbodies crossed by the anticipated alignment for Segment 3 include the following:

- **Public Waterbodies:** Segment 3 crosses Zumbro Lake and Pool 5 of the Mississippi River.
- **Impaired Waterbodies:** Segment 3 crosses Zumbro Lake.

Despite spanning watercourses and waterbodies, indirect impacts associated with crossing these resources could occur during construction. Adjacent soil disturbance could result in short-term water quality impacts due to increased turbidity. Construction impacts could also remove riparian or shoreline forest areas within the ROW that currently assist with water attenuation and decreasing erosion impacts.

9.9.9.3 Mitigation

The sample route permit (Section 5.3.9 of Appendix H) includes the following measures to mitigate impacts to surface water:

- Space and place structures at variable distances to span and avoid watercourses and floodplains.
- Contain soil excavated from riparian areas and not place it back into the riparian area.
- Access riparian areas using the shortest route possible in order to minimize travel and prevent unnecessary impacts.
- Do not place staging or stringing set-up areas within or adjacent to water resources, as practicable.
- Assemble structures on upland areas before they are brought to the site for installation.
- Restore water resource areas disturbed by construction activities to pre-construction conditions in accordance with the requirements of applicable state and federal permits or laws and landowner agreements.
- Meet the USACE, DNR, Minnesota BWSR, and local units of government water resource requirements.

Mitigation measures are anticipated to prevent and minimize impacts to watercourses and waterbodies. The applicant would obtain a NPDES Construction Stormwater permit from the MPCA for construction of the project, which requires development of a SWPPP that identifies BMPs to be used during construction to minimize erosion and sedimentation. Per the stormwater permit, additional BMPs would be required for work near special waters, which include impaired waters and trout streams. Sediment barriers, such as silt fence, straw bales, and bio-logs, would be used along waterways and slopes during construction to minimize soil erosion and sedimentation. The applicant would maintain water and soil conservation practices during construction and operation of the project to protect topsoil and adjacent water resources and minimize soil erosion. If tree removal is required along waterways, trees would be cut, leaving the root systems intact to retain bank stability. Construction would be completed according to NPDES permit requirements and an approved AIMP and VMP.

Impacts would be mitigated by using BMPs. Watercourses would only be crossed by construction equipment where required to support construction activities. Crossing PWI waters would require a DNR license to cross public waters, and work near special or impaired waters would require additional BMPs as detailed in the construction stormwater permit. According to the joint certificate of need application and route permit application, the applicant would work with the DNR to confirm that all proper licenses and approvals are obtained for public water crossings. Further, the joint certificate of need application and route permit application also states that through the licensing process, the applicant would work with the DNR to determine appropriate mitigation measures for these crossings.

9.9.10 Vegetation

The ROI for vegetation is the ROW. Segment 3 is entirely within existing ROW that's vegetation has previously been cleared. Potential short-term impacts, such as compacting or otherwise disturbing vegetation, could occur during construction and maintenance activities. Impacts would be localized, and unavoidable.

Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation including but not limited to implementation of the VMP and AIMP. The applicant committed to working with state and local agencies to coordinate appropriate BMPs for noxious weeds and also committed to implementing integrated vegetation management plans associated with its existing pollinator initiative.

9.9.10.1 Existing Conditions

The DNR and the U.S. Forest Service (USFS) have developed an ECS for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features (reference (10)). The ECS splits the state of Minnesota into Ecological Provinces, Sections, and Subsections.

Segment 3 is within the Eastern Broadleaf Forest Province. The Eastern Broadleaf Forest Province is characterized as a transition zone between semi-arid portions of Minnesota that were historically prairie and semi-humid mixed coniferous-deciduous forests to the northeast (reference (189)). Within this province, Segment 3 would cross the Big Woods and Oak Savanna subsections.

The project would cross the Oak Savanna subsection in Rice and Goodhue Counties. Vegetation in the Oak Savanna subsection consisted of predominantly of bur oak savanna, with areas of tallgrass prairie and maple-basswood forest, before European settlement. Bur oak savanna was found on rolling moraine ridges at the western edge of the subsection and in dissected ravines at the eastern edge. Tallgrass prairie concentrated on gently rolling portions of the landscape, in the center of the subsection. Maple-basswood forest was found in steep, dissected ravines or where stream orientation reduced fire frequency or severity. At present, the subsection is dominated by agricultural vegetation, with urban development accelerating along the northern boundary (reference (12)).

The project would cross the Rochester Plateau subsection in Goodhue, Olmsted, and Wabasha Counties. Prior to European settlement, vegetation in the subsection consisted of tallgrass prairie and bur oak savanna. At present, the Rochester Plateau subsection is heavily farmed, with small areas of characteristic of oak openings and barrens (reference (199)).

The project would cross the Blufflands subsection in Olmsted and Wabasha Counties. Prior to European settlement, vegetation consisted of tallgrass prairie and bur oak savanna on ridge tops and dry upper slopes. On moister slopes, red oak-white oak-shagbark hickory-basswood forests were present, and red oak-basswood-black walnut forests were present in protected valleys. At present, the subsection is a mix of mainly crop, pasture, and woodland (reference (272)).

In general, the vegetation resources across the project are dominated by agricultural vegetation and crops, including grain, soybeans, hay/haylage, sweet corn, corn for silage, green peas, corn for grain, and oats for grain (Section 9.7.1). Map 48 provides an overview of landcover types according to the NLCD, and Table 6-22 summarizes the landcover types within the ROW across Segment 3. The NLCD is derived from Landsat imagery along with various other data sources. As such, it provides only an approximation of existing landcover types.

In Segment 3, there are portions of forested and herbaceous upland and wetland areas, which are mostly concentrated around the Zumbro River crossing and the area leading up to the Mississippi River crossing. Near the Mississippi River, there is the Upper Mississippi River National Wildlife Refuge and the McCarthy Lake State Wildlife Management Area that consist of wetlands and backwaters of the Mississippi River (Map 50). Agricultural land still is the primary landcover of Segment 3 (71 percent). Developed land areas in the segment include rural existing roadways, residential lots, and businesses concentrated around the cities of Pine Island and Oronoco. Wetlands are discussed in Section 9.9.11 and native plant communities and other sensitive ecological resources are discussed in 9.9.7.

Table 9-22 Landcover Types within the ROW of Segment 3

Landcover Type	Segment 3	
Agricultural (cultivated crops and hay/pasture)	560.4 acres	71%
Barren Land (rock/sand/clay)	0.9 acres	<1%
Developed (low-high intensity; open space)	51.0 acres	6%
Forest (upland and wetland)	99.3 acres	13%
Herbaceous (upland and wetland)	69.7 acres	9%
Open Water	6.5 acres	1%
Shrub/Scrub (upland and wetland)	1.0 acres	<1%
Total acres	748.5 acres	

9.9.10.2 Potential Impacts

Construction of the project would result in short-term impacts on existing vegetation, including localized physical disturbance and soil compaction. 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. These impacts to low growing vegetation would be temporary, having the ability to regrow after construction. Vegetation would be permanently removed where structures and foundations would be installed. The ROW would continue to be maintained with low-growing vegetation during operations. The clearing of trees and tall vegetation is required for the construction, maintenance, and safe operation of the project.

Construction and maintenance activities have the potential to result in the introduction or spread of noxious weeds and other non-native species. Noxious weeds, which are regulated under Minnesota Statute 18, can be introduced to new areas through propagating material like roots or seeds transported by contaminated construction equipment. Activities that could potentially lead to the introduction of noxious weeds and other non-native species include ground disturbance that leaves soils exposed for extended periods, introduction of topsoil contaminated with weed seeds, vehicles importing weed seed, and conversion of landscape type, particularly from forested to open settings. Noxious weeds establish more quickly on disturbed soil surfaces than native vegetation and, in turn, displace existing native land cover without proper controls in place.

Segment 3 is double-circuited the entire route and so the forested vegetation within the existing ROW would already be cleared and maintained. These areas of forest have generally already been fragmented. Conversion from forest to open habitats in the ROW could have impacts on native vegetation by altering environmental conditions, such as light penetration; this could alter the vegetation community adjacent to the ROW and increase the potential spread of noxious weeds and other non-native species.

9.9.10.3 Mitigation

Mitigation and minimization measures for potential impacts to vegetation resources are standard Commission route permit conditions (Sections 5.3.10, 5.3.11, 5.3.12, and 5.3.13 of Appendix H) and include the following:

- Minimize number of trees to be removed in selecting the ROW specifically preserving to the maximum extent practicable windbreaks, shelterbelts, living snow fences, and vegetation in areas such as trail and stream crossings where vegetative screening could minimize aesthetic impacts.
- Remove tall growing species located within the transmission line ROW that endanger the safe and reliable operation of the transmission line. Leave undisturbed, to the extent possible, existing low growing species in the ROW or replant such species in ROW to blend the difference between the ROW and adjacent areas, to the extent that the low growing vegetation that will not pose a threat to the transmission line or impede construction.

- Employ BMPs to avoid the potential introduction and spread of invasive species on lands disturbed by construction activities. Develop an Invasive Species Prevention Plan and file with the Commission prior to construction.
- Take all precautions against the spread of noxious weeds during construction. Site appropriate seed certified to be free of noxious weeds should be used, and to the extent possible, native seed mixes should be used.
- Restrict pesticide use to those pesticides and methods of application approved by the Minnesota Department of Agriculture, DNR, and the U.S. EPA. Selective foliage or basal application shall be used when practicable.

As summarized in the route permit application, the applicant has committed to the following measures as the primary means to mitigate impacts to vegetation and minimize the potential for the introduction or spread of noxious weeds and invasive species:

- Limiting vehicle traffic to roads and pathways along the proposed ROW and within previously disturbed areas to the extent practicable
- Restricting equipment to narrow paths within the proposed ROW
- Spanning areas of sensitive vegetation
- Installing the line as a double circuit with an existing transmission line
- Routing parallel or adjacent to existing rights-of-way, such that tree removal is minimized

The applicant committed to working with the state and counties crossed by the project to identify where noxious weeds may be present and develop appropriate BMPs to minimize impacts. The applicant will implement a vegetation management plan to mitigate impacts and restore lands impacted by construction, as provided in the applicant's route permit application. Furthermore, the applicant committed to implementing integrated vegetation management plans associated with its existing pollinator initiative, created to enhance pollinator habitat. The plans minimize chemical use by avoiding broadcast applications and employ spot treatments for control of invasive species.

9.9.11 Wetlands

The ROI for wetlands is the ROW. Impacts to wetlands were evaluated by examining wetland type, size, and potential for spanning. There are wetlands within the ROI of Route Segment 17 (Highway 14 Option), however all of Segment 3 would be constructed where there is already an existing transmission line ROW present. Clearing within forested wetlands would not likely be required for Segment 3.

Localized direct impacts to wetlands would include vegetation clearing, movement of soils, and construction traffic which could alter or impair wetland functions. Forested wetlands would be subject to long-term impacts given their conversion to non-forested wetlands. Wetland crossings longer than 1,000 feet might require one or more structures to be placed in the wetland, resulting in small, localized permanent wetland impacts.

Impacts can be minimized using BMPs. Wetland impacts would be regulated and could require permits. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW, moving the anticipated alignment to a least impactful alignment within the route width, or minimizing clearing required in forested wetlands by selecting a route with an existing ROW where the project would be double-circuited.

9.9.11.1 Existing Conditions

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

Minnesota also has state-level regulations focused on protecting wetlands. The Minnesota WCA (Minnesota Rules 8420) is administered by the BWSR under Minnesota Rules 8420.0100, subpart 3, 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 (1) avoid disturbing the wetland if feasible, (2) minimize wetland impacts, and (3) replace lost wetland acres, functions, and values. Certain activities are exempt from the WCA, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation.

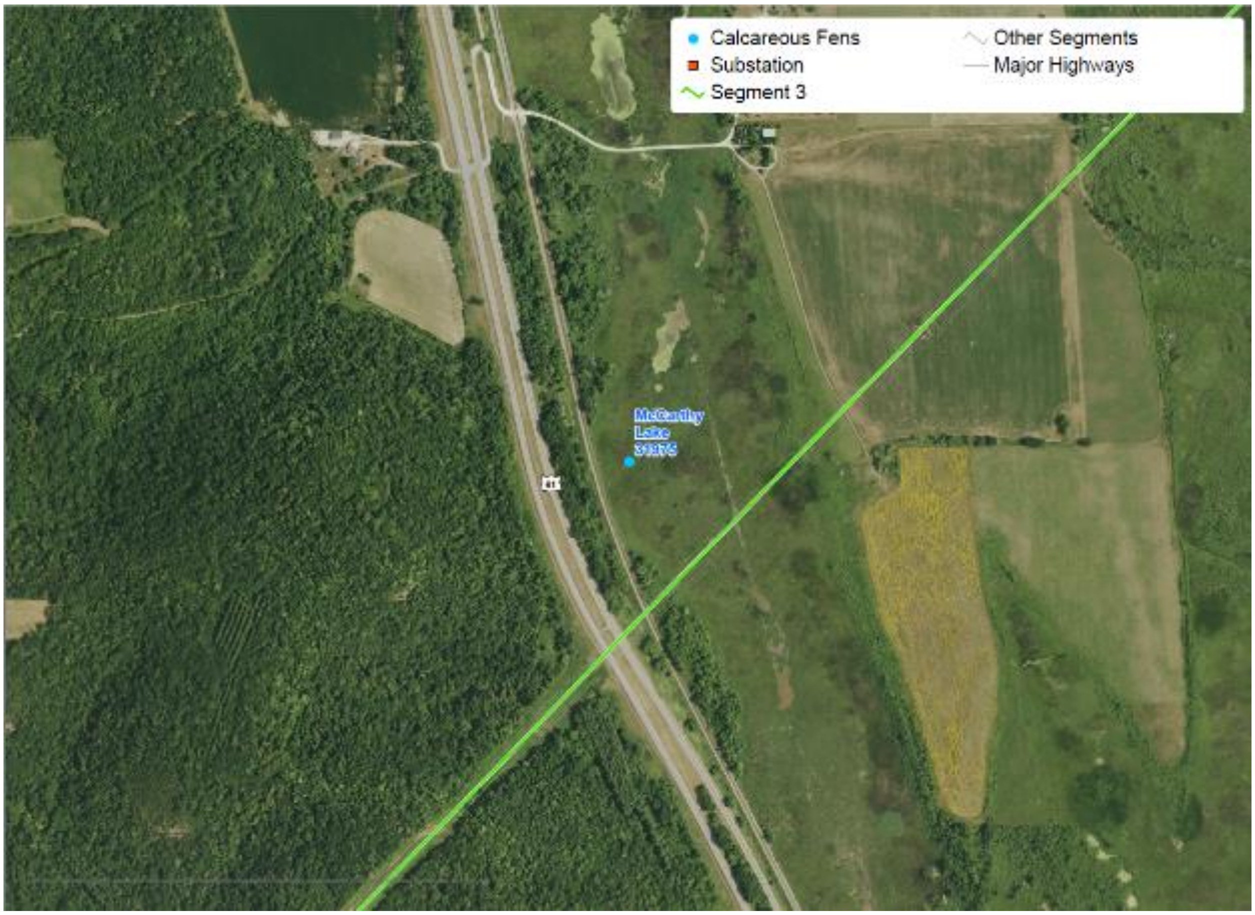
A second state-level program that offers protection to the state's waters and wetlands is the PWI program administered by the DNR (Minnesota Statute § 103G.005). The DNR regulates work below the ordinary high-water level of PWI wetlands and waters through the public waters work permit program. Examples of work activities addressed by this program include filling, excavation, bridges and culverts, dredging, structures, and other construction activities.

Wetlands are areas with hydric (wetland) soils, hydrophytic (water-loving) vegetation, and wetland hydrology (inundated or saturated much of the year). Wetlands detain floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. Wetland types vary widely due to differences in topography, soils, hydrology, vegetation, water chemistry, climate, and other factors.

Calcareous fens are rare and distinctive peat-accumulating wetlands that receive groundwater rich in calcium and other minerals. The Wetlands Conservation Act (WCA), authorized by Minnesota Statute Section 103G.223, states that calcareous fens may not be filled, drained, or otherwise degraded, wholly or partially, by any activity, except as provided for in a management plan approved by the commissioner of the DNR. The DNR regulates calcareous fens under Minnesota Rules 8420.0935.

The USFWS National Wetlands Inventory (NWI), as updated by the DNR, identifies wetland complexes and isolated wetlands within the ROI of Segment 3 (Map 49). Wetland types in Segment 3 generally include seasonally flooded wetlands, wet meadows, shallow marshes, deep marshes, shallow open water, shrub swamps, wooded swamps, and riverine wetlands. As shown on Map 49, wetlands in the route width are mostly non-forested. Segment 3's ROI does not include PWI wetlands. One calcareous fen (McCarthy Lake site) is located approximately 650 feet northwest of Segment 3 (Figure 9-8) (reference (190)).

Figure 9-8 Location of McCarthy Lake Calcareous Fen



9.9.11.2 Potential Impacts

The ROW of Segment 3 includes approximately 58 acres of wetlands. Given that 100 percent of Segment 3 would be double-circuited with existing transmission lines, forested wetlands within the existing ROW have already been cleared. Access through wetland areas could be required in order to string the second circuit on the existing line for Segment 3. BMPs would be used and appropriate permits would be obtained, as needed, for the temporary impacts.

In its Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR noted that many of the unique characteristics of calcareous fens result from the upwelling of groundwater through calcareous substrates. Because of this dependence on groundwater hydrology, calcareous fens can be affected by nearby activities or even those several miles away. Activities that affect surface water flows (e.g., stormwater flow, erosion) or activities that affect groundwater hydrology (e.g., groundwater pumping, contamination, discharge, or excavation) can impact calcareous fens.

9.9.11.3 Mitigation

Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width.

The sample route permit (Section 5.3.9 of Appendix H) includes the following measures to mitigate impacts to wetlands:

- Develop wetland impact avoidance measures and implement them during construction of the project.
- Space and place the structures at variable distances to span and avoid wetlands.
- Limit unavoidable wetland impacts as a result of the placement of structures to the immediate area around the structures.
- Construct in wetland areas during frozen ground conditions where practicable and according to permit requirements by the applicable permitting authority.
- Use wooden or composite mats to protect wetland vegetation when construction during winter is not possible.
- Contain soil excavated from the wetlands and not place it back into the wetland.
- Access wetlands using the shortest route possible in order to minimize travel through wetland areas and prevent unnecessary impacts.
- Do not place staging or stringing set-up areas within or adjacent to wetlands, as practicable.
- Assemble structures on upland areas before they are brought to the site for installation.
- Restore wetland areas disturbed by construction activities to pre-construction conditions in accordance with the requirements of applicable state and federal permits or laws and landowner agreements.
- Meet the USACE, DNR, Minnesota BWSR, and local units of government wetland requirements.

In order to avoid impacting or altering the McCarthy Lake fen, the applicant could obtain a no effect concurrence decision from the DNR prior to construction, given Segment 3 proximity within 5 miles of the fen. If the DNR determines the no effect concurrence to be required, the applicant would need to demonstrate that any temporary or permanent disturbance from any project-related activities, including dewatering (amount, timing, and duration), is avoided. In their Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the

DNR noted to ensure compliance with WCA, the applicant would be required to contact the Calcareous Fen Program Coordinator for further coordination. If, through further coordination, the DNR determines if any impacts to the fen would occur during any phase of the project, the applicant could be required to develop a Calcareous Fen Management Plan in coordination with the DNR, as specified in Minnesota Statute § 103G.223. A special condition could be added to the route permit to direct the applicant to coordinate with DNR to ensure an appropriate plan and protections are in place.

9.9.12 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width. Impacts to wildlife and wildlife habitat are assessed both by considering wildlife inhabiting the ROI as well as assessing the presence of potential habitat for wildlife within the ROI.

9.9.12.1 Existing Conditions

Wildlife inhabiting the ROI are typical of those found in disturbed habitats associated with agriculture and rural and suburban development. Watercourses and waterbodies, and areas of natural vegetation, such as wetlands, forested areas, and open herbaceous areas also provide habitat for wildlife in the area. Wildlife species inhabiting the ROI are generally adapted to disturbance associated with agricultural activities and human settlement. Typical species include mammals such as deer, fox, squirrels, coyote, and racoons; songbirds, such as robins and red-winged blackbirds; waterfowl, such as eagles and wood ducks; reptiles, such as snakes and turtles; amphibians, such as toads and frogs; and aquatic biota such as fish and mussels.

The state of Minnesota is in the Mississippi Flyway of North America. The Mississippi Flyway is a bird migration route that encompasses the Great Plains of the U.S. and Canada. Migratory birds use portions of the Mississippi Flyway as resting grounds during spring and fall migration, as well as breeding and nesting grounds throughout the summer. Suitable habitat for migratory birds is present throughout Segment 3.

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

Minnesota is home to over 2,000 known native wildlife species and over 300 of these species have been identified as Species in Greatest Conservation Need (SGCN) because they are rare, their populations are declining, or they face serious threats that can cause them to decline, and thus have populations below levels desirable to promote their long-term health and stability. Minnesota's Wildlife Action Plan 2015-2025 includes a habitat approach, which focuses on sustaining and enhancing terrestrial and aquatic habitats for SGCN in the context of the larger landscapes (reference (191)). The Wildlife Action Plan lays out the basis for the long-term vision of a Wildlife Action Network composed of terrestrial and aquatic habitat cores and ROWs to support biological diversity and ecosystem resilience with a focus on SGCN. As shown on Map 60, several Wildlife Action Network corridors are scattered throughout Segment 3, with a higher concentration near the Mississippi River, which is the eastern extent of Segment 3. The Wildlife Action Network is a metric that can be used to assess buffers and connectors of habitats representing the diversity of habitat quality, supporting SGCN. As detailed by the DNR, “Consideration should be given to projects or activities that could result in the loss, degradation, or fragmentation of habitat within the Wildlife Action Network, as habitat loss was identified as a substantial contributor to SGCN population declines” declines” (reference (191)).

Several lands that are preserved or managed for wildlife and associated habitat are scattered throughout Segment 3, including USFWS National Wildlife Refuge, a National Audubon Society Important Bird Area (IBA), and a DNR Wildlife Management Area; these areas are all in the eastern extent of Segment 3 (Map 60).

The USFWS designates public lands for the conservation and management of wildlife (reference (56)).). The Upper Mississippi River National Wildlife and Fish Refuge intersects the eastern extent of Segment 3 (Map 60).

The National Audubon Society works to identify, monitor, and protect habitat for bird species throughout the U.S., in part by designating sites as IBAs; these areas are designated when they meet certain criteria related to providing habitat for vulnerable species (reference (194)). The Upper Mississippi National Wildlife Refuge IBA intersects the ROI of Segment 3 (Map 60-5).

The DNR manages over one million acres of land as WMAs to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses (reference (192)) The McCarthy Lake WMA intersects the ROI for Segment 3 (Map 60-5).

There are over 5,000 shallow lakes that are greater than 50 acres in size in the state of Minnesota; these shallow lakes serve as important habitat to wildlife species (reference (188)). Mississippi River U.S. Lock and Dam Pool 5 is categorized as a shallow lake but is not a DNR-designated shallow wildlife lake. The DNR Shallow Lakes Program designates certain shallow lakes as shallow wildlife lakes; this designation allows them to protect and enhance wildlife habitat on these larger lakes (reference (196)).

In addition to the lands that are preserved or managed for wildlife, there are several sensitive ecological resources, such as native plant communities, that would also provide habitat for wildlife; these resources are discussed in Section 9.9.7.1.3.

9.9.12.2 Potential Impacts

9.9.12.2.1 General Wildlife Impacts

Construction activities that generate noise, dust, or disturbance of habitat could result in short-term, indirect impacts on wildlife. During project construction, wildlife would generally be displaced within and adjacent to the ROW. Heavy equipment could also affect birds’ eggs or nestlings and small mammals that might be unable to avoid equipment. Many wildlife species would likely avoid the immediate area during construction and possibly not return following construction; the distance that animals would be displaced depends on the species and the tolerance level of each animal. However, comparable habitat is available adjacent to the project.

Construction of the project could result in long-term adverse impacts on wildlife due to loss, conversion, or fragmentation of habitat, particularly areas that are preserved and/or managed for wildlife. The route width and ROW of Segment 3 intersect areas preserved or managed for wildlife, as summarized in Table 9-23 and shown on Map 60.

As discussed in Section 9.4, all of Segment 3 would be double-circuited with existing an transmission line. As such, impacts to wildlife and associated habitat, including the wildlife areas summarized in Table 9-23, would be minimized because habitat fragmentation has already occurred in these areas.

Table 9-23 Wildlife Resources within the Route Width and ROW of Segment 3

Resource	Units	Segment 3	
		Route width	ROW
USFWS National Wildlife and Fish Refuge	Acres	68	10
Important Bird Areas	Acres	453	69
Wildlife Management Area	Acres	189	26
Wildlife Action Network corridors	High or medium-high rank (acres)	406	61
	Medium rank (acres)	187	28
	Low or medium-low rank (acres)	216	30
	Total acres	808	119

9.9.12.2.2 Avian Impacts

Potential impacts to avian species (for example, songbirds, raptors, and waterfowl) could occur due to electrocution and collision with transmission line conductors. Electrocution occurs when an arc is created by contact between a bird and energized lines or an energized line and grounded structure equipment. Electrocution occurs more frequently with larger bird species, such as hawks, because they have wider wingspans that are more likely to create contact with the conductors.

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

As discussed above, impacts to wildlife and associated habitat would be minimized by double-circuiting with existing transmission lines. However, the incidence of birds colliding with transmission lines is influenced by the number of horizontal planes in which the conductors are strung. Stringing the conductors in a single horizontal plane presents less of a barrier to birds crossing the transmission line ROW. The proposed double-circuiting for Segment 3 would require adding another horizontal plane to the transmission line, which could increase potential impacts to avian species.

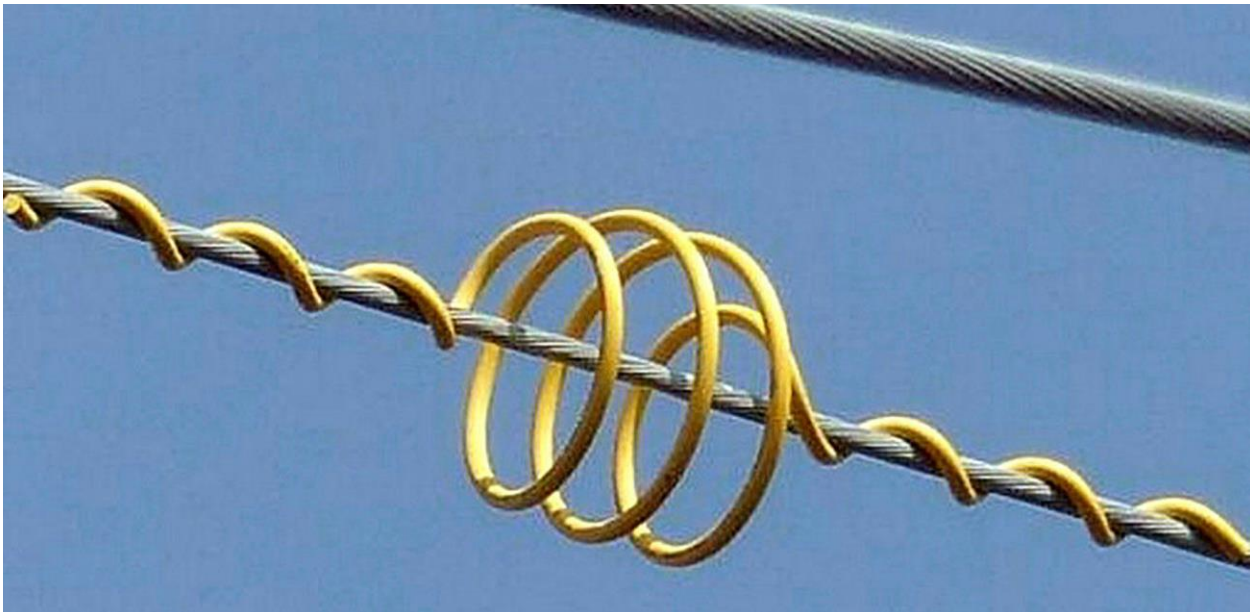
9.9.12.3 Mitigation

Potential impacts to wildlife and wildlife habitat can often be minimized or mitigated through several strategies. The primary strategy for mitigating impacts is to select route alternatives away from areas known to contain high-quality habitat or which serve as migratory corridors. Use of existing rights-of-way can minimize habitat loss and fragmentation. Impacts to wildlife can also be minimized by spanning habitats and minimizing the number of structures in high-quality habitat through the use of specialty structures.

Mitigation and minimization measures for potential impacts to avian species, including federally and/or state protected avian species are standard Commission route permit conditions. As noted in Appendix H, as part of the Commission's route permit, the applicant, in cooperation with the DNR, would need to identify areas of the transmission line where bird flight diverters would be incorporated into the transmission line design to prevent large avian collisions attributed to visibility issues. A typical bird flight diverter installation is shown Figure 9-9. In addition, standard transmission design would need to incorporate adequate spacing of conductors and grounding devices in accordance with Avian Power Line Interaction Committee standards to eliminate the risk of electrocution to raptors with larger wingspans that could simultaneously come in contact with a conductor and grounding devices.

As discussed in Section 9.9.10.3, there are several standard Commission route permit conditions to mitigate or minimize potential impacts to vegetation resources; these standard route permit conditions would also be applicable to mitigating and minimizing potential impacts to wildlife habitat.

Figure 9-9 Typical Bird Flight Diverter



As summarized in its route permit application, the applicant has committed to the following measures to minimize the potential for impacts to wildlife and wildlife habitat:

- Designing the route to avoid wildlife habitat identified to the extent possible during a constraints analysis completed during the routing process.
- Implementation of specific BMPs for protected species that would also be beneficial to wildlife in general; these are discussed in Section 9.9.7.3.
- Coordinating with the DNR and/or USFWS to identify wildlife migration pathways, particularly avian flyways crossed by the route alternatives and to identify areas where transmission lines should be marked to minimize avian interactions.

Currently, the state of Minnesota does not track locations of bald eagles or their nests, and the USFWS does not have any public data available on eagle nests. The DNR is in the process of developing a database of eagle nest locations; however, it is not currently available. The DNR suggests reporting any eagle sightings on eBird (https://ebird.org/home); these reports will ultimately become part of the DNR's eagle database.

The USFWS bald eagle management guidelines indicate that activities within 660 feet of an active nest and occur within line of sight of the nesting location might have the potential to disturb nesting bald eagles (reference (198)). Impacts to bald eagles could be minimized by conducting a visual inspection for bald eagle nests not more than two weeks prior to the start of construction, if work will occur during the active nesting period for bald eagles (January 15th – July 31st). If an active nest is observed and if construction would need to take place during the time that the nest remains active, consultation with the USFWS would need to occur to determine the appropriate next steps. Under such a circumstance, a variety of options are available, including the presence of a biological monitor to observe and determine if project activities are resulting in disturbance, a shift in project schedule to avoid the active nesting season, or a submittal for an incidental take permit that would allow work to proceed even if it is likely to result in disturbance.

As summarized in their joint certificate of need application and route permit application, the applicant has committed to continuing coordination with the USFWS regarding the 2024 revised regulations for the issuance of permits for eagle incidental take and eagle nest take (Permits for Incidental Take of Eagles and Eagle Nests, 50 Code of Federal Regulations CFR, Parts 13 and 22, 2024).

9.10 Electric System Reliability

In the joint certificate of need application and route permit application, the applicant summarized MISO's reliability analysis findings and noted that the applicant completed their own examination of system reliability improvements yielded by the project. Reliability analyses studied all NERC contingency categories (P1-P7). These analyses support the purpose and need of the project.

The purpose of the project, as also discussed in Section 4.1, is to construct an HVTL to provide additional transmission capacity to reduce congestion and to improve electric system reliability throughout the region as more renewable energy resources are added to the high-voltage transmission system. The project would provide additional transmission capacity that is needed to mitigate current capacity issues and, as part of the LRTP Tranche 1 Portfolio, would address reliability violations as defined by the NERC at over 300 different sites across the Midwest. The project would increase transfer capability across the MISO Midwest subregion to allow reliability to be maintained for all hours under varying dispatch patterns driven by differences in weather conditions.

The joint certificate of need application and route permit application discussed that the existing 230 kV transmission system in eastern North Dakota and South Dakota plays a key role in transporting and delivering energy to customers in Minnesota, but the existing 230 kV system is currently at its capacity. The project, as part of LRTP Tranche 1, would provide a new 345 kV transmission line, which is designed to provide additional transmission capacity to mitigate current capacity issues on the existing 230 kV transmission system and to improve electric system reliability as more renewable energy resources are added throughout the region.

The applicant designed the project with the intent of meeting the project's electric system reliability needs. Reliability was also considered by the applicant in their alternatives analysis.

9.11 Costs that are Dependent on Design and Route

The applicant's overall project costs, as presented in the joint certificate of need application and route permit application and discussed in Section 3.5, are based on high and low-cost estimates of the project as a whole, and do not distinguish between the individual route segments and alternatives. The transmission line is expected to cost approximately $3.7 million per mile, but Segment 3 is anticipated to cost less per mile because the structures are already in place, and vegetation clearing within the existing

ROW has already been completed. The estimated project construction cost at the time of the application was between \$524.7 million and \$577.2 million. Also, as discussed in Section 3.5, since the filing of the joint certificate of need application and route permit application, the applicant has updated this range of project costs to include alternatives, and the updated estimated cost is between \$436.8 million and \$583.8 million.

Construction cost estimates rely on the best available information at the time of the estimate. Estimates include (1) transmission line structures and materials; (2) transmission line construction and restoration; (3) transmission line and substation permitting and design; (4) transmission line ROW acquisition; and (5) substation materials, substation land acquisition, and construction. The cost estimates assume the applicant would pay prevailing wages for applicable positions during project construction.

The following variables were considered when estimating project costs:

- Unexpected weather conditions
- Environmental sensitivities resulting in the need for mitigation measures
- Poor soil conditions in areas where no data was obtained
- Transmission line outage constraints
- Potential shallow bedrock
- River crossings
- Labor shortages
- Market fluctuations in material pricing and availability
- Labor costs

These cost estimates could increase over time for any number of reasons such as, but not limited to escalation, inflation and commodity pricing, especially for these types of large-scale 345 kV transmission projects that have multi-year schedules.

9.12 Segment 3 Application of Routing Factors

The Commission is charged with locating transmission lines in a manner that is “compatible with environmental preservation and the efficient use of resources” and that minimizes “adverse human and environmental impact(s)” while ensuring electric power reliability per Minnesota Statute § 216E.02. Minnesota Statute §216E.03, subdivision 7(b) identifies considerations that the Commission must consider when designating transmission lines routes. These considerations are further clarified and expanded by Minnesota Rule 7850.4100, which identifies the following 14 factors the Commission must consider when making a transmission line route permit decision:

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

C. effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining;
D. effects on archaeological and historic resources;
E. effects on the natural environment, including effects on air and water quality resources and flora and fauna;
F. effects on rare and unique natural resources;
G. application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity
H. use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries;
I. use of existing large electric power generating plant sites;
J. use of existing transportation, pipeline, and electrical transmission systems or rights-of-way;
K. electrical system reliability;
L. costs of constructing, operating, and maintaining the facility which are dependent on design and route;
M. adverse human and natural environmental effects which cannot be avoided; and
N. irreversible and irretrievable commitments of resources.

This section discusses Segment 3 and its merits relative to the factors in Minnesota Rule 7850.4100 for routing high-voltage transmission lines. Through an analysis of the routing factors, this section summarizes and discusses the potential impacts of Segment 3, as summarized in Table 9-25.

Some elements of resource categories that are considered to have minimal impacts that might not vary significantly and/or the routing factors are not applicable. These include:

- Impacts on human settlements (factor A)— cultural values, environmental justice, noise, property values, socioeconomics, transportation, and public services.
- Impacts on public health and safety (factor B)—EMF, implantable medical devices, stray voltage, public and worker safety, stray voltage, induced voltage, and electronic interference.
- Impacts on the natural environment (factor E) – air quality, climate, geology and topography, floodplains, groundwater, and soils.
- Maximizing energy efficiencies and accommodating expansion of transmission capacity (factor G)
- with respect to environmental impacts, the examination of such impacts suggested by routing factor G is included in the discussion of other routing factors and elements that more specifically address an environmental impact (for example, effects on vegetation and wildlife, routing factor E, or rare and unique natural resources, routing factor F).

Routing factor I, the use of existing large electric power generating plant sites, is not relevant to this project and is not discussed further.

Routing factors M and N— the unavoidable and irreversible impacts of the project—are discussed in Chapter 12.

Table 9-24 Guide to Relative Merits Analysis

Consistency with Routing Factor or Anticipated Impacts	Symbol
Minimal: Impacts are anticipated to be minimal with mitigation – OR – route option is very consistent with this routing factor.	
Moderate: Impacts are anticipated to be minimal to moderate with mitigation; special permit conditions may be required for mitigation – OR – the route may not be the least impactful with respect to the routing factor.	
Significant: Impacts are anticipated to be moderate to significant and likely unable to be mitigated – OR – route alternative is not consistent with the routing factor or consistent only in part. Indicates that the route is impactful with respect to the routing factor.	

Table 9-25 Segment 3 Summary of the Routing Factors

Routing Factor / Resource	Segment 3	Summary
Aesthetics	●	Aesthetic impacts are anticipated to be minimal for Segment 3 because it would be double-circuited on existing structures, as previously permitted.
Displacement	●	Segment 3 does not contain any residences or non-residential structures within ROW, no displacement would occur.
Land Use and Zoning	●	The existing land use (i.e., a transmission line) would remain the same; no impacts are anticipated.
Recreation	●	The Snake Creek Management Unit Trails and Snake Creek Trail are within the route width of Segment 3. The existing transmission line crosses the trail in multiple locations. Segment 3 crosses Zumbro River and Mississippi River, which are designated state water trails and wild and scenic rivers. Segment 3 crosses the Great River Road, a scenic byway that follows the Mississippi River. Segment 3 crosses the Richard J. Dorer Memorial Hardwood State Forest for approximately 2.0 miles.
Agriculture	●	Segment 3 would occur within existing ROW and no new impacts to agriculture would be anticipated during operation. Temporary impacts during construction could occur.
Forestry	●	Segment 3 crosses the Richard J. Dorer Memorial Hardwood State Forest for approximately 2.0 miles within the existing ROW. The ROW of Segment 3 has previously been cleared, and therefore, the usage of Segment 3 would result in continued permanent loss of forestry resources. No new loss of forestry resources is anticipated.
Mining	●	No active gravel pits were identified within Segment 3's route width; therefore, no impacts are anticipated.
Tourism	●	Known events and other opportunities for tourism are advertised in nearby incorporated towns and the activities are not located within the ROI. Recreational opportunities identified within the ROI include publicly accessible lands and waters used for outdoor activities. Impacts to the tourism-based economy are anticipated to be negligible to minimal.

Routing Factor / Resource	Segment 3	Summary
Archaeological	●	Segment 3's route width contains one previously documented NRHP-eligible archaeological site, and three unevaluated sites for the NRHP. Segment 3's route width contains one potential historic cemetery; however, the exact location is unknown. Survey efforts would be completed by the applicant and would inform potential impacts; impacts could be avoided and/or mitigated.
Historic	●	Segment 3's route width has one previously identified NRHP-eligible historic architectural resource and three unevaluated historic architectural resources. Survey efforts would be completed by the applicant and would inform potential impacts; impacts could be avoided and/or mitigated.
Public and Designated Lands	●	Segment 3 would be within existing ROW where easements to occupy public and designated lands would have already been obtained. Easements for temporary workspaces outside the permanent easements could be required.
Surface Water	●	Segment 3 crosses numerous watercourses and waterbodies but the structures are already present and span these features.
Vegetation	●	The ROW of Segment 3 is already maintained free of woody vegetation. Additional impacts to vegetation could occur as a result of construction activities and heavy equipment.
Wetlands	●	Wetlands within Segment 3's ROW are mostly non-forested; 10 acres are forested wetlands. Temporary impacts for access could occur to wetlands; impacts could be minimized by using BMPs.
Wildlife and Wildlife Habitat	●	The ROW of Segment 3 would intersect a USFWS National Wildlife Refuge, an Important Bird Area, a Wildlife Management Area, and Wildlife Action Network corridors. Segment 3 would double-circuit with an existing transmission line for its entire length; as such, these wildlife resources have already been fragmented. The proposed double-circuiting for Segment 3 would require adding another horizontal plane to the transmission line, which could increase potential impacts to avian species.
Rare and Unique Natural Resources	●	Potential impacts to federal or state protected species could occur should they be present in the ROW during construction or maintenance activities. However, given Segment 3 would be double-circuited with an existing transmission line in a routinely maintained ROW, federal or state protected species are not likely to be present. The ROW of Segment 3 would intersect several SBS, native plant communities, and a Lake of Biological Significance. However, the sensitive ecological resources are already traversed by the existing transmission line ROW and new impacts are not anticipated given the proposed double-circuiting.
Paralleling Existing Transmission Line	●	Segment 3 would be double-circuited within existing 345 kV transmission line for 43.4 miles which is 100% of its length.
Paralleling Roads and Railroads	●	Segment 3 would parallel roads for 3.5 miles which is 8% of its length.

Routing Factor / Resource	Segment 3	Summary
Paralleling existing survey lines, natural division lines, and agricultural field boundaries	●	Segment 3 would follow existing division lines (field, parcel, and section lines) for 27 miles which is 62% of its length.
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.	●	Segment 3 parallels existing infrastructure (transmission lines, roads, or railroads) for 100% of its length.
Costs Dependent on Design and Route	●	The applicant's overall project costs, as presented in the joint certificate of need application and route permit application and discussed in Section 3.5, are based on high and low-cost estimates of the project as a whole, and do not distinguish between the individual route segments and alternatives.

10 Segment 4 (161 kV Relocation) - Affected Environment, Potential Impacts, and Mitigation

This chapter provides an overview of the human and environmental resources that could be affected by Segment 4 and its alternatives (Section 3.1.5). It discusses potential impacts relative to the construction and operation of the project on these resources. It also discusses ways to avoid, minimize, and mitigate these impacts.

Segment 4 (161 kV Relocation) would be a new 161 kV transmission line that would replace the portion of the existing North Rochester to Chester 161 kV transmission line that would be displaced by Segment 3 (Figure 3-6). There are multiple options for Segment 4 (161 kV Relocation) with differing beginning points but all ending at the North Rochester Substation (Map 2-5).

The applicant proposed two potential options for Segment 4 (161 kV Relocation) in the joint certificate of need application and route permit application: Segment 4 West (23.7 miles; Section 3.1.5.1) and Segment 4 East (19.6 miles; Section 3.1.5.3). Two additional alternatives were proposed during scoping: Segment 4 West Modification (22.7 miles; Section 3.1.5.2) and Segment 4 CapX Co-Locate Option (16.4 miles; Section 3.1.5.6). The analysis of potential impacts associated with these options is discussed in Section 10.3 through Section 10.11.

A total of six alternatives are available for the Segment 4 options (Appendix D). Two were proposed during scoping, and four were proposed by the applicant in the joint certificate of need application and route permit application. Alternatives to Segment 4 West are discussed in Section 10.13, alternatives to Segment 4 East are discussed in Section 10.14, and one alternative alignment for the Segment 4 CapX Co-Locate Option is discussed in Section 10.15.

The applicant included Connector 4Q in the joint certificate of need application and route permit application. This is incorporated into the Highway 52 to existing 161 kV line study area as described in Section 3.1.5.5. Connector 4Q connects Segment 4 West and Segment 4 East in Olmsted County and presents options for connecting north and south options from Highway 52 to the existing 161 kV line; these options and the opportunities they could present for minimizing or avoiding impacts are discussed in Section 10.17.

There are three options leading up to Highway 52. The North Rochester Substation to Highway 52 Study Area isolates data for these three options which include: Segment 4 West, Segment 4 Modification, and Segment 4 East (Section 3.1.5.4). This data is discussed in Section 10.16.

10.1 Terms and Concepts

Understanding proposed and alternative route impacts involves contextualizing their duration, size, intensity, and location. This form of contextual information serves as the basis for assessing the overall project impacts on resources. To provide appropriate context, the following terms and concepts are used to describe and analyze potential impacts:

- **Duration –** Impacts vary in length of time. Short-term impacts are generally associated with construction but might extend into the early operational phase of the project. Long-term impacts are associated with the operation of the project. Permanent impacts extend beyond project decommissioning and reclamation.
- **Size –** Impacts vary in size. To the extent possible, potential impacts are described quantitatively, for example, the number of impacted acres or the percentage of affected individuals in a population.
- **Uniqueness –** Resources are different. Common resources occur frequently, while uncommon resources are not ordinarily encountered.
- **Location –** Impacts are location-dependent. For example, common resources in one location might be uncommon in another.

The context of an impact, in combination with its anticipated on-the-ground effect, is used to determine an impact intensity level, which can range from highly beneficial to highly harmful.

Impact intensity levels are described using qualitative descriptors, which are explained below. These terms are not intended as value judgments, but rather a means to confirm common understanding among readers and to compare potential impacts between route alternatives.

- **Negligible** impacts do not alter an existing resource condition or function and are generally not noticeable to an average observer. These short-term impacts affect common resources.
- **Minimal** impacts do not considerably alter an existing resource condition or function. Minimal impacts might, for some resources and at some locations, be noticeable to an average observer. These impacts generally affect common resources over the short- or long-term.
- **Moderate** impacts alter an existing resource condition or function and are generally noticeable to the average observer. Impacts might be spread out over a large area making them difficult to observe but can be estimated by modeling. Moderate impacts might be long-term or permanent to common resources, but generally short- to long-term to uncommon resources.
- **Significant** impacts alter an existing resource condition or function to the extent that the resource is impaired or cannot function as intended (highly harmful). Significant impacts are likely noticeable or predictable to the average observer. Impacts might be spread out over a large area, making them difficult to observe, but can be estimated by modeling. Significant impacts can be of any duration and affect common or uncommon resources.

Also discussed are opportunities to mitigate potential impacts through mitigation. Mitigation means:

- Avoiding impacts altogether by not undertaking a certain project or parts of a project;
- Minimizing impacts by limiting the degree of magnitude of a project;

- Rectifying impacts by repairing, rehabilitating, re-creating, or restoring the affected environment;
- Reducing or eliminating impacts over time by preservation and maintenance operations during the life of the project;
- Compensating for impacts by replacing or providing substitute resources or environments; or
- Reducing or avoiding impacts by implementing pollution prevention measures.

Some impacts can be avoided or minimized; some might be unavoidable but can be minimized; others might be unavoidable and unable to be minimized but can be rectified (corrected). The level at which an impact can be mitigated might change the impact intensity level.

When referring to construction practices or mitigation measures, this EIS uses the convention of describing these as actions by the applicant, even if the action would be carried out by the applicant's contractor.

10.2 Regions of Influence

Potential impacts on human and environmental resources are analyzed within specific geographic areas called regions of influence (ROI). The ROI is the geographic area where the project might exert some influence and is used as the basis for assessing potential impacts. ROIs vary by resource and potential impact (Table 10-1). As necessary, the EIS discusses potential impacts and mitigation measures beyond the identified ROI to provide appropriate context. Direct impacts within the ROI might cause indirect impacts outside the ROI.

This EIS uses the following ROIs:

- **Right-of-Way –** the ROW for the 161 kV transmission line is 100 feet wide (50 feet on each side of the anticipated alignment). In some locations, ROW may already exist but could require expansion as described in Section 3.3.2.
- **Route Width –** the route width varies but is most commonly 1,000 feet wide (500 feet on each side of the anticipated alignment). Locations where the route width varies are described in Section 3.3.1 Route Width.
- **Local vicinity –** within 1,600 feet of the anticipated alignment (in other words - a 3,200-foot-wide buffer area distributed equally on either side of the anticipated alignment)
- **Project area –** within one mile of the anticipated alignment (in other words - a two-mile-wide buffer distributed equally on either side of the anticipated alignment)
- **Three-county area** – term used to collectively describe the three counties in which the project is located (including Goodhue, Olmsted, and Wabasha counties).

Table 10-1 Regions of Influence

Resource Type	Resource Element	Region of Influence
Human settlement	Aesthetics	Local vicinity
	Cultural values	Three-county area
	Displacement	ROW
	Environmental justice	Census Tracts within the route width
	Land use and zoning	ROW
	Noise	Local vicinity
	Property values	Local vicinity
	Recreation	Route width
	Socioeconomics	Three-county area
	Transportation and Public Services	Roadways/rail - Local vicinity/Route Width Public utilities - ROW Emergency Services – Three-county area Airports – 3.78 miles
Human health and safety	Electromagnetic fields	ROW
	Implantable medical devices	ROW
	Public and worker safety	ROW
	Stray voltage	ROW
	Induced voltage	ROW
	Electronic interference	ROW
Land-based economies	Agriculture	Route width
	Forestry	Route width
	Mining	Route width
	Tourism	Local vicinity
Archaeological and historic resources	Archaeological and historic resources	Route width

Resource Type	Resource Element	Region of Influence
Natural environment	Air quality	Project area
	Climate	Project area
	Geology and topography	Route width
	Greenhouse Gases	ROW
	Groundwater	ROW
	Public and designated lands	ROW
	Rare and unique natural resources	Project area for protected species; route width for sensitive ecological resources
	Soils	ROW
	Surface water	Route width
	Vegetation	ROW
	Wetlands	ROW
	Wildlife and Wildlife Habitat	Route width

10.3 Environmental Setting

Segment 4's project area is dominated by rural and agricultural land uses, with concentrated areas of development on the west end near Pine Island and the central portion near Oronoco (Map 61). Segment 4 crosses the Zumbro River and its tributaries (Map 62). Floodway associated with the Middle Fork of the Zumbro River is crossed by Segment 4 West near Pine Island and Segment 4 East near Oronoco (Map 62).

The DNR and the USFWS have developed an ECS for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features (reference (10)). Under this classification system, Segment 4 is in the Eastern Broadleaf Forest Province (Map 64). This section is further divided into subsections including the Oak Savanna, Rochester Plateau and the Blufflands subsections. These subsections are used below to classify the environmental setting of the project.

The Oak Savanna Subsection, crossed only by Segment 4 West, is primarily characterized by rolling plains of loess-mantled ridges over sandstone and carbonate bedrock and till. The boundaries are characterized by end moraines to the west and land dominated by hardwood forests to the east. Topography is gently rolling throughout the subsection and stagnation moraines with steep slopes in the southwest. Glacial drift is generally less than 100 feet thick, with a maximum thickness of about 200 feet. Soils within this subsection are a combination of Alfisols and Mollisols and include Aquolls, Udolls, Udalfs, and Aqualfs. Pre-settlement, bur oak savanna was the primary vegetation; at present, most of the area is farmed (reference (12)).

The Rochester Plateau Subsection is primarily characterized by level to gently rolling older till plains, overlying dolomite, limestone, and sandstone. The boundaries are characterized by end moraines to the west, and by an area of transition between a level to rolling plateau and dissected landscapes to the east. Topography is controlled by underlying glacial till along the western edge. As glacial till thins to the east, topography is largely bedrock controlled. Depth of drift over bedrock varies from 100 to 200 feet in the west to 10 to 100 feet in the east with bedrock exposures common. Loess thickness is variable, ranging from 30 feet thick on broad ridgetops, to less than a foot on valley walls. The predominant soils are Udalfs, with localized Aquents along the floodplains and major rivers. Pre-settlement tallgrass prairie and bur oak savanna were the primary vegetation; at present, most of the area is farmed (reference (199)).

The Blufflands Subsection, crossed only by Segment 4 CapX Co-Locate Option, is primarily characterized by loess-capped plateau that is deeply dissected by river valleys where dolomite, limestone, sandstone, and shale bedrock formations are exposed in valley walls. Topography is controlled by underlying glacial till along the western edge of the subsection where loess is several feet thick. As glacial drift thins to the east, topography is largely bedrock controlled. Depth of drift over bedrock varies from 0 to 50 feet. Loess thickness is variable, ranging from 30 feet thick on broad ridgetops to less than a foot on valley walls. The predominant soils are Udalfs, with localized Aquents along the floodplains and major rivers. Presettlement vegetation consisted of tallgrass prairie and bur oak savanna on ridge tops and dry upper slopes; red oak-white oak-shagbark hickory-basswood forests on moister slopes; and red oak-basswood-black walnut forests in protected valleys. At present, about 30% of the area is farmed, 20% is in pasture, and 50% is in woodland (reference (272)).

Segment 4 is in Goodhue, Olmsted, and Wabasha Counties. Major communities nearest to Segment 4 include Pine Island and Oronoco (Map 2-5). Existing transmission lines are prevalent throughout (Map 65). Segment 4 is generally bound by U.S. Highway 52 to the west and central, and U.S. Highway 63 to the east (Map 65). County and township roads are also present within the route widths.

10.4 Use or Paralleling of Existing Rights-of-Way

When the Commission makes a final decision about the route permit and per Minnesota Statute § 216E.03, subpart 7(e), it must make specific findings that it has considered locating a route for a new HVTL along an existing HVTL route or parallel to existing highway right-of-way (ROW), and, to the extent these are not used, the Commission must state the reason(s).

When considering a new HVTL along an existing HVTL route, there is a difference in potential impacts between using ROW for double-circuiting and paralleling existing ROW. Both would present opportunities for combining new ROW with existing ROWs, which minimizes fragmentation of the landscape and can minimize human and environmental impacts (e.g., aesthetic and agricultural impacts). Use of existing ROW for double-circuiting would involve either:

- Expanding the existing ROW and replacing existing transmission line structures (for existing lines of a smaller voltage than 161 kV) with new structures capable of double-circuiting the new 161 kV line, or
- Using the existing ROW and placing the new 161 kV line on the existing double-circuit capable poles (for existing 161 kV lines which already have existing double-circuit capable poles present).

Segment 4 does not involve any opportunities for double-circuiting with an existing 345 kV line, and therefore, in all cases, double-circuiting within the alternatives for Segment 4 would involve replacing the existing transmission line structures (Section 3.2.1) and expanding the ROW (Section 3.3.2). Opportunities for use or paralleling existing ROW for double-circuiting are summarized in Table 10-2.

Table 10-2 Segment 4 Opportunities for Double-Circuiting

	Unit	Segment 4 West	Segment 4 West Modification	Segment 4 East	Segment 4 CapX Co-Locate Option
Total Segment Length	Miles	23.6	22.8	19.6	16.4
Double-circuit with existing 69 kV line	Miles (percent)	0.0 (0)	0.0 (0)	5.1 (26)	0.0 (0)
Double-circuit with existing 161 kV line	Miles (percent)	3.4 (14)	11.3 (49)	0.0 (0)	0.0 (0)
Total opportunity for double-circuiting	Miles (percent)	3.4 (14)	11.3 (49)	5.1 (26)	0.0 (0)
Parallels existing transmission line (i.e., not double-circuited but parallel and adjacent to)	Miles (percent)	4.3 (18)	<.1 (0)	1.4 (7)	13.7 (84)
Double-circuiting or paralleling existing transmission lines (total)	Miles (percent)	7.7 (33)	11.3 (49)	6.5 (33)	13.7 (84)

Paralleling existing ROW would involve installing the new 161 kV line parallel and adjacent to existing transmission lines or transportation, pipeline, and electrical transmission systems or rights-of-way. As described in Section 3.3.2, the total width of the new ROW required could be reduced from 100 feet where some of the ROW would overlap with existing ROW. Opportunities for paralleling existing ROW, including highway rights-of-way, are further discussed in Section 10.5.1.

10.5 Human Settlements

10.5.1 Aesthetics

The ROI for aesthetics is the local vicinity. Transmission lines alter a viewshed. Because aesthetic impacts are subjective, the potential impacts can vary widely and be unique to each person. Impacts are largely assessed by reviewing the number of nearby residences and opportunities for double-circuiting with an existing transmission line and/or ROW paralleling. Where double-circuiting

occurs within Segment 4, existing transmission line structures have the potential to be replaced with larger structures, and the ROW would be extended. Determining the relative scenic value or visual importance in any given area is subjective and depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question.

Aesthetic impacts can be minimized by selecting routes that are located away from homes, schools, businesses, and other places where people congregate (for example, parks or other recreation areas). Aesthetic impacts can also be minimized by following existing transmission line ROW where elements of the built environment already define the viewshed, and the addition of an additional transmission line would have an incremental impact. Following other infrastructure, such as roads and railroads, would also be expected to reduce potential impacts, but not to the same extent.

10.5.1.1 Existing Conditions

The aesthetic and visual resources of a landscape are defined as the existing natural and built features which affect the visual quality and character of an area. A landscape's character is largely influenced by topography, vegetation, water resources, existing development, and infrastructure. Determining the relative scenic value or visual importance in any given area depends, in large part, on the individual viewer, or community of viewers, whose perceptions are shaped by their values and experiential connection to the viewing area, as well as their physical relationship to the view, including distance to structures, perspective, and duration of the view.

Viewer sensitivity is understood as an individual's interest or concern for the quality of a viewshed and varies depending upon the activity viewers are engaged in, their values and expectations related to the viewshed, and their level of concern for potential changes to the viewshed. High viewer sensitivity is generally associated with individuals engaged in recreational activities; traveling to scenic sites for pleasure and to or from recreational, protected, natural, cultural, or historic areas; or experiencing viewsheds from resorts, roadside pull-outs, or residences. Residents have a higher sensitivity to potential aesthetic impacts than temporary observers. Low viewer sensitivity is generally associated with individuals commuting, working, or passing through an area.

For the purpose of this document, it is assumed that landscapes which are, for the average person, harmonious in form and use are generally perceived as having greater aesthetic value. Infrastructure which is not harmonious with a landscape or affects existing landscape features reflects a change in the aesthetic view that, for some or many, could negatively affect a viewer's perception and expectation of the area. Assessing visual quality reflects the difference between the landscape change and the individual or communal reaction to that change. As noted above, individual or communal perspectives are complex, affected by individual or shared values and experiences with the land. As such, some viewers could perceive the project setting as having high visual quality while others might perceive the area to have less visual quality. Perceived aesthetics can carry more weight when they are tied to a specific feature, like residential properties, scenic byways, or historic/archaeological/natural features. This is a key reason among those that prefer to co-locate new infrastructure among the built environment (utility ROWs, roads, railways, pipelines).

The topography of Segment 4 is generally level to moderately rolling with areas of river valley. Segment 4 East is primarily a mix of agricultural (42 percent) and developed (41 percent) landcover, with smaller areas of barren, forested, and herbaceous landcover. Segment 4 West is primarily agricultural (71 percent) with pockets of developed, forested, and herbaceous land. Segment 4 West Modification is largely a mix of agricultural (65 percent) and developed (18 percent) landcover with smaller areas of barren, forested, and herbaceous land. Segment 4 CapX Co-Locate Option is primarily agricultural (80 percent), with small pockets of developed, forested, herbaceous landcover.

There are several municipalities in Segment 4 (Map 2-5). All segments in Segment 4 end at the North Rochester Substation which is just north of Pine Island. Segment 4 East generally follows MN Highway 52 through Oronoco until just north of Rochester. Segment 4 West and Segment 4 West Modification also begin north of Rochester. The Segment 4 CapX Co-Locate Option is north of Pine Island and Oronoco. The municipalities are characterized by a higher concentration of commercial features, residential buildings, streets, and sidewalks. There are also other recreational features that influence the visual character and enjoyment of these areas, like parks and trails. There are no wind or solar farms in the local vicinity of Segment 4.

The majority of Segment 4's route width contains existing utility infrastructure, including electric transmission and distribution lines as well as existing roadways (Map 65). The existing transmission structures within Segment 4's ROI generally range in height from 45 to 140 feet, depending on the size of the existing line.

- Where existing transmission lines are 69 kV, the structures are typically 45 to 70 feet tall.
- Where existing transmission lines are 161 kV, the structures are typically 75 to 140 feet tall.

Certain landscape areas have higher aesthetic value due to their scenic qualities. These areas could include scenic byways, recreation areas, and river crossings. Segment 4 East, Segment 4 West, Segment 4 West Mod, and Segment 4 CapX Co-locate would all cross the Zumbro River, which is a state water trail, at different points (Map 63). The Douglas State Trail would be near and parallel certain portions of Segment 4 West Modification (Map 63-2). In the city of Oronoco, Segment 4 East would paralleling Highway 52 N immediately west of Lake Shady Park (Map 63-2). While the park is not located within the ROI, the city noted concerns about potential visual impacts to the park (Section 10.5.5.1.2).

10.5.1.2 Potential Impacts

The project's HVTL structures and conductors would create aesthetic impacts. The ROI for aesthetic impacts is the local vicinity. The new 161 kV transmission line would be either single-circuit or double-circuit, with a 69 kV of 161 kV transmission line, depending on the existing infrastructure. The structures would range in height from 75 to 140 feet. Aesthetic impacts would also include clearing existing woody vegetation and creating a new fragmented landscape, and/or expanding the fragmented landscape with the expansion of the existing ROW. The degree of impacts depends in large part on opportunities to share or parallel existing ROW and the magnitude of viewer sensitivity.

Paralleling and/or sharing other types of existing ROW would have an incremental impact relative to existing horizontal elements, such as existing transmission lines, highways, and county roads, and/or railroads (collectively referred to as “existing infrastructure”). In some cases, portions of a route segment could parallel ROW with more than one of these existing features at the same time (e.g., be sharing or paralleling transmission line and be paralleling road ROW). Map 7 illustrates where ROW paralleling occurs and shows existing infrastructure and division lines in the region. Where subparts parallel more than one existing type of infrastructure, precedence is given to showing where the alternative could be double-circuited or paralleling an existing transmission line over showing it paralleling existing road ROW.

As shown in Table 10-3, both Segment 4 East and Segment 4 CapX Co-Locate would primarily follow existing infrastructure, for 82 and 84 percent of their lengths, respectively. Segment 4 West and Segment 4 West Modification would follow existing infrastructure for 46 and 64 percent of their length, respectively. Segment 4 CapX Co-Locate, Segment 4 East, Segment 4 West, and Segment 4 West Modification would each not follow existing infrastructure or existing field, parcel, and section lines (collectively referred to as “division lines”) for similar lengths (1.7 miles, 1.0 miles, 2.5 miles, and 1.1 miles, respectively).

Table 10-3 Segment 4, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

	Segment 4 West (23.6 mi total)		Segment 4 West Modification (22.8 mi total)		Segment 4 East (19.6 mi total)		Segment 4 CapX Co-Locate Option (16.4 mi total)	
Double-circuited with or paralleling existing transmission lines	7.7 mi	33%	11.3 mi	49%	6.5 mi	33%	13.7 mi	84%
Follows existing roads	3.2 mi	14%	6.0 mi	27%	14.4 mi	73%	<.1 mi	0%
Follows existing railroads	0.0 mi	0%	0.0 mi	0%	0.0 mi	0%	0.0 mi	0%
Follows existing infrastructure (transmission lines, roads, and railroads)	10.9 mi	46%	14.5 mi	64%	16.1 mi	82%	13.7 mi	84%
Follows division lines (field, parcel, and section lines)	19.1 mi	81%	19.1 mi	81%	18.3 mi	93%	7.8 mi	48%
Total ROW paralleling	21.1 mi	89%	21.7 mi	95%	18.6 mi	95%	14.7 mi	90%
Total length that does not follow existing infrastructure or division lines	2.5 mi	11%	1.1 mi	5%	1.0 mi	5%	1.7 mi	10%

[1] Total ROW paralleling represents the total length of the segment that either parallels existing infrastructure (transmission lines, roads, and railroads) *or* follows division lines (field, parcel, and section lines). Some parts of a segment fall into both categories but are not double-counted in this total.

For the majority of Segment 4, where the HVTL could be double-circuited (Map 7), aesthetic impacts would be diminished because the existing transmission lines are already part of the aesthetics of the area. Aesthetic impacts would include removal of existing structures and installation of the larger structures (Section 3.2.1). The increased structure height (typically 75 to 140 feet) for the new structures could be taller than the existing structures (ranging from 45 to 145 feet, Section. 10.5.1.1). Impacts due to taller structures would be applicable to Segment 4 East, which could be double-circuited with existing 69 kV line, compared to Segment 4 West, which could be double-circuited with existing 161 kV line. In some cases, existing structures are wood and would be replaced with steel structures. Impacts for double-circuited areas could also include vegetation clearing to accommodate the expansion of the ROW width (Section 3.3.2). In some cases, the aesthetic impacts could be shifted from one side of a road to another. For example, if the existing transmission line is on the north side of the road and the final alignment for the project is on the south side of the road, aesthetic impacts would be shifted.

In addition to opportunities to share or parallel existing ROW, the degree of aesthetic impacts would also be dependent on the magnitude of viewer sensitivity and exposure. Visual impacts are expected to be minimal for those with low viewer sensitivity, such as people traveling to and from work. For those with high viewer sensitivity, for example, neighboring landowners or recreationalists, visual impacts are anticipated to be moderate to significant. Viewer exposure refers to variables associated with observing a viewshed, and can include the number of viewers, frequency and duration of views, and view location. Viewer exposure would typically be highest for views experienced by high numbers of people, frequently, and for long periods. To the extent these impacts can be quantified depends on the presence of several on-the-ground factors linked to the concepts of viewer quality, sensitivity, and exposure. These factors include:

- Proximity to residences, schools, churches, etc., where relatively more observers are present to experience aesthetic impacts;
- Views valued by the public at large, for example, scenic overlooks or scenic byways; or
- Locations where people recreate or otherwise enjoy leisure activities.

Appendix G summarizes human settlement features in the local vicinity of the route segments. The proximity of residential structures (homes, daycares, and nursing homes) and non-residential structures (for example, agricultural buildings and sheds) to route segments at various distances is shown in Figure 10-1 and Table 10-4, respectively. The Segment 4 CapX Co-Locate Option has the least number of residences within the local vicinity (40) and Segment 4 East has the most residences within the local vicinity (258). Segment 4 West and Segment 4 West Modification both have a similar number of residences in the local vicinity (96 and 113, respectively). Segment 4 East is the only route that has a residence within the ROW. Segment 4 CapX Co-Locate Option has the least number of non-residential structures within the local vicinity (92), and Segment 4 East would have the largest number of non-residential structures in the local vicinity (356).

Figure 10-1 Segment 4, Proximity of Residential Structures

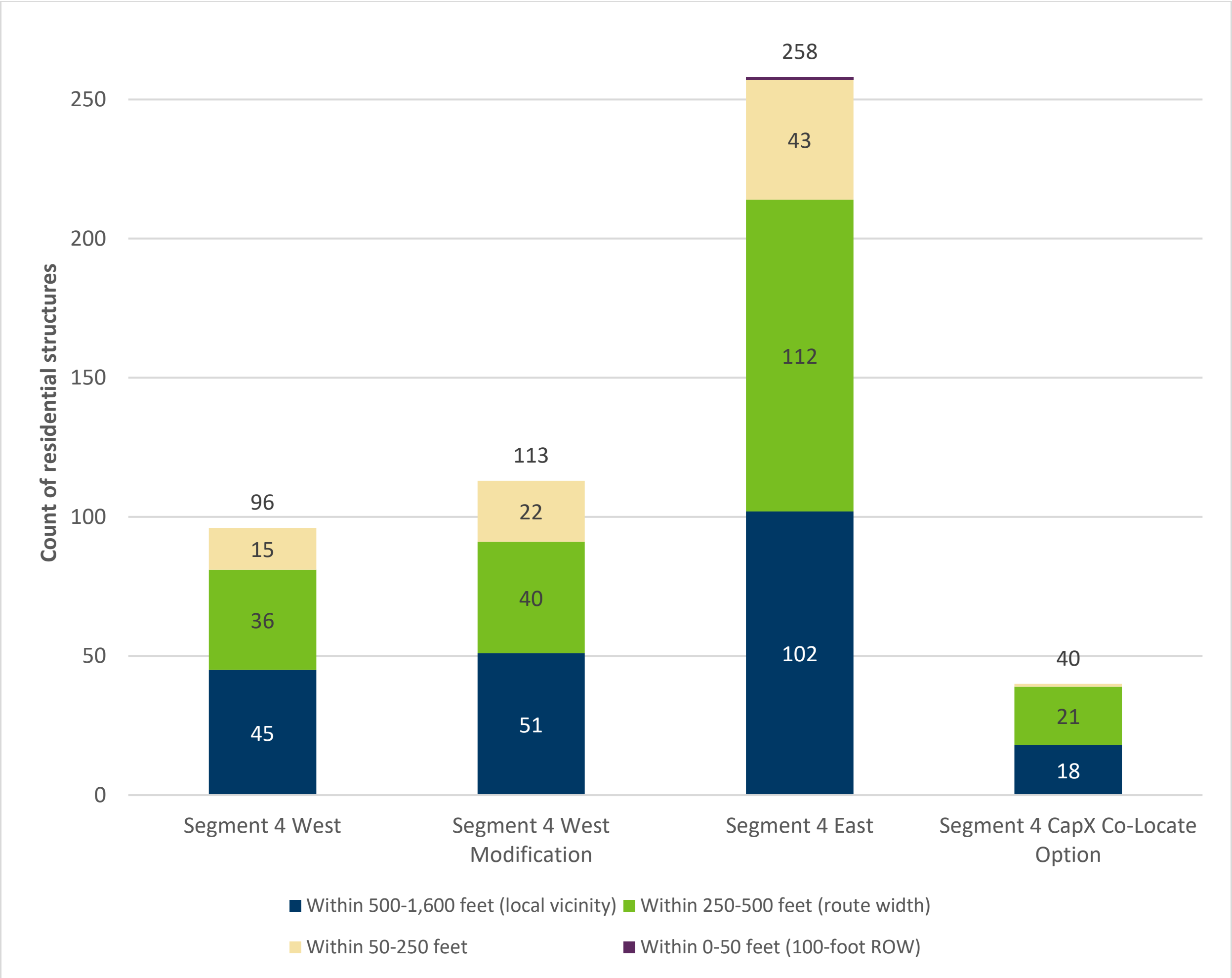


Table 10-4 Segment 4, Proximity of Non-Residential Structures

	Segment 4 West	Segment 4 West Modification	Segment 4 East	Segment 4 CapX Co-Locate Option
Within 0-50 feet (100-ft ROW)	1	3	2	0
Within 50-250 feet	29	43	75	2
Within 50-500 feet (route width)	44	62	157	48
Within 500-1,600 feet (local vicinity)	76	60	122	42

Recreational resources are also considered in the aesthetic impacts analysis in that they might include certain landscapes with higher aesthetic value due to their scenic qualities and could also have the potential for higher viewer sensitivity, especially if people are expected to congregate in recreational areas. Recreationalists subject to potential impacts in Segment 4's ROI would include users of the state water trails and hiking trails.

Aesthetic impacts would occur to the Zumbro River that is designated as a state water trail. The Zumbro River is within the ROI of every segment in Segment 4 (Map 63). At some locations, including two Segment 4 East crossing locations and two Segment 4 West/Segment 4 West Modification crossing location, there are no existing transmission lines. The aesthetic impacts would range from minimal to moderate for the Zumbro River, given the existing transmission lines at most of the crossings. Segment 4 West and Segment 4 East would have the most crossings without existing infrastructure (Map 4).

The Douglas State Trail is crossed by Segment 4 West Modification on its western end (Map 63), and it would be adjacent to portions of Segment 4 West Modification for around 8 miles. Segment 4 West Modification would parallel the trail, where there is an existing 161 kV line (Map 63). The anticipated alignment of Segment 4 West Modification is generally on the opposite side of a forested visual barrier. It would intersect with both Segment 4 West and Segment 4 West Modification near Rochester, where there is no existing transmission line infrastructure (Map 63). Aesthetic impacts would include visibility of construction traffic and equipment during construction.

10.5.1.3 Mitigation

The primary strategy for minimizing aesthetic impacts is prudent routing—that is, choosing routes where an HVTL is most harmonious with the landscape. This could include:

- Maximizing ROW sharing and/or paralleling with existing linear rights-of-way (for example, transmission lines, roadways, and railroads) to minimize incremental aesthetic impacts.
- Minimizing the magnitude of viewer exposure (for example, locating the transmission line away from residences or areas where people congregate).
- Avoiding routing through areas with high-quality, distinctive viewsheds.
- Crossing rivers and streams using the shortest distance possible (that is, perpendicular to the waterbody).
- Reducing structure heights to minimize impacts within scenic areas.
- Using structures and structure designs that minimize impacts.

In the joint certificate of need application and route permit application, the applicant committed to minimizing aesthetic impacts by avoiding removal of trees where possible, spanning natural areas when feasible, and using existing infrastructure and roadway or transmission facility rights-of-way to the maximum practicable extent.

The sample route permit (Section 5.3.7 of Appendix H) contains the following mitigation related to aesthetics:

- “The Permittee shall consider input pertaining to visual impacts from landowners or land management agencies prior to final location of structures, rights-of-way, and other areas with the potential for visual disturbance.”
- “The Permittee shall use care to preserve the natural landscape, minimize tree removal and prevent any unnecessary destruction of the natural surroundings in the vicinity of the Transmission Facility during construction and maintenance.”
- “The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads.”
- “The Permittee shall place structures at a distance, consistent with sound engineering principles and system reliability criteria, from intersecting roads, highways, or trail crossings.”

Other minimization and mitigation measures could include:

- Placing structures to take advantage of existing natural screening to reduce the view of the line from nearby residences and roadways.
- Including specific conditions in individual easement agreements with landowners along the route (for example, requiring new plantings or landscaping).
- Using the protections of Minnesota Statute § 216E.12, subdivision 4 (commonly known as the “Buy the Farm” statute), where available, to move residents away from potential aesthetic impacts.

10.5.2 Cultural Values

The ROI for cultural values is the project area. Impacts associated with rural character and sense of place are expected to be dependent on the individual. These impacts would be localized, short- and long-term, but might diminish over time. Impacts to community unity are not anticipated to occur. Impacts are minimal and unavoidable.

10.5.2.1 Existing Conditions

Cultural values are those community beliefs and attitudes which provide a framework for community unity and animate community actions. Cultural values can be informed by history and heritage, local resources, economy, local and community events, and common experiences. The project traverses land that has been home to a variety of persons and cultures over time.

The project area was populated primarily by Dakota and Ojibwe tribes in the early to mid-1800s. Most lands in the local vicinity of the project were ceded to the U.S. government during the 1851 treaty. Existing conditions are discussed for both the pre-contact period (prior to European settlement of the project area) and the post-contact period.

10.5.2.1.1 Tribal and Indigenous Peoples History within ROI

Segment 4 is within the Bdewakantunwan (those born of the waters) (Mdewakanton) Band of Eastern Dakota's, also commonly referred to as the Minnesota Sioux, ancestral lands. The Dakota people lived on the lands in this area long before European settlers arrived. The 1851 Treaty of Mendota and the Treaty of Traverse des Sioux of 1851 stripped the Dakota of these ancestral lands. The foundation of the Prairie Island reservation began forming in 1880 when 120 acres of land was purchased for the Dakota people who stayed in Minnesota by the Secretary of the Interior. In 1936, Prairie Island adopted its Constitution and By-laws, becoming recognized by the federal government as a Tribe and establishing the Prairie Island Reservation.

The Treaty of Traverse des Sioux in 1851, between the Sioux-Sisseton and Wahpeton bands of the Dakota and the U.S. government, ceded much of the southeastern portion of the Minnesota territory. The Sisseton and Wahpeton bands of Dakota were in areas that had been overhunted and depleted of animals. While many of the Sisseton and Wahpeton Dakota leaders had concerns and did not support the treaties, a consensus was eventually reached that they believed would help supplement their struggling hunting and gathering economy (reference (13)). The land cession treaty offered annuity payments and a way to get through the hard times. When signed, the treaty ceded 24 million acres for $1,665,000. A reservation including an area of land ten miles wide was retained on each side of the Minnesota River for the tribal members (reference (14)). The U.S. government kept more than 80 percent of the money, leaving the Dakota to receive the interest on the amount, at five percent for 50 years (reference (15)). The Dakota Leaders also signed the "Traders Papers," which unfairly siphoned substantial funds from the treaty to pay alleged Dakota debts to settler fur traders (reference (13)).

After the Treaty of Traverse de Sioux was signed by the upper bands of the Dakota, the treaty delegation traveled to lower bands of the Dakota. The Treaty of Mendota was also signed in 1851, between the Mdewakanton and Wahpekute bands of Dakota. The Mdewakanton and Wahpekute were not as in need for foods and goods to support their tribes at the time as the upper bands were. The Leaders asked that annuity from the Treaty of 1837 be paid before further discussion and attempted to change the boundaries of the proposed reservation. Under this treaty, the bands were to receive annual annuities on $1,410,000 (reference (16)). The bands were given one year to move to the same reservation land along the Minnesota River outlined above in the Treaty with the Sioux-Sisseton and Wahpeton Bands (reference (14)).

10.5.2.1.2 Tribal and Indigenous Peoples within Present Day ROI

There are currently 11 federally recognized American Indian Tribes with reservations in Minnesota. Minnesota tribes are sovereign nations that operate their own natural resource departments that reflect their commitment to environmental preservation for future generations. Various restoration projects have been aimed at revitalizing bison, lake trout, sturgeon, and plant populations. Traditional ecological knowledge emphasizes that caring for the land means it will care for you in return. This belief is deeply rooted in the spiritual and cultural importance of flora and fauna, as well as sacred burial sites.

Plants such as wild rice, cedar, sage, sweetgrass, and tobacco, are considered sacred and used for ceremonial purposes and their healing properties (reference (17)).

According to the United States Department of Housing and Urban Development Tribal Directory Assessment Tool (reference (18)), Tribes with historic cultural interest or ancestral ties in Segment 4 include the following:

- Apache Tribe of Oklahoma
- Cheyenne and Arapaho Tribes, Oklahoma
- Flandreau Santee Sioux Tribe of South Dakota
- Lower Sioux Indian Community in the State of Minnesota
- Menominee Indian Tribe of Wisconsin
- Prairie Island Indian Community in the state of Minnesota
- Fort Belknap Indian Community of the Fort Belknap Reservation of Montana
- Grand Portage Band of the Minnesota Chippewa Tribe
- Iowa Tribe of Kansas and Nebraska
- Sisseton-Wahpeton Oyate of the Lake Traverse Reservation, South Dakota
- Spirit Lake Tribe, North Dakota
- Santee Sioux Nation, Nebraska
- Upper Sioux Community, Minnesota

Within the present day ROI the federally recognized PIIC has an established reservation located within Goodhue County. The PIIC core values are bdewakantuŋwaŋ (those born of the water), woksape (wisdom), wowaȟbada (peace or calm), waciŋic'iya (self-dependence), akhidečheča (equality), wowacaŋtohnake (generosity), and oahe (foundation). It consists of approximately 534 acres of original reservation land, 2,774 acres of other trust land close to the existing reservation, and more than 1,700 acres of additional off-reservation properties that are not currently in federal trust. Within the reservation land the Prairie Island Edwin Buck Jr. Memorial Buffalo Project has restored nearly 200 buffalo to the pastures of Prairie Island (reference (200)). Preserving culture and historical treasures is a top priority for the PIIC, and in turn Goodhue County is home to the largest concentration of untouched burial mounds in the state. Their partnership with Minnesota State University, Mankato, developed and is implementing a burial mound protection plan to preserve these sites (reference (20)). There are several Wacipi (the Dakota word for powwow) held throughout the year, with the largest celebration being held during the summer.

10.5.2.1.3 Prairie Island Indian Community and Elk Run property

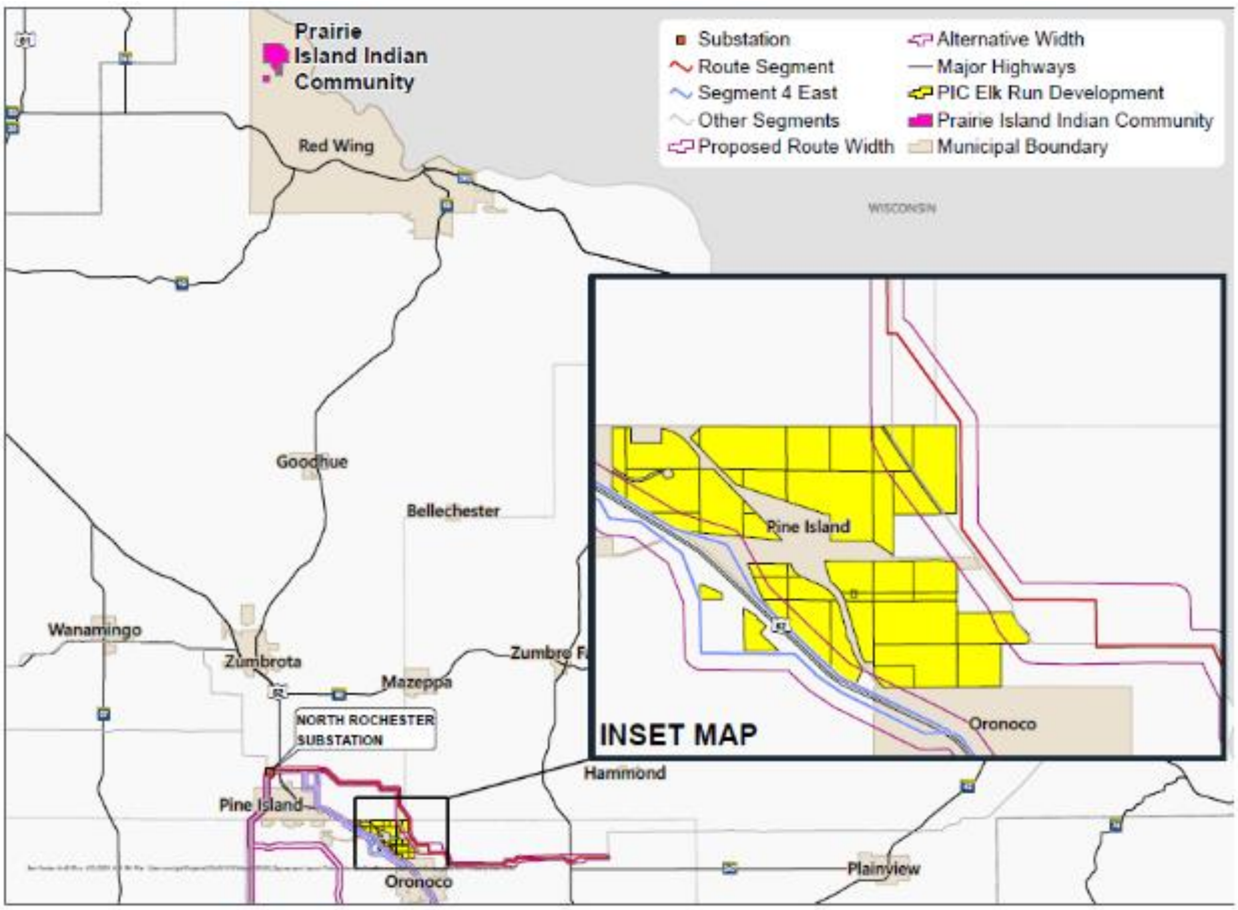
The PIIC submitted a comment during scoping[19] noting the presence of PIIC-owned property referred to as Elk Run. This property is in Olmsted County, north of MN Hwy 52. The route width of the Segment 4 CapX Co-locate Option intersects the northeastern portion of the property, while Segment 4 East would be outside its southern boundary, on the south of MN Hwy 52. The route width of the Segment 4 CapX Co-locate Option was extended east in order to have a potential alignment avoid the Elk Run property (Figure 10-2, Map 66-26). The purpose of the Elk Run property was to support creating a Tribal

[19] Docket No. 20248-209559-01 [TRIBAL AND AGENCY COMMENTS]

community in a location where Tribal members can live and work without being impacted by unrelated infrastructure development. Specifically, it was developed to provide an alternative to living on the existing Reservation in Welch, Minnesota, due to the close proximity of the Prairie Island Nuclear Generating Plant, transmission lines, and stored nuclear waste.

The Elk Run property is within PIIC ancestral territory that holds historical and cultural significance. The property has areas within it that are intended to be preserved due to the rare native land cover. This land would continue to be protected and utilized for Tribal members participating in culturally sensitive activities.

Figure 10-2 Prairie Island Indian Community Reservation and Elk Run Property



10.5.2.1.4 County Conditions within ROI

Today, Segment 4 goes through Goodhue, Olmsted, and Wabasha County in the southeastern region of Minnesota. Southeastern Minnesota is known for its vast landscapes and wooded bluffs along the Mississippi Corridor (reference (20)). It is a health care and agricultural powerhouse, where advanced manufacturing is a strong industry (reference (21). Segment 4 is primarily in a rural setting, with two cities, Pine Island and Oronoco along the route.

Goodhue County is a largely rural county with some industrious small river and mill towns. Landscapes feature agricultural areas and scenic natural features of the Mississippi River Valley. Goodhue County has many outdoor recreational opportunities with many parks and trails. They also have a large county fair and the Cannon Valley Fair. The county is on the ancestral homeland of the Mdewakanton Dakota Oyote and the current day Prairie Island Indian Community reservation is located south of Hastings and north of Red Wing, along the Mississippi corridor (reference (201)). Segment 3 begins north of the city of Pine Island and continues across the southeastern corner of the county.

Olmsted County is on the southeastern border of Minnesota and Wisconsin. The county is home to Rochester, the third largest city in Minnesota and is unique considering the relative urban-rural divide surrounding the city. The County's employment industries are heavily focused on education, health care and social assistance, which make up 50% of the total employment (reference (217)). The Mayo Clinic is in the city of Rochester and offers three health care campuses and an academic medical center.

Wabasha County is also on the southeastern border of Minnesota and Wisconsin. With the Mississippi River running along its whole eastern border, the county is considered to be part of the Mississippi River Valley and Mississippi River Bluff Area. It is one of the original counties in the Minnesota Territory (reference (274)). Segment 4 crosses the southern portion of the county.

There are numerous natural amenities that would attract local and regional recreational users within and nearby the project area (discussed further Sections 9.5.8 and 9.9.6). These areas provide a variety of outdoor recreational opportunities, like fishing, hunting, boating, hiking, and snowmobiling which also contribute to the identity of area residents.

10.5.2.2 Potential Impacts

Construction, operation, and maintenance of Segment 4 is not anticipated to conflict with cultural values in the ROI. The area throughout Segment 4 is generally rural, with several more populated municipal areas within one mile. There are no lakes that have shown historical wild rice growth within Segment 4, so no impacts to wild rice harvesting or production are anticipated. The project would not interfere with hunting or fishing in the area.

Transmission line and substation projects have the potential to impact community and regional events during construction, primarily due to the presence of equipment and supplies on local roadways and potential temporary road closures or detours. Impacts would be minor and temporary if they occur.

Impacts associated with rural character and sense of place are expected to depend on the individual. For some residents, constructing the project might change their perception of the area's character, thus potentially eroding their sense of place. This tension between infrastructure projects and rural character creates real tradeoffs. Segment 4 CapX Co-Locate would follow existing infrastructure for its entire route, Segment 4 East would follow Highway 52 for a large part of its route, and Segment 4 West and Segment 4 West Modification would go through mainly agricultural areas. All routes would start in Pine Island, but Segment 4 East is the only route that would go through Oronoco. For those residents that place high value on rural character and a sense of place, impacts are anticipated to be moderate to significant. These impacts would be localized, short- and long-term, but might diminish over time depending on the individual.

10.5.2.2.1 Prairie Island Indian Community Elk Run Property Potential Impacts

PIIC purchased the Elk Run property specifically to provide a refuge for Tribal members wishing to live apart from the nuclear plant located within their reservation. PIIC stated concern in their scoping comment letter that construction of the Segment 4 CapX Co-Locate Option would be constructed in very close proximity to land of significant prairie biodiversity and intact botanical genetics. They also noted that the Segment 4 CapX Co-Locate Option would undermine the purpose of its acquisition of Elk Run by perpetuating undue infrastructure burdens on a historically disadvantaged Tribal community. PIIC believes the applicant can avoid or minimize these potential impacts by prioritizing either Segment 4 West, Segment 4 West Modification, or Segment 4 East.[20]

10.5.2.3 Mitigation

There are no conditions included in the sample route permit that directly mitigate impacts to cultural values, sense of place, or community unity. Impacts could be minimized by sharing or paralleling existing ROW as it would minimize new routes across the landscape.

PIIC requested that Segment 4 West and Segment 4 West modification be fully reviewed for impacts, as the PIIC believe those options would have fewer impacts on the Prairie Island's Elk Run property. These options would avoid environmentally sensitive and significant areas of rare native land cover, as well as avoid undue infrastructure burdens on a historically disadvantaged Tribal community.

10.5.3 Displacement

The ROI for displacement is the anticipated ROW. Displacement occurs when a residence or building is required to be removed for construction of the project. Residential buildings within the ROI could require removal, whereas non-residential buildings could more likely stay within the ROI if the activities taking place in these buildings are compatible with the safe operation of the line.

Potential displacement impacts are assessed by identification of buildings within the ROW which is based on the anticipated alignment. If buildings are located within the ROW, they could be subject to displacement depending upon site-specific considerations and coordination with the applicant. The applicant noted in the joint certificate of need application and route permit application that "displacement of residential properties is not anticipated" if any of the applicant-proposed segments are selected by the Commission.

[20] The letter (Docket No. 20248-209559-01 [TRIBAL AND AGENCY COMMENTS]) refers to Segment 4 East as the disruptive route, but using current naming conventions Segment 4 East would be Segment 4 CapX Co-Locate. Segment 4 East as referred to in the EIS is not the same route as is referred to in the letter.

10.5.3.1 Existing Conditions

Displacement is the removal of a residence or building to facilitate the operation of a transmission line. For electrical safety code and maintenance reasons, utilities generally do not allow residences or other buildings within the ROW of a transmission line. Any residences or other buildings within a proposed ROW have the potential to be removed or displaced. Displacements are relatively rare and more likely to occur in highly populated areas where avoiding all residences and businesses is not feasible.

The ROI for displacement is the ROW. There are no daycares, hospitals, schools, churches, or nursing homes within the ROI of Segment 4. There are no residential structures located within the ROI of Segment 4 West, Segment 4 West Modification, or Segment 4 CapX Co-Locate. There is one residential structure in Segment 4 East's ROW, on the northeast side of the intersection of 31st Ave NW and 75th St NW (Map 66-20).

There would be no non-residential structures (for example, agricultural outbuildings or animal production structures) within the ROI of Segment 4 CapX Co-Locate. There would be two non-residential structures within Segment 4 East's ROI, one non-residential structure within Segment 4 West's ROI, and three non-residential structures within the Segment 4 West Modification's ROI. All non-residential structures appear to be agricultural, storage, or shed type buildings, with the exception of two businesses (a Dahl Dance studio and a Family Tree) south of 75th St NW just west of 75th St NE within Segment 4 East's ROI (Map 66-21).

10.5.3.2 Potential Impacts

Segment 4 East's ROW includes one residence. The applicant indicated in the joint certificate of need application and route permit application and in Appendix E that displacement of residential structures would not occur. The applicant noted in Appendix E that if a residence is identified within the permitted route and within the required transmission line ROW, Xcel Energy would revise the alignment to avoid such impact and avoid displacement.

Non-residential structures within the ROW could be displaced by the project. Though the general rule is that buildings are not allowed within the ROW of the transmission line, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line. This is determined on a case-by-case basis.

10.5.3.3 Mitigation

The sample route permit (Section 5.3.7 of Appendix H) does not have specific statements on displacement. In the aesthetic requirements it states: "The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads."

In the safety codes and design requirements it states: "The Permittee shall design the transmission line and associated facilities to meet or exceed all relevant local and state codes, the National Electric Safety Code, and NERC requirements. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, strength of materials, clearances over roadways, ROW widths, and permit requirements."

Displacement of residential and non-residential structures can be avoided by adjusting the placement of transmission line structures, using specialty structures, increasing structure height, or by modifying the ROW location or width. The applicant would work with landowners on a case-by-case basis to address potential displacement. The applicant might need to conduct a site-specific analysis to determine if the building would need to be displaced. Building owners would be compensated by the applicant for any buildings that are displaced.

10.5.4 Environmental Justice

The ROI for EJ includes the census tracts that intersect the route width. Potential EJ impacts are assessed by first identifying if any census tracts meet a definition of an EJ area per its socioeconomic information. Second, census tracts meeting an EJ definition are reviewed to consider if those residents might be disproportionately affected. The project would not result in disproportionate adverse impacts to the EJ areas of concern within the ROI. Therefore, impacts are anticipated to be minimal.

10.5.4.1 Existing Conditions

The MPCA's EJ Proximity Analysis tool is an online mapping tool that uses census data to identify areas for meaningful community engagement and additional evaluation for disproportionate effects from pollution (reference (35)). The tool identifies EJ areas of concern using the following four criteria, which align with the definition of an environmental justice area in Minnesota Statutes § 216B.1691, subdivision 1(e):

1. 40 percent or more of the area's total population is nonwhite;
2. 35 percent or more of households in the area have an income that is at or below 200 percent of the federal poverty level;
3. 40 percent or more of the area's residents over the age of five have limited English proficiency; or
4. The area is located within Indian country, as defined in United States Code, title 18, section 1151.

Using the above criteria, there were no census tracts in Goodhue, Olmsted, or Wabasha County within the ROI of Segment 4 that were identified as EJ areas of concern.

There are no reservations located within the ROI. However, as described in Section 10.5.2.1.3, the PIIC does own property referred to as the Elk Run property which is partially located within the ROI of Segment 4 East and the Segment 4 CapX Co-Locate Option.

10.5.4.2 Potential Impacts

PIIC purchased the Elk Run property specifically to provide a refuge for Tribal members wishing to live apart from the nuclear plant located within their reservation. PIIC stated concern in their scoping comment letter PIIC is concerned that construction of Segment 4 East would undermine the purpose of its acquisition of Elk Run by perpetuating undue infrastructure burdens on a historically disadvantaged Tribal community.[21]

10.5.4.3 Mitigation

PIIC requested that other Segment 4 options (i.e., Segment 4 West or Segment 4 West Modification) be prioritized over Segment 4 East to avoid potential impacts to the Elk Run property; this is further described in Section 10.5.2. The Segment 4 CapX Co-Locate Option was not directly addressed by PIIC as it was proposed during scoping. However, the route width would accommodate avoiding the Elk Run property for the Segment 4 CapX Co-Locate Option.

10.5.5 Land Use and Zoning

The ROI for land use and zoning is the ROW. If a route permit is issued, it would supersede and preempt zoning restrictions, building, or land use rules. However, to assess human settlement impacts, potential land use and zoning impacts are addressed by evaluating the project against local land use and zoning ordinances. Impacts to planning and zoning are anticipated to be minimal and can be avoided through selection of alternatives.

10.5.5.1 Existing Conditions

Minnesota authorizes counties and cities to create their own zoning ordinances to implement and work in conjunction with their comprehensive plans. Zoning is a method to regulate the way land is used and create patterns in the way they are used. Zoning is a regulatory device used by local governments to geographically restrict or promote certain types of land uses. Minnesota Statutes provide local governments with zoning authority to promote public health and general welfare.

This project is subject to Minnesota's Power Plant Siting Act (Minnesota Statute § 216E.10). Under this Statute, the route permit issued for a transmission line "shall be the sole site or route approval required to be obtained by the utility. Such permit shall supersede and preempt zoning restrictions, building or land use rules, regulations, or ordinances promulgated by regional, county, local, and special purpose government." Therefore, the applicant is not required to seek permits or variances from local governments to comply with applicable zoning codes. Nonetheless, impacts to local zoning can clearly impact human settlements, and the Commission considers impacts to human settlements as a factor in selecting transmission line routes.

[21] Docket No. 20248-209559-01 [TRIBAL AND AGENCY COMMENTS]

Publicly available zoning information was reviewed for each county and municipality crossed by the route alternatives. Segment 4 has three counties within its ROI including Goodhue, Olmsted, and Wabasha. Map 67 shows the zoning district data that was gathered for the project.

10.5.5.1.1 Goodhue County Plan Analysis

The Goodhue County 2016-2040 Comprehensive Plan provides general guidelines to help manage growth and land use changes, and to promote sound management of the land and water resources within the County (reference (204)). The county's shared vision includes planning for stability and modest growth, and being aware of continued conversion of agricultural land to rural housing and environmental challenges associated with intense land uses and water resources. The Goodhue County Zoning Ordinance includes provisions for the following zoning districts: agricultural, agricultural protection, urban fringe, suburban residence, mixed use hamlet, business industry, wild and scenic river, commercial recreational, floodplains, parks and trails, and conservation subdivision (reference (205)). The project begins in this county, going through agricultural and some residential districts.

10.5.5.1.2 Olmsted County Plan Analysis

The Olmsted County General Land Use Plan was adopted in 2022 (reference (234)). The plan includes land use policies that help to define the community's vision of "how, when, and where growth, redevelopment, and preservation should occur throughout the county" (reference (234)) The Olmsted County Zoning Ordinance (reference (235)) was last updated in 2024. The zoning districts that are outlined in the ordinance are as follows: agricultural protection, agricultural, agricultural urban expansion, agricultural/resource commercial district – aggregate extraction and reuse, agricultural/resource commercial district – land intensive low impact uses, agricultural residential cluster, rural service center, rural residential, low density residential, mixed low density residential, recreational commercial, commercial service, highway commercial, industrial, medical institutional. The project goes through primarily agricultural, with some other smaller areas like residential and commercial zoning districts, when going through the city of Pine Island and through the city of Oronoco.

During the scoping period a resolution was passed by New Haven Township, Oronoco Township, Cascade Township, Pine Island Township, Farmington Township, Haverhill Township, the city of Pine Island, and the city of Oronoco requesting a route that would avoid Oronoco City Park (Lake Shady Park) (reference (287)) (Map 63-1).

The city of Oronoco provided a letter during scoping[22] stating the impacts that Segment 4 East would have to Oronoco City Park and the Lake Shady lakebed. The city of Oronoco believes that this route segment would visually impact residents who are trying to enjoy the walking trails, gazebo, and other amenities in the park. They also have concerns due to the limited space along the east side of MN Hwy 52. In this area there could be significant impacts due to the cliffs and homes that are in and near the proposed ROW in this area. The City Parks department confirmed that there is no planned

[22] Docket No. 20249-210198-06, [PUBLIC COMMENTS 27-49]

construction for the Oronoco City Park in the near future. According to information from the city, the development of the park is complete (reference (288)).

10.5.5.1.3 Wabasha County Plan Analysis

The Wabasha County Land Use Plan was adopted in 1998 (reference (275)). The plan highlights four major issues of concern: the protection of private property rights; the conflicts caused by non-farm residential development in agricultural areas of the County; environmental issues (water quality and steep slope, feedlot, and blufftop development); the amount of land held and continued acquisition of land by the DNR. The Wabasha County Zoning Ordinance was established to “promote, preserve, and protect the public health, safety, and general welfare of the citizens of Wabasha County, along with the integrity of the land and water resources (reference (276)).” It was last updated in 2024. The zoning districts that are outlined in the ordinance are as follows: agricultural protection, agriculture/urban fringe, agriculture/low-density residential, rural residential, floodplain overlay, shoreland overlay, and bluffland overlay. The project goes through only agricultural zoning districts in Wabasha County.

10.5.5.2 Potential Impacts

Transmission line and substation projects have the potential to be incompatible with existing land use patterns, local zoning requirements, and the future land use planning of local governments. Construction and operation of the project is not expected to have a significant impact on land use within the counties crossed by the route alternatives.

Existing land uses along the HVTL would experience short-term impacts during the period of construction. When transmission line construction is complete, project workspaces would be restored as described in Section 3.4.53.4.5. Land uses which are consistent with the safe and reliable operation of the project would be allowed to continue as before.

The project crosses mostly agricultural areas within the ROI of Goodhue County (around 99 percent), Olmsted County (around 98 percent), and Wabasha County (around 100 percent). Transmission lines and substations are typically either permitted or conditional use in areas zoned as agricultural, and transmission lines and substations currently exist in some of these areas. In places where the project crosses sensitive environmental features such as larger perennial watercourses, shoreland, and floodplain districts or overlays are crossed as well.

The project passes through scenic river, shoreland, and floodplain management districts throughout the counties. Minnesota Statute § 103F defines protection of water resources, including floodplain management, wild and scenic rivers, and shoreland areas, and describes limitations on uses and locations of structures in those areas. These limitations are established through special land use provisions to maintain and restore the natural beauty and attractiveness of shoreland and to provide environmental protection for the water resources. These overlay districts were established to protect and enhance shoreland and floodplain areas by establishing additional restrictions and requirements for development and use of these resources. Currently, construction details for the project and exact locations of structures and associated facilities are not known. The project would be designed to span waterbodies and floodplains where practicable and to minimize the number of structures in surface water resources where these resources cannot be spanned. Furthermore, no impacts to the overall function of watersheds are expected. Any impacts that might occur from installation of structure foundations would be minimal and localized. The placement of transmission line structures in floodplains is not anticipated to alter the flood storage capacity of the floodplain based on the minimal size of individual transmission line structures.

A few smaller pockets of commercial and industrial zoning areas are crossed by the project, in particular where the project routes near municipalities. Transmission lines and substations are typically permitted as conditional use in areas zoned as industrial or commercial because these facilities are similar to other infrastructure in industrial and commercial areas.

Based on review of the zoning information for the counties crossed by each route alternative, the likelihood of future residential, commercial, or industrial development within the route alternatives is generally low. Future development would most likely be in or near the incorporated areas traversed by the project.

10.5.5.3 Mitigation

The sample route permit does not include mitigation measures specific to land use and zoning. Section 1.1 of Appendix H states: “Pursuant to Minn. Stat. § 216E.10, this route permit shall be the sole route approval required for construction of the transmission facilities and this route permit shall supersede and preempt all zoning, building, or land use rules, regulations, or ordinances promulgated by regional, county, local and special purpose governments.”

Project impacts to zoning and to current and future land uses can be mitigated by selecting route alternatives that are compatible, to the extent possible, with community zoning and land-use plans. Land-use impacts can be mitigated by minimizing aesthetic impacts of the project, to the extent that zoning and land-use plans address aesthetics (for example, landscaping). Land-use impacts can also be mitigated by using existing ROW to the maximum extent possible. The proposed transmission line is generally compatible with local planning and zoning ordinances. Impacts to planning and zoning are anticipated to be negligible.

10.5.6 Noise

The ROI for noise is the local vicinity. Short-term noise impacts would occur during construction. Impacts would be minimal, and the applicant would be required to comply with state noise standards. Noise impacts during operation would be negligible except for perceptible noise impacts, particularly during periods of foggy, damp, or light rain conditions. Operation of the project would meet state noise standards. Impacts would be minimized by selecting the route with the fewest receptors nearby; receptors are quantified as part of the aesthetics assessment.

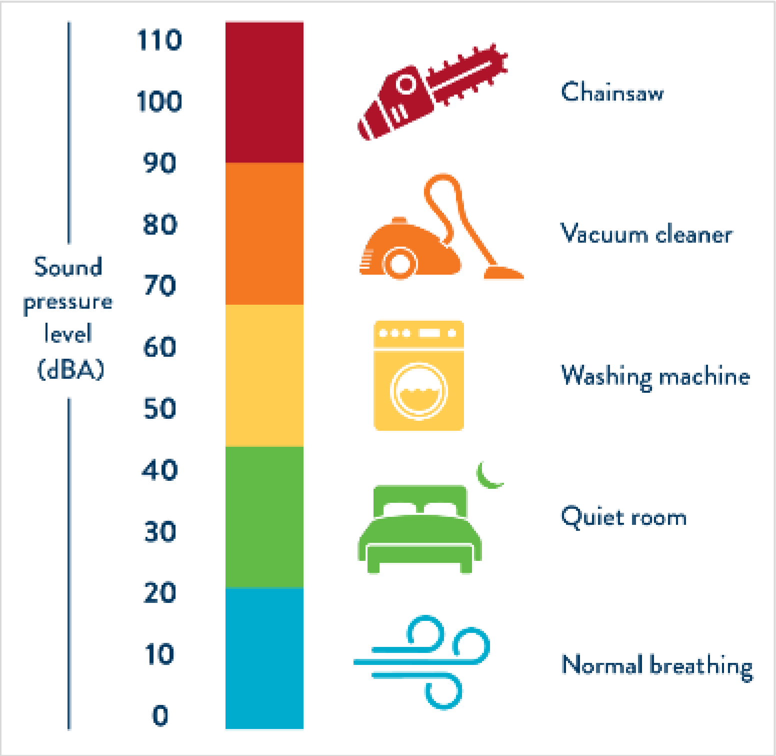
Noises from the project are associated with construction and operation. Noise created by construction activities is anticipated to be minimal for all route alternatives. Construction activity would occur

during a specified time during the day, and only at a specific portion of the project for a few days to weeks at a time over the course of 24 to 27 months. Impacts are expected to be compliant with state noise standards.

10.5.6.1 Existing Conditions

Noise levels are measured in units of dB on a logarithmic scale and can be used to compare a wide range of sound intensities. Human hearing is not equally sensitive to all frequencies of sound, so certain frequencies are given more weight. The A-weighted dBA accounts for the sensitivity of the human ear. It puts more weight on the range of frequencies that the average human ear perceives, and less weight on those we don't, like higher or lower frequencies. An increase of 10 dBA sounds twice as loud, due to the way that the logarithmic scale functions in compressing the measurements associated with sounds (reference (52)). Figure 10-3 illustrates common noise levels at various levels of the dBA scale.

Figure 10-3 Common Activity Noise Levels



The MPCA has the authority to adopt noise standards pursuant to Minnesota Statute § 116.07, subpart 2. The adopted noise standards are set forth in Minnesota Rule 7030, which sets noise limits for different land uses (Table 10-5). These land uses are grouped by NAC and are separated between the daytime and nighttime noise limits. Residences are classified as NAC -- 1 and have the lowest noise limits of the four NACs. A complete list of all land use designations assigned to the NAC categories is available at Minnesota Rule 7030.0050. All project noises must comply with the MPCA noise standards (Table 10-5). The noise standards specify the maximum allowable noise volumes that may not be exceeded for more than 10 percent of any hour (L_{10}) and 50 percent of any hour (L_{50}) (reference (52)).

Table 10-5 Minnesota Noise Standards

	Daytime Limit (dBA)	Daytime Limit (dBA)	Nighttime Limit (dBA)	Nighttime Limit (dBA)
	L_{10}	L_{50}	L_{10}	L_{50}
NAC – 1: Residential and Other Sensitive Uses	65	60	55	50
NAC – 2: Non-Residential Uses (typical Commercial)	70	65	70	65
NAC – 3: Non-Residential Uses (typical Industrial, Agricultural)	80	75	80	75
NAC – 4: Undeveloped Uses	NA	NA	NA	NA

Source: reference (1)

The project ranges through a mix of developed and rural areas. Background noise has the potential to be higher in the more populated areas of the project. Rural areas without significant noise might be in the 30 to 40 dBA range, while noise could be in the 40 to 50 dBA range in more developed portions of the project (reference(53)). Portions of the route parallel existing highways which may further elevate near-field noise levels depending on traffic load. The primary noise receptors within the project area are residences and farmsteads, which are classified as NAC – 1.

For most of the project, ambient noise levels are in the range of 30 to 50 dBA, with temporary, higher noise levels associated with wind, vehicular traffic, and the use of gas-powered equipment (for example, tractors or chain saws). Community noise levels are usually closely related to the intensity of human activity. Noise levels are generally considered low when below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. In rural areas, noise levels can be below 35 dBA. In small towns or wooded and lightly used residential areas, noise levels are more likely to range from 40 to 50 dBA. Levels around 75 dBA are more common in busy urban areas, and levels up to 85 dBA occur near major freeways and airports.

10.5.6.2 Potential Impacts

10.5.6.2.1 Construction Noise

During project construction, temporary, localized noise from heavy equipment and increased vehicle traffic is expected to occur along the ROW during daytime hours during implementation of the project. HVTL 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. Major noise producing activities are associated with clearing and grading, material delivery, augering foundation holes, setting structures, and stringing conductors.

Noise associated with heavy equipment can range between 80 and 90 dBA when operating at full power 50 feet from the source (reference (54)). Heavy equipment generally runs at full power up to 50 percent of the time. Point source sounds decrease six dBA at each doubling of distance (reference (52));

therefore, a 90 dBA sound at 50 feet is perceived as a 72 dBA sound at 400 feet and a 60 dBA sound at 1,600 feet.

Construction noise could reach levels above the state thresholds for short intervals at select times and locations. Any periods of sufficient duration to exceed the MPCA daytime noise limits would be temporary in nature and no exceedances of the MPCA nighttime noise limits are expected for the project. Construction noise could temporarily affect residences, schools, businesses, libraries, parks, recreational areas, and related public spaces that are close to the ROW. An exceedance of noise standards need not occur for a negative impact to occur. For example, interference with conversational speech typically begins at about 60 dBA (reference (55)). A 70 dBA sound interferes with telephone conversations, and an 80 dBA sound interferes with normal conversation. Distinct noise impacts during construction are anticipated to be minimal to moderate depending on proximity to receptors, the activity occurring and equipment being used. Construction noise impacts will be temporary, localized, and intermittent.

10.5.6.2.2 Transmission Line Noise

Noise from transmission lines (electrical conductors) is due to small electrical discharges which ionize surrounding air molecules. The level of noise from these discharges depends on conductor conditions, voltage levels, and weather conditions. Noise emissions are greatest during heavy rain events when the conductors are consistently wet. However, during heavy rains, the background noise level is usually greater than the noise from the transmission line. As a result, audible noise is typically not noticeable during heavy rains. In foggy, damp, or light rain conditions, transmission lines might produce audible noise higher than background levels. During dry weather, noise from transmission lines is a perceptible hum and sporadic crackling sound. The noise modeling for the proposed transmission line indicates that the noise generated by the project will not exceed the most stringent MPCA noise standards of NAC-1 at the edge of the ROW. Therefore, no mitigation is proposed.

10.5.6.3 Mitigation

The sample route permit (Section 5.3.6 of Appendix H) contains the following mitigation related to noise: "The Permittee shall comply with noise standards established under Minnesota Rules 7030.0010 to 7030.0080. The Permittee shall limit construction and maintenance activities to daytime working hours to the extent practicable."

Sound control devices on vehicles and equipment, for example, mufflers; conducting construction activities during daylight hours, and, to the greatest extent possible, during normal business hours; and running vehicles and equipment only when necessary are common ways to mitigate noise impacts. Impacts to state noise standards can be mitigated by timing restrictions if needed. During operation, permittees are required to adhere to noise standards. No additional mitigation is proposed.

10.5.7 Property Values

The ROI for property values is the local vicinity. Property values are impacted by many interconnected factors. If effects do occur due to transmission lines and substations, research has shown these effects to be almost always less than 10 percent. Impacts are anticipated to be minimal. However, it is acknowledged that every landowner has a unique relationship and sense of value associated with their property and impacts. Impacts of the project would be minimized by selecting the route with the fewest residences nearby; residences are quantified as part of the aesthetics assessment.

10.5.7.1 Existing Conditions

The ROI for property values is the local vicinity. Residences located within the local vicinity of Segment 4 are summarized in the aesthetics impact analysis (Section 10.5.1). Map 68 includes residence locations within the route width of the route alternatives; they are also shown on Map 66. For a general sense of the number of residences within the ROI and as shown in Figure 10-1:

- Segment 4 West has 96 residences within the local vicinity,
- Segment 4 West Modification has 113 residences within the local vicinity,
- Segment 4 East has 258 residences within the local vicinity, and
- The CapX Co-Locate Option has 40 residences within the local vicinity.

10.5.7.2 Potential Impacts

Potential impacts of overhead transmission lines on property values generally are connected to three main factors. First, how the transmission line affects the viewshed and aesthetics of a property. Second, the real or perceived risks that buyers have of EMF. Third, the effects to agricultural production on properties that are used for farming operations. The aforementioned factors are only some of the many interconnecting factors that affect property values. Because of this, it is difficult to measure how much and the numerous ways that transmission lines and property values are correlated.

A variety of methodologies have been used to research the relationship between transmission lines and property values. Some general conclusions can be drawn from this body of literature. This discussion highlights relevant outcomes of property value research with additional detail provided in Appendix I.

Research does not support a clear cause-and-effect relationship between property values and proximity to transmission lines, but has revealed trends that are generally applicable to properties near transmission lines:

- When negative impacts on property values occur, the potential reduction in value is in the range of one to 10 percent.
- Property value impacts decrease with distance from the line; thus, impacts are usually greater on smaller properties than on larger ones.
- Negative impacts 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 greater effect on sale price than the presence of a transmission line.
- The value of agricultural property decreases when transmission line structures interfere with farming operations.

Every landowner has a unique relationship and sense of value associated with their property. Thus, a landowner's assessment of potential impacts to their property's value is often a deeply personal comparison of the property "before" and "after" a proposed project is constructed. These judgments, however, do not necessarily influence the market value of a property. Rather, appraisers assess a property's value by looking at the property "after" a project is constructed. Moreover, potential market participants likely see the property independent of the changes brought about by a project; therefore, they do not take the "before" and "after" into account the same way a current landowner might.

10.5.7.3 Mitigation

The sample route permit does not include any specificity around mitigation required for property values.

The applicant would be responsible for any construction-related damages and for returning affected property to its original condition, which would help maintain property value. As discussed in Section 3.3.2.2, for properties crossed by the ROW, the applicant would develop a fair market value offer and, once ROW is acquired, would contact the landowner to discuss any special considerations that might be needed (for example, for fences, crops, or livestock). Impacts could also be mitigated by using the protections offered through Minnesota Statute § 216E.12 (commonly known as the "Buy the Farm" statute), where available, to move away from potential property value impacts.

10.5.8 Recreation

The ROI for recreation is the route width. Impacts to recreation are assessed through identification of recreational resources within the ROI and reviewing their use and proximity to the anticipated alignment in comparison to other features that are a part of the natural or built environment. Recreational resources that are present include a publicly accessible trail system (Douglas State Trail), public watercourse (including a designated state water trail), and snowmobile trails. Intermittent and localized indirect impacts could occur during construction (for example, increased noise levels); long-term impacts during operation could occur in the form of aesthetic impacts (Section 10.5.1). Given that direct long-term effects are predominantly related to aesthetics, the indirect long-term repercussions on recreation are anticipated to be subjective, meaning that responses vary based on individual perspectives and experiences.

10.5.8.1 Existing Conditions

Recreation within Segment 4's ROI consists primarily of outdoor recreational opportunities including picnicking, hiking, cross country skiing, biking, bird watching, fishing, hunting, canoeing/kayaking, and snowmobiling. Publicly accessible recreational areas within the ROI are summarized in Table 5-6, shown in Map 63, and further discussed below. One additional recreational resource, the Lake Zumbro Park, is located north of the Segment 4 CapX Co-Locate Option but outside of the ROI (Map 63-3). For Segments 1, 2, and 3, there are publicly accessible lands that may be used for recreational purposes but also serve to provide wildlife habitat. There are none within Segment 4's ROI, as noted in Section 10.9.12.

Table 10-6 Recreational Resources within the ROI

Recreational Resource Type	Recreational Resource	Unit	Segment 4 West	Segment 4 West Modification	Segment 4 East	Segment 4 CapX Co-Locate Option
State Trails	Douglas State Trail	miles	0.5	8.1	0	0
State Water Trails	Zumbro River	crossing count	4	4	3	1
		linear feet	7,550	9,563	4,330	1,792
Snowmobile Trails	Goodhue County Trails	miles	0.1	0.1	1.1	0.5
	Tiger Bear I County Snow Trails	miles	0.7	4.4	1.3	0
	Zumbrowatha Trails	miles	0.2	0.2	1.4	2.6
	Total snowmobile trails	miles	1.0	4.7	3.8	3.1

The Douglas State Trail is located within the ROI of Segment 4 West for 0.5 miles and Segment 4 West Modification for 8.1 miles (Map 63-1 and Map 63-2). The trail is a 12.5-mile paved and natural surface trail system that begins near northwestern Rochester, travels through the town of Douglas, and ends in Pine Island (reference (289)). The trail is used for bicycling, hiking, in-line skating, horseback riding, and snowmobiling (reference (289)). In most areas, but not all, the trail is lined with trees on at least one of its sides. Existing infrastructure, including roads, crosses the trail in multiple locations. An existing 161 kV transmission line is adjacent to the trail in some areas that coincide with the location of Segment 4 West Modification.

Watercourses provide opportunities for recreation throughout the project area. Some watercourses hold special designations, such as state water trails and national or state wild and scenic rivers. State water trails are miles of waters publicized for canoeing, kayaking, and camping (reference (60)). The Zumbro River is designated as a state water trail. Segment 4 West and Segment 4 West Modification cross the Zumbro River four times, Segment 4 East crosses the Zumbro River three times, and the Segment 4 CapX Co-Locate Option only crosses once (Map 63). There are existing transmission lines at most of the crossings, including the one crossing of Segment 4 CapX Co-Locate Option. The ROI of the Segment 4 CapX Co-Locate Option contains the least linear feet of the watercourse (Table 5-6).

Several snowmobile trails are located within the ROI (Table 5-6; Map 63). The trails are maintained by the Zumbrota Covered Bridge Riders, Tiger Bear I, and the Elba Snowbirds.

In addition to the recreational resources summarized in Table 5-6, three recreational resources have been noted by the public and include: a private airstrip, the Rochester Archery Club, and the Rochester Aero Model Society (RAMS). All three are located within the ROI of Segment 4 West, or nearby it.

The Rochester Archery Club is within the route width of Segment 4 West (Map 63-3). The Rochester Archery Club is a 43-acre site used for bowhunting and target archery by its members (reference (290)). Segment 4 West parallels the northern edge of the archery club for approximately 0.2 miles. Members of the archery club noted the property is used for various recreational activities, including hosting 4H and Bear Cubs.

The Rochester Aero Model Society (RAMS) is within the route width of Segment 4 West (Map 63-3). The RAMS is a radio-controlled fuel and electric-powered airplane club with an FAA-Recognized Identification Area that is used for flying (reference (291)). Segment 4 West parallels the southern edge of the RAMS club for approximately 0.5 miles.

During scoping, a commenter noted the presence of a private airstrip that is used for recreational resources. It is approximately 0.3 miles north of the route width of Segment 4 West.

The city of Oronoco provided a letter during scoping stating impacts that it considers Segment 4 East would have on Oronoco City Park; this is discussed in Section 10.5.5.1.2.

10.5.8.2 Potential Impacts

Effects on recreation due to construction of the project are anticipated to be minimal and temporary in nature, lasting only for the duration of construction and are anticipated to include short-term disturbances, such as increased noise and dust, as well as visual impacts. They could also detract from nearby recreational activities and, during construction, could require short-term closures across the Douglas State Trail which would impact pedestrians and bikers. Construction activities also could, depending on the timing, affect nearby hunting or wildlife viewing opportunities in public spaces by temporarily displacing wildlife. Wildlife, however, is expected to return to the area once construction has been completed.

Once constructed, the project would result in modified viewsheds or new visual impacts caused by new built features introduced to the landscape, which could change the aesthetic of a recreational destination in a way that changes the experience or reduces visitor use. Because direct long-term impacts are primarily aesthetic in nature, indirect long-term impacts to recreation are expected to be subjective and unique to the individual. These unavoidable impacts might affect unique resources. Potential impacts can be minimized through prudent routing. Visual impacts are discussed in Section 10.5.1. While visual impacts would occur, the project is not anticipated to impede recreational activities, such as snowmobiling, golfing, canoeing, hunting, or fishing.

Members of the Rochester Archery Club noted during scoping that potential impacts could include degradation of the natural setting of the property and potential impacts to the property's fencing.[23]

The powerline would cross the main landing approach of the RAMS Club and could require the club to modify its approach. A modified approach might be infeasible or could result in decreased safety or increased risk of damaging aircrafts.[24]

The owner of the private airstrip included a map of the airstrip and noted departure paths which traverse southwest before turning north or turning south. Where the approaches turn north or south, an existing 345 kV transmission line is present. The commentor indicated that new lines or higher lines would impede the path for a safe landing.[25]

10.5.8.3 Mitigation

Impacts to recreation can be mitigated by prudent routing and/or selecting route alternatives that avoid resources used for recreational purposes. The applicant committed to installing appropriate signage along recreational areas to warn trail users of ongoing construction.

Impacts can also be mitigated by reducing impacts to natural landscapes. Specifically, impacts could be reduced by paralleling existing infrastructure and/or sharing existing ROW. The applicant committed to coordinating with local governments, the DNR, and USFWS to ensure construction of the project will not significantly impact nearby natural resources that could influence recreation.

If Segment 4 West is selected as a part of the final route, the applicant would be required to further coordinate with the owner of the private airstrip, the Rochester Archery Club, and the Rochester Aero Model Society.

10.5.9 Socioeconomics

The ROI for socioeconomics is the three-county area. Impacts are qualitatively assessed based on the influx of workers during construction activities. Economic factors related to construction and operation of the project are anticipated to be short-term and positive, but minimal. Positive impacts come from increased expenditures at local businesses during construction, the potential for some materials to be purchased locally, and the use of local labor.

10.5.9.1 Existing Conditions

Segment 4 is in southeastern Minnesota. Labor force and unemployment data was used from the 2019-2023 American Community Survey, 5-Year Estimates from the US Census Bureau, and the Minnesota Department of Employment and Economic Development. Table 10-7 shows the compiled

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[23] Docket No. 20249-210198-08, [PUBLIC COMMENTS 50-96]
[24] Docket No. 20253-216353-01, [Rochester Aero Model Society]
[25] Docket No. 20249-210198-04, [PUBLIC COMMENTS 1-26]

population and economic data on Minnesota and the counties that Segment 4 intersect, including Goodhue, Olmsted, and Wabasha Counties.

Table 10-7 Population, Income, and Employment

County	Population	Population Density (population/ sq. miles)	Labor Force Participation (%)	Labor Force	Labor Force Unemployment Rate (%)	Per Capita Income	Median Household Income
Minnesota	5,024,279	71.7	68.7	4,537,247	4.0	$44,947	$84,313
Goodhue	47,844	63.4	64.9	25,038	2.3	$42,254	$82,749
Olmsted	164,784	252.1	69.2	90,174	2.1	$51,880	$87,856
Wabasha	21,519	41.5	65.9	11,412	1.5	$42,262	$80,133

County populations within Segment 4 range from around 21,000 to 164,000. The highest population and population density within Segment 4 is in Olmsted County. At the county level, change in population between the 2010 and 2020 census saw the largest percent increase in Olmsted County (12.7 percent), with a more modest increase in Goodhue County (2.9 percent), and a decline in population in Wabasha County (1.3 percent).

The labor force unemployment rate in Segment 4 ranges from 1.5 percent in Wabasha County to 2.3 in Goodhue County. All counties in Segment 4 have an unemployment rate below the state of Minnesota. Per capita income for counties crossed by Segment 4 range from $42,254 to $51,880. The highest per capita income is in Olmsted County.

The median household income ranges from $80,133 in Wabasha County to $87,856 in Olmsted County. All of the counties, besides Olmsted, had a median income lower than the state of Minnesota, which has a median income of around $84,000.

According to the 2019-2023 American Community Survey, 5-Year Estimates from the US Census Bureau, Goodhue, Olmsted, and Wabasha County's largest industry in terms of employment is "Educational services, health care, and social assistance." The second largest industry in terms of employment for all counties was "Manufacturing."

10.5.9.2 Potential Impacts

Potential socioeconomic impacts would be short-term due to the time frame of construction (2-3 years). An influx of construction jobs and personnel, delivery of construction material, temporary housing, and other purchases from local businesses will occur during that time. Slight increases in retail sales in the project area are expected. These would include purchases of lodging, food, fuel, construction materials, and other merchandise. No long-term impacts are expected in transmission line and substation projects.

Construction of the transmission line would employ approximately 50-100 workers over the 2-3 years of the project, per the joint certificate of need application and route permit application. The applicant committed in the joint certificate of need application and route permit application to pay prevailing wages for applicable construction jobs. Local construction crew expenditures would result in temporary, positive impacts on local economies.

Workers would likely be commuting to the area instead of relocating to the project area. Construction workers traveling to the area might find temporary housing over the span of the project, but this might move with construction along the project area. The construction and operation of the project are not anticipated to create or remove jobs over the long term or result in the permanent relocation of individuals to the area.

10.5.9.3 Mitigation

Adverse impacts are not expected; therefore, mitigation is not proposed.

10.5.10 Transportation and Public Services

The ROI for transportation and public services varies. For roadways and rail, the ROI is the local vicinity. For public utilities, the ROI is the ROW. For emergency services, the ROI is the three-county area. For airports, the ROI is within 3.78 miles. Impacts are expected to primarily be related to construction activities and would be short-term and minimal. Negative impacts, such as traffic delays, should be negligible. Long-term impacts to public services are also anticipated to be minimal. Impacts are unavoidable but can be minimized and mitigated.

10.5.10.1 Roadways and Railways Existing Conditions

In addition to numerous other county, city, and township roads, Segment 4 is located adjacent to or crosses the below-listed US highways and MN highways.

- US Highway 52, which Segment 4 East crosses six times and Segment 4 West, Segment 4 West Modification, and Segment 4 CapX Co-Location options each cross once.
    - Segment 4 East is parallel to it for 6.4 miles.
    - Segment 4 West is parallel to it for 0.1 miles.
- US Highway 63, which Segment 4 East crosses three times, and Segment 4 West crosses once.
    - Segment 4 East is parallel to it for 3.4 miles.
- MN Highway 60, which Segment 4 West Modification and Segment 4 CapX Co-Location options each cross once.

There are no railroads that intersect or parallel with Segment 4.

10.5.10.2 Public Utilities Existing Conditions

Electric utilities near the project are provided by numerous entities (reference (64)), including:

- Northern States Power Company
- Dakota Electric Association

- Kenyon Municipal Utilities
- Goodhue County Coop Elec Assn
- People's Cooperative Services
- Rochester Public Utilities

Natural gas service in the project area is provided by several entities, including Northern States Power Company, Franklin Heating Station, Rochester Public Utilities, Westside Energy Station, Invenergy, and Minnesota Municipal Power Agency. Segment 4 intersects with natural and other utility pipelines 8 separate times. Segment 4 West and Segment 4 West Modification each have four pipeline crossings. The Segment 4 CapX Co-Locate Option has one pipeline crossing.

Potable water in Segment 4 is largely supplied by local wells. Near urban areas, primarily within municipalities, water mains and other public utilities are provided. Goodhue, Olmsted, and Wabasha Counties have septic programs that conduct inspection services, issue permits, and oversee installation and maintenance of private septic systems and wells in Segment 4. Public works and utility departments design, construct, and maintain sanitary sewers, streets and sidewalks, storm sewers, and water mains.

10.5.10.3 Emergency Services Existing Conditions

Emergency services in Segment 4 are provided by local law enforcement and emergency response entities, fire departments, and ambulance services of various counties and communities. Sheriffs' offices and municipal police departments provide regional law enforcement to Goodhue, Olmsted, and Wabasha Counties and their respective cities in Segment 4 of Pine Island, Oronoco, and Rochester. Fire departments would provide emergency fire response services in Segment 4. Fire services are provided by city and community fire departments in Pine Island, Oronoco, and Rochester, which have volunteer fire departments. Ambulance districts provide emergency medical response services throughout Segment 4. Emergency medical response is available from local medical clinics. A list of emergency services for Segment 4 is as follows:

- Pine Island Police Department
- Rochester Police
- Goodhue County Sheriff Department
- Olmsted County Sheriff Department
- Wabasha County Sheriff Department
- Pine Island Fire Department
- Oronoco Fire Department
- Rochester Fire Department
- Zumbrota Volunteer Fire Department
- Mayo Clinic Hospital - Rochester
- Olmsted Medical Center – Wanamingo

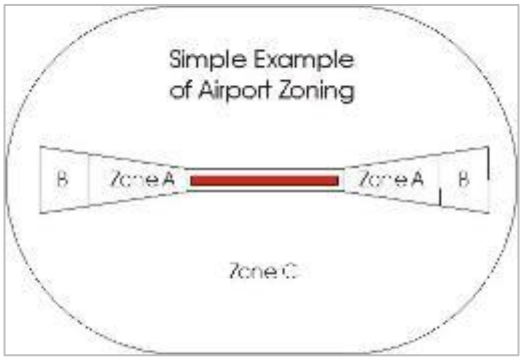
10.5.10.4 Airports Existing Conditions

Transmission line structures and conductors can conflict with the safe operation of an airport if they are located within applicable safety zones. Airports are defined by the state and the FAA as areas of land or water that are used or intended to be used for the landing and takeoff of aircraft, and includes the surrounding area used or intended to be used for airport buildings and facilities (14 C.F.R. Part 1, § 1.1 and Minn. R. 8800.0100, subp. 3). Different classes of airports have different safety zones depending on several characteristics, including runway dimensions, classes of aircraft they can accommodate, and navigation and communication systems (reference (65)). These factors determine the necessary take-off and landing glide slopes, which in turn determine the setback distance of transmission line structures.

The FAA and MnDOT each have established development guidelines on the proximity of tall structures to public-use airports. Transmission lines near public airports are limited by FAA height restrictions, which prohibit transmission line structures above a certain height, depending on the distance from the specific airport. FAR Part 77 and Minn. R. 8800.1200 establish guidelines on heights for any structures that could endanger aircraft, which includes either structures exceeding 200 ft above ground level (AGL) or the airport elevation, whichever is greater. These guidelines impose stricter regulations for structures within a maximum distance of 20,000 ft (3.78 miles) of a public use or military airport. Regulatory obstruction standards only apply to those airports that are available for public use and are listed in the FAA airport directory. Per Minnesota Rules 8800.2400, private airstrips and personal use airstrips cannot be used in commercial transportation or by the public and are not subject to FAA regulatory obstruction standards.

In addition, MnDOT has established separate zoning areas around airports as shown in Figure 10-4. The most restrictive safety zones are safety zone A, which does not allow any buildings, temporary structures, places of public assembly, or transmission lines, and safety zone B, which does not allow places of public or semi-public assembly such as churches, hospitals, or schools. Permitted land uses in both zones include agricultural uses, cemeteries, and parking lots. Safety zone C, the horizontal airspace obstruction zone, encompasses all land enclosed within the perimeter of the imaginary horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs of specified radii (5,000 to 10,000 feet) from the center of each end of the primary surface of each runway, and which is not included in zone A or zone B. As with FAA regulations and per Minnesota Rules 8800.2400 subpart 1, MnDOT zoning requirements only apply to public airports and are recommended for private airports (reference (66)).

Figure 10-4 MnDOT Example of Airport Zoning



Source: reference (67))

There are no public airports within 20,000 feet (3.78 miles) of Segment 4.

There is one private airstrip located within 20,000 feet of Segment 4. The Nietz Airstrip (FAA identifier MN32) is a private use airstrip that is around 6,700 feet north of the Segment 4 CapX Co-Locate Option, just east of the Zumbro River (Map 65).

During scoping, a commenter noted the presence of a private airstrip approximately 0.3 miles north of the route width of Segment 4 West.[26] This airstrip is used for recreational resources and is discussed in Section 10.5.8.

10.5.10.5 Potential Impacts

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

Construction could cause moderate, localized impacts to roadways that would be short-term in nature. Construction activities occasionally cause lanes or roadways to be closed. These closures would only last for the duration of the construction activity in a given area. Construction equipment and delivery vehicles would increase traffic along roadways throughout project construction, with effects lasting from a few minutes to a few hours, depending upon the complexity and duration of the construction activities. Drivers could experience increased travel times as a result. Construction vehicles could temporarily block or alter public access to streets and businesses. Lane closures and traffic management might pose safety concerns to workers and the public as active traffic and workers move throughout the construction space. Additionally, construction along roadways can increase dust as grading occurs, which can obscure road lines or vision.

[26] Docket No. 20249-210198-04, [PUBLIC COMMENTS 1-26]

Vehicles and equipment that would be used for construction of the transmission line (for example, overhead line cranes, concrete trucks, construction equipment, and material delivery trucks) are generally heavy load vehicles and can cause more damage to road surfaces. Oversized/overweight load permits must be obtained from MnDOT and county road authorities when size and/or weight limits would be exceeded.

During operation, severe weather, including high winds, ice, snowstorms, and tornadoes, could result in structure damage. If structures and lines fall over or otherwise reach the ground, they would create safety hazards on any roadways located within the designed fall distance of an overhead transmission line parallel to existing roadways. Snow and ice accumulation and high winds could make the transmission line more susceptible to failure or collapse.

The applicant indicated that its design standards would meet or surpass NESC requirements for the safe design and operation of transmission lines. These standards include designing transmission lines to withstand severe winds from summer storms and the combination of ice and strong winds from winter weather.

Potential impacts to the electrical grid and other utilities during construction are anticipated to be short-term, intermittent, and localized. In some areas, the project could cross over existing transmission lines, follow existing transmission line ROW, or cross or parallel electric distribution lines. An overarching project objective is to provide additional transmission capacity to reduce congestion and to improve electric system reliability throughout the region as more renewable energy resources are added to the high voltage transmission system. Project operations would, therefore, have long-term beneficial impacts by providing additional transmission line capacity in the project area.

The project crosses pipeline ROWs in eight separate locations in Segment 4. Potential pipeline impacts are expected to be avoided and mitigated by coordinating with the appropriate pipeline companies. The applicant indicated that they would use the Gopher State One-Call system to locate and mark underground utilities prior to ground-disturbing activities. Transmission lines have the ability to cause AC interference on pipelines. Engineering analysis and induction study can be done to determine the extent of possible impacts and determine if co-location is feasible and reasonable.

The project is not anticipated to impact emergency services. Construction and operation of the project is not expected to impact heliports operating from hospitals. Temporary road closures required during construction would be coordinated with local jurisdictions to provide for safe access of police, fire, and other emergency service vehicles. Accidents that might occur during construction would be handled through local emergency services. Given the limited number of construction workers involved in the project and the low probability of a construction-related accident, the existing emergency services should have sufficient capacity to respond to emergencies. During operation, emergency services providers could receive 911 phone calls in the event of a fallen transmission line structure.

Potential airport impacts, as they exist today, are anticipated to be minimal as there are mitigation measures that can be employed to avoid these impacts, such as routing away from the airport, the use of appropriate height structures to avoid impact to glide or approach slopes, and structure marking or lighting. The Nietz Airport is located within 3.78 miles of the Segment 4 CapX Co-Locate Option. Potential impacts to private airstrips would be determined through an analysis of proximity and location in relation to the airstrips, as well as discussions with landowners.

10.5.10.6 Mitigation

The sample route permit (Sections 5.3.4 and 5.3.14 of Appendix H) contains the following mitigation related to transportation:

"The Permittee shall cooperate with county and city road authorities to develop appropriate signage and traffic management during construction."

"The Permittee shall keep records of compliance with this section and provide them upon the request of Commerce or Commission staff."

"The Permittee shall advise the appropriate governing bodies having jurisdiction over all state, county, city, or township roads that will be used during the construction phase of the Transmission Facility. Where practical, existing roadways shall be used for all activities associated with construction of the Transmission Facility. Oversize or overweight loads associated with the Transmission Facility shall not be hauled across public roads without required permits and approvals."

"The Permittee shall promptly repair private roads or lanes damaged when moving equipment or when accessing construction workspace, unless otherwise negotiated with the affected landowner."

The applicant committed to attempt to avoid or limit roadway closures to the maximum extent practicable and use conductor safety guides over roads, or utilize helicopters for stringing activities where possible. The applicant also noted impacts to traffic would be mitigated by limiting construction traffic to the project right-of-way and existing access points to the maximum extent feasible and minimizing impacts related to dust by proper use of BMPs (e.g., soil matting, wetting) to reduce the potential for dust. The applicant also committed to utilizing appropriate safety measures such as use of safety signage, installation of temporary barrier structures, and employing spotters during clearing or stringing activities. Finally, the applicant would meet with MnDOT, county highway departments, township road supervisors, and/or city road personnel to address any issues that occur during roadway construction.

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to public services and utilities: "During Transmission Facility construction, the Permittee shall minimize any disruption to public services or public utilities. To the extent disruptions to public services or public utilities occur these shall be temporary, and the Permittee shall restore service promptly. Where any impacts to utilities have the potential to occur the Permittee would work with both landowners and local entities to determine the most appropriate mitigation measures if not already considered as part of this route permit."

In the joint certificate of need application and route permit application, the applicant committed to ongoing coordination with MnDOT, local and county road authorities, railroad companies, and the FAA.

MnDOT and rail operator design guidelines would need to be met for any utility occupation of road and railroad ROW and a permit from MnDOT would be required to use any state highway ROWs. MnDOT has a formal policy and procedures for accommodating utilities within or as near as feasible to highway ROWs. The applicant would continue to work with MnDOT and, as noted in Section 2.7.3, has completed ENMs and will be required to complete a constructability report. Additionally, the applicant has committed to coordinating with county and township road departments to minimize impacts on local roads and highways. The applicant also noted in the joint certificate of need application and route permit application that at the suggestion of MnDOT, they met with the Mississippi River Parkway Commission to discuss the crossing of Minnesota Highway 61, or the Great River Road, and explained that the crossing location would use existing structures.

Where the project crosses pipeline ROWs, mitigation might be required. If induction mitigation is necessary, the pipeline company would have to approve the mitigation being installed and the applicant would be responsible for the added project costs.

The applicant committed to coordinating with local emergency services to ensure that emergency access to areas near construction activities is maintained.

10.6 Human Health and Safety

The ROI for electric and magnetic fields (EMF) is the ROW. Impacts to human health from possible exposure to EMFs are not anticipated. The HVTL would be constructed to maintain proper safety clearances. EMF associated with the project are below Commission permit requirements, and state and international guidelines. Potential impacts would be long-term and localized. These unavoidable impacts would be of a small size and can be mitigated. Impacts would be minimized by appropriate placement and adhering to electric field standards for transmission lines.

10.6.1 Electric and Magnetic Fields (EMF)

The ROI for electric and magnetic fields (EMF) is the ROW. Impacts to human health from possible exposure to EMFs are not anticipated. The HVTL would be constructed to maintain proper safety clearances. EMF associated with the project are below Commission permit requirements, and state and international guidelines. Potential impacts would be long-term and localized. These unavoidable impacts would be of a small size and can be mitigated. Impacts would be minimized by appropriate placement and adhering to electric field standards for transmission lines.

10.6.1.1 Existing Conditions

The term "EMF" is typically used to refer to electric and magnetic fields that are coupled together. EMF is associated with natural sources such as lightning and sunlight. EMFs are also invisible lines of force that surround electrical devices (for example, power lines, electrical wiring, and electrical equipment) which are produced through the generation, transmission, and use of electric power (reference (70)). However, for lower EMF frequencies associated with power lines, electric and magnetic fields are relatively decoupled. Generally, electric fields are dependent on the voltage of a transmission line and magnetic fields are dependent on the current carried by a transmission line.

Electric fields are the result of electric charge, or voltage, on a conductor. Using a garden hose as an analogy, voltage is equivalent to the pressure of the water moving through the hose. The intensity of an electric field is related to the magnitude of the voltage on the conductor and is measured in kV per meter (kV/m). Magnetic fields are created and increase from the strength of the flow of current through wires or electrical devices. Using the same analogy, current is equivalent to the amount of water moving through the garden hose. The intensity of a magnetic field is related to the magnitude of the current flow through the conductor and is measured in units of Gauss (G) or milliGauss (mG).

Because the EMF associated with a transmission line is proportional to the amount of electrical current passing through the power line, it will decrease as distance from the line increases (reference (71)). This means that the strength of EMF that reaches a house adjacent to a transmission line ROW will be significantly weaker than it would be directly under the transmission line. Electric fields are easily shielded by conducting objects, such as trees and buildings, further shielding electric fields.

Magnetic fields, unlike electric fields, are not shielded or weakened by materials that conduct electricity (for example, trees, buildings, and human skin). Rather, they pass through most materials. Both magnetic and electric fields decrease rapidly with increased distance from the source. Electric and magnetic fields are invisible, just like radio, television, and cellular phone signals, all of which are part of the electromagnetic spectrum (reference (70)).

Electric and magnetic fields are found anywhere there are energized, current-carrying conductors, such as near transmission lines, local distribution lines, substation transformers, household electrical wiring, and common household appliances. The frequency from transmission lines is considered “non-ionizing, low-level radiation which is generally perceived as harmless to humans” (reference (70)). Table 10-8 illustrates the typical ranges of electric and magnetic fields of frequently and commonly used appliances that would be in a home (reference (70)).

Table 10-8 Electric and Magnetic Field Ranges for Common Household Appliances

Electric Field [1]		Magnetic Field [2]			
Appliance	kV/m	Appliance	mG		
	1 foot		1 inch	1 foot	3 feet
Stereo	0.18	Circular saw	2,100 to 10,000	9 to 210	0.2 to 10
Iron	0.12	Drill	4,000 to 8,000	22 to 31	0.8 to 2
Refrigerator	0.12	Microwave	750 to 2,000	40 to 80	3 to 8
Mixer	0.10	Blender	200 to 1,200	5.2 to 17	0.3 to 1.1
Toaster	0.08	Toaster	70 to 150	0.6 to 7	< 0.1 to 0.11
Hair Dryer	0.08	Hair dryer	60 to 200	< 0.1 to 1.5	< 0.1
Television	0.06	Television	25 to 500	0.4 to 20	< 0.1 to 1.5
Vacuum	0.05	Coffee maker	15 to 250	0.9 to 1.2	< 0.1

[1] German Federal Office for Radiation Safety
[2] Long Island Power Institute

Research on whether exposure to magnetic fields causes biological responses and health effects has been performed since the 1970s. The U.S. National Institute of Environmental Health Sciences and the World Health Organization's research does not support a relationship or association between exposure to electric power EMF and adverse health effects. The U.S. National Institute of Environmental Health Science evaluated numerous epidemiologic studies and comprehensive reviews of scientific literature regarding association of cancers with living near power lines, with magnetic fields in the home, and with exposure of parents to high levels of magnetic fields in the workplace. They concluded that "no consistent evidence for an association between any source of non-ionizing EMF and cancer has been found" (reference (72)).

Minnesota, Wisconsin, and California have performed literature reviews and research examining EMF. In 2002, Minnesota formed an Interagency Working Group to evaluate EMF research and develop public health policy recommendations for any potential problems arising from EMF effects associated with high-voltage transmission lines. The Working Group included staff from a number of state agencies and published its findings in a White Paper titled *EMF Policy and Mitigation Options*. Their research found that some epidemiological studies have shown no statistically significant association between exposure to EMF or health effects, and some have shown a weak association. Studies have not been able to establish a biological mechanism for how magnetic fields could cause cancer (reference (73)).

There is no federal standard for transmission line electric fields. The Commission has imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground (reference (74)). The Commission has not adopted a magnetic field standard for transmission lines. Appendix J provides detailed background on EMF health impact research.

10.6.1.2 Potential Impacts

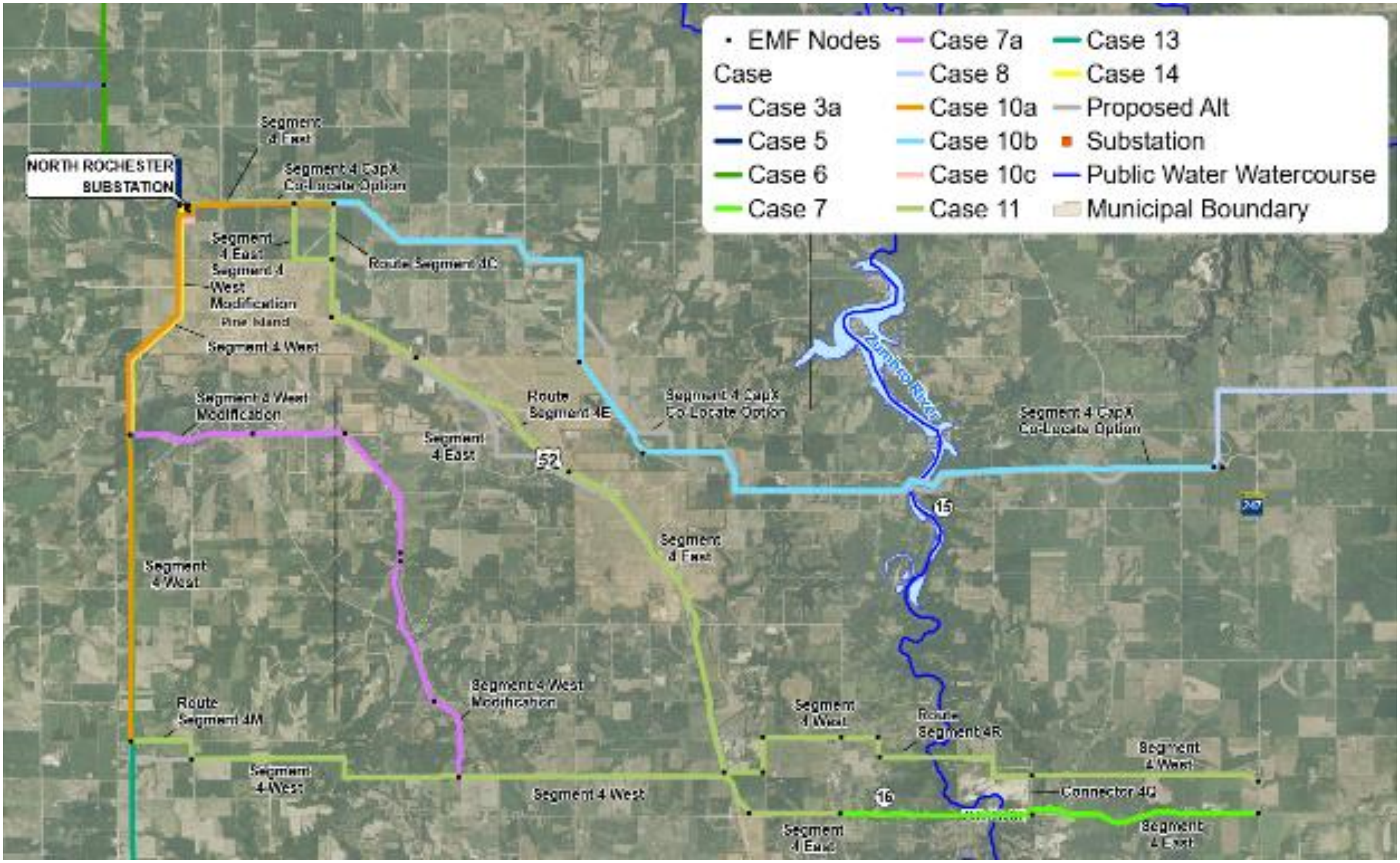
The magnitude of the voltage on a transmission line is near-constant and ideally within plus or minus five percent of the designed voltage. Because of this, the magnitude of the electric field will also be near constant regardless of the power flowing down the line. The maximum electric field associated with the project and measured at one meter (3.28 feet) above the ground, is calculated to be 6.9 kV/m. The strength of electric fields diminishes rapidly as the distance from the conductor increases. The maximum electric field values are provided in Table 10-9 and the corresponding case number is shown in Figure 10-5.

Table 10-9 Electric Field Calculations

Structure Type	Circuits Present	Case	Maximum within ROW
Single Pole, Davit Arm, 345 kV Single Circuit	Wilmarth – North Rochester 345 kV	Case 1	6.2 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild	Wilmarth – North Rochester 345 kV & Line 832 115 kV	Case 2	2 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild	Wilmarth – North Rochester 345 kV & Line 706, 707 or 708 69 kV	Case 3a, Case 3b, Case 3c	1.5 kV/m
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit	Wilmarth – North Rochester 345 kV / Line 964 345 kV	Case 4	6.4 kV/m
Single Pole, Tangent/Dav it Arm, 345 kV Double Circuit	Wilmarth – North Rochester 345 kV & Line 964 345 kV	Case 5	5.2 kV/m
Single Pole, Tangent/Dav it Arm, 345 kV Double Circuit with 69 kV Underbuild	Wilmarth – North Rochester 345 kV , Line 964 345 kV & Line 739 69 kV	Case 6	1.2 kV/m
Single Pole, Davit, 161/69 kV Double Circuit	North Rochester – Chester 161 kV & Peoples Line 69 kV	Case 7	1.5 kV/m
Single Pole, Tangent, 345 kV Double Circuit	North Rochester – Tremval 345 kV, Line 965 345 kV	Case 8	6.3 kV/m
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 9	1.3 kV/m
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit	North Rochester – Chester 161 kV & Line 979 345 kV	Case 10a	6.9 kV/m
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit	North Rochester – Chester 161 kV / Line 965 345 kV, North Rochester – River 345 kV	Case 10b	6.2 kV/m
Single Pole, Davit, 161 kV Single Circuit	North Rochester – Chester 161 kV	Case 11	2.7 kV/m
Single Pole, Tangent, 345 kV Double Circuit Single Circuit	Wilmarth – North Rochester 345 kV	Case 12	6.2 kV/m

Structure Type	Circuits Present	Case	Maximum within ROW
Single Pole, Tangent, 345 kV Double Circuit	Wilmarth – North Rochester 345 kV, Line 979 345 kV	Case 13	4.9 kV/m
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit	North Rochester –Chester 161 kV, Line 5310 161 kV / Wilmarth –North Rochester 345 kV, Line 979 345 kV	Case 14	5.0 kV/m

Figure 10-5 Segment 4, EMF Nodes



The projected magnetic fields are provided in Table 10-10 and the corresponding case number is shown in Figure 10-5. Because magnetic fields are dependent on the current flowing on the line, calculations were based on two typical system conditions that are likely to occur during the project's first year in service. The two scenarios are system peak energy demand and system average energy demand.

Table 10-10 Calculated Magnetic Flux density (mG)

Structure Type	Circuits Present	Case	Maximum within ROW (mG)
Single Pole, Davit Arm, 345 kV Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV	Case 1	77
Single Pole, Davit Arm, 345 kV Single Circuit (Max Loading)		Case 1	167
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 832 115 kV	Case 2	65
Single Pole, Davit Arm, 345 kV Single Circuit with 115 kV Underbuild (Max Loading)		Case 2	114
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 708 69 kV	Case 3a	55
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3a	96
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 707 69 kV	Case 3b	27
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3b	59
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV & Line 706 69 kV	Case 3c	31
Single Pole, Davit Arm, 345 kV Single Circuit with 69 kV Underbuild (Max Loading)		Case 3c	62
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV /Line 964 345 kV	Case 4	78
Single Pole, Davit Arm, 345 kV Single Circuit / Single Pole, Tangent, 345 kV Single Circuit (Max Loading)		Case 4	246
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit (Average Loading)	Wilmarth – North Rochester 345 kV & Line 964 345 kV	Case 5	74
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit (Max Loading)		Case 5	224
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit with 69 kV Underbuild (Average Loading)	Wilmarth – North Rochester 345 kV , Line 964 345 kV & Line 739 69 kV	Case 6	19
Single Pole, Tangent/Davit Arm, 345 kV Double Circuit with 69 kV Underbuild (Max Loading)		Case 6	59
Single Pole, Davit, 161/69 kV Double Circuit (Average Loading)	North Rochester – Chester 161 kV & Peoples Line 69 kV	Case 7	5 mG
Single Pole, Davit, 161/69 kV Double Circuit (Max Loading)			21 mG
Single Pole, Tangent, 345 kV Double Circuit with 69 kV Underbuild (Average Loading)		Case 8	105 mG

Structure Type	Circuits Present	Case	Maximum within ROW (mG)
Single Pole, Tangent, 345 kV Double Circuit with 69 kV Underbuild (Max Loading)	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV		190 mG
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild (Average Loading)	North Rochester – River 345 kV, Line 965 345 kV, Peoples Line 69 kV	Case 9	23 mG
Single Pole, Davit, 161 kV Double Circuit with 69 kV Underbuild (Max Loading)			41 mG
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit (Average Loading)	North Rochester – Chester 161 kV & Line 979 345 kV	Case 10a	150 mG
Single Pole, Davit, 161 kV Single Circuit / Two Pole H-Frame 345 kV Single Circuit (Max Loading)			400 mG
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit (Average Loading)	North Rochester – Chester 161 kV / Line 965 345kV, North Rochester – River 345 kV	Case 10b	111 mG
Single Pole, Davit, 161 kV Single Circuit / Single Pole Tangent 345 kV Double Circuit (Max Loading)	North Rochester – Chester 161 kV / Line 965 345kV, North Rochester – River 345 kV		205 mG
Single Pole, Davit, 161 kV Single Circuit (Average Loading)	North Rochester – Chester 161 kV	Case 11	8 mG
Single Pole, Davit, 161 kV Single Circuit (Max Loading)	North Rochester – Chester 161 kV		27 mG
Single Pole, Tangent, 345 kV Double Circuit Single Circuit (Average Loading)	Wilmarth – North Rochester 345 kV	Case 12	76 mG
Single Pole, Tangent, 345 kV Double Circuit Single Circuit (Max Loading)			164 mG
Single Pole, Tangent, 345 kV Double Circuit (Average Loading)	Wilmarth – North Rochester 345 kV, Line 979 345 kV	Case 13	85 mG
Single Pole, Tangent, 345 kV Double Circuit (Max Loading)			222 mG
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Average Loading)	North Rochester – Chester 161 kV, Line 5310 161 kV / Wilmarth –North Rochester 345 kV, Line 979 345 kV	Case 14	85 mG
Single Pole, Davit, 161 kV Double Circuit / Single Pole Tangent 345 kV Double Circuit (Max Loading)			222 mG

System peak energy demand represents the current flow on the line during the peak hour of the system-wide energy demand. Peak demand is 1,200 amps on both conductors. Whereas system average energy demand represents the current flow on the line during a non-peak time, average demand is 560 amps on both conductors. For both scenarios, the magnetic field values were calculated at a point where the conductor is closest to the ground. Like electric fields, magnetic field levels decrease rapidly as the distance from the centerline increases. In addition, because the magnetic field produced by the transmission lines is dependent on the current flow, the actual magnetic fields when the project is placed in service would vary as the current flow on the line changes throughout the day.

10.6.1.3 Mitigation

The sample route permit (Section 5.4.2 of Appendix H) states: "The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms."

Mitigation of magnetic field strength would be achieved by increasing distance from the HVTL to the receptor. The Commission has, however, 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.

10.6.2 Implantable Medical Devices

The ROI for implantable medical devices is the ROW. Potential impacts associated with the project are anticipated to be negligible. If impacts occur, they can be mitigated. Impacts would be minimized by appropriate grounding and adherence to electric field standards for transmission lines.

10.6.2.1 Existing Conditions

Implantable medical devices, such as an implantable cardioverter defibrillator (ICD) or a pacemaker, are battery-powered devices that help keep a person's heartbeat in a regular rhythm. These devices are implanted into the heart tissue and can deliver electrical shocks to correct the heart's rhythm to prevent sudden cardiac issues and help people at risk for recurrent, sustained ventricular tachycardia or ventricular fibrillation (reference (75)). Instances of interference attributed to EMF are recognized, commonly referred to as electromagnetic interference (EMI). EMF exposure produced by transmission lines generally does not affect implantable devices.

Electromechanical implantable medical devices, such as cardiac pacemakers, ICDs, neurostimulators, and insulin pumps could be subject to interference from EMF, which could mistakenly trigger a device or inhibit it from responding appropriately (reference (76)). While EMI can result in either inappropriate triggering or inhibition of a device from responding properly, only a small percentage of these occurrences are caused by external EMI. Electrical interference at levels above 1.5 kV/m have the potential to interfere with modern, bipolar pacemaker behavior, but some models have been unaffected at as high as 20 kV/m (reference (77)). There is the potential for interference at lower levels, as differing manufacturers vary in susceptibility to EMI (reference (78)). During the peak hour of system-wide energy demand, the maximum electric field within the ROW was calculated to be 6.9 kV/m.

Workers who have cardiac pacemakers have separate guidelines for EMF exposure. The American Conference of Governmental Industrial Hygienists (ACGIH) recommended magnetic and electric field exposure limits for workers who have ICDs are 1 G and 1 kV/m, respectively (reference (79)). While ICD's vary and questions and concerns should be directed to the specific manufacturer, ICD manufacturers' recommended threshold for modulated magnetic fields is 1 G (reference (76)). One gauss is five to 10 times greater than the magnetic field likely to be produced by a high-voltage transmission line (references (76); (80)). During the peak hour of system-wide energy demand, the maximum magnetic field was calculated to be 0.246 G.

It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line, inducing a voltage on the object. Induced voltage is further discussed in Section .

10.6.2.2 Potential Impacts

While EMI can result in either inappropriate triggering or inhibition of a device from responding properly, only a small percentage of these occurrences are caused by external EMI. The project is under ACGIH and ICD manufacturers' recommended threshold for magnetic fields. Additionally, shocks from induced voltage from transmission lines are considered more of a nuisance than a danger. Impacts of induced voltage are further discussed in Section 10.6.5.

In the event ICDs are impacted by EMF, it generally results in a temporary asynchronous pacing (reference (76)). Therefore, health impacts or permanent impacts on implantable medical devices could be possible.

10.6.2.3 Mitigation

The sample route permit (Section 5.4.1 of Appendix H) contains the following mitigation related to grounding, electric field, and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the National Electric Safety Code. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

"The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms."

Electric and magnetic field strength is mitigated by increasing the distance from the transmission line and structures. Workers with ICDs should consult with their doctors directly with concerns about work in electrical or magnetic environments (references (81); (82)). Medical devices will return to normal operation when the person moves away from the source of the EMF (reference (76)). Transmission lines will not be energized during construction; therefore, construction workers would not be at risk of EMF or magnetic field exposure. The project would be designed in accordance with applicable NESC standard and to keep electric fields below the 8 kV/m standard set by the Commission. Individuals are expected to follow the recommendations of their medical provider.

10.6.3 Public and Worker Safety

The ROI for public and worker safety is the ROW. Any construction project has potential risks, which can include potential injury from falls, equipment and vehicle use, and electrical accidents. Risks for the public involve electrocution. Potential impacts are anticipated to be minimal, short- and long-term, and can be mitigated. Impacts would be minimized by appropriate adherence to relevant local and state codes, the NESC, and NERC requirements.

10.6.3.1 Existing Conditions

The most recent data from the Bureau of Labor Statistics for injuries and illnesses was used to find the recent number of injuries and illnesses for Power and Communication Line and Related Structures Construction (North American Industry Classification System Code No. 237130). From 2021 to 2022 there were a total of 4,520 nonfatal occupational injuries and illnesses, with around four percent of them being classified as traumatic. From 2021 to 2022 there were 18 fatal injuries, 10 fatal transportation incidents (roadway accident or being struck by a vehicle), and four fatal incidents from coming into contact with an object or equipment (being hit, crushed, caught, struck, etc. by an object or equipment) associated with Power and Communication Line and Related Structures Construction (reference (83)).

10.6.3.2 Potential Impacts

As with any construction project, there are construction-related risks. These could include potential injury from falls, equipment and vehicle use, and electrical accidents. There is potential for construction to disturb existing environmental hazards.

Electrocution is a risk that could occur with direct contact to lines. Between 2011 and 2015, power-line installers in the U.S. had 32 deaths related to electrocution, a rate of 29.7 deaths per 100,000 full-time workers (reference (84)). It could also happen when working near power lines, like when using heavy equipment. Electrocution could occur when there is electrical contact between an object on the ground and an energized conductor, but this situation is most likely with distribution lines (reference (76)).

Any accidents that might occur during construction of the project would be handled through local emergency services. Existing emergency services should have sufficient capacity to respond to any emergencies.

10.6.3.3 Mitigation

The sample route permit (Section 5.5.1 of Appendix H) contains the following mitigation related to safety: “The Permittee shall design the transmission line and associated facilities to meet or exceed all relevant local and state codes, the National Electric Safety Code, and NERC requirements. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, strength of materials, clearances over roadways, ROW widths, and permit requirements."

Proper safeguards would be implemented for construction and operation of the transmission line. The project would be designed to meet or exceed local, state, and the applicant's standards regarding clearance to the ground, clearance to crossing utilities, strength of materials, and ROW distances.

The project must comply with the NESC.89 and Occupational Safety and Health Administration standards (reference (85)). Construction crews and contract crews would also comply with local, state, and NESC standards for installation and construction practices. The applicant would use their established safety procedures, as well as industry safety procedures, during and after installation of the transmission line, including appropriate signage during construction.

10.6.4 Stray Voltage

The ROI for stray voltage is the ROW. Potential impacts to residences and farming operations from stray voltage are not anticipated. Transmission lines do not produce stray voltage during normal operation, as they are not directly connected to businesses, residences, or farms. The project would be constructed to NESC standards, and therefore, impacts are anticipated to be minimal. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

10.6.4.1 Existing Conditions

"Stray voltage" is a condition that can potentially occur on a property or on the electric service entrances to structures from distribution lines connected to these structures. The term generally describes a voltage between two objects where no voltage difference should exist. The source of stray voltage is a voltage that is developed on the grounded neutral wiring network of a building and/or the electric power distribution system. Stray voltage is not created by transmission lines, as they do not directly connect to businesses or residences (reference (86)).

Where utility distributions systems are grounded, a small amount of current will flow through the earth at those points. This is called neutral-to-earth voltage (NEV), which is voltage that is associated with distribution lines and electrical wiring within buildings and other structures (reference (87)). Electrical systems that deliver power to end-users and electrical systems within the end-user's business, home, farm, or other buildings are grounded to the earth for safety and reliability reasons. Stray voltage could arise from neutral currents flowing through the earth via ground rods, pipes, or other conducting objects, from faulty wiring or faulty grounding of conducting objects in a facility. Thus, stray voltage could exist at any business, house, or farm which uses electricity, independent of whether there is a transmission line nearby. Site-specific mitigation measures are required to address potential stray voltage impacts.

Stray voltage is a natural phenomenon that can be found at low levels between two contact points at any property where electricity is grounded; it is measured between two points that livestock can simultaneously touch (reference (87)). Stray voltage and its effects on farms have been studied for nearly 30 years. Numerous studies have found that though it is likely to exist on farms, it is rarely strong enough to affect the behavior or production of dairy cattle (reference (88)). The Commission issued a report in 1998 supporting the conclusion that no credible scientific evidence has been found to show that currents in the earth or associated electrical parameters, such as voltages, magnetic fields, and electric currents, are causes of poor health and mild production in dairy herds (references (88)).

10.6.4.2 Potential Impacts

Stray voltage is, generally, an issue associated with electrical distribution lines and electrical service at a residence or on a farm. Under normal operating conditions, transmission lines do not create stray voltage as they do not directly connect to businesses, residences, or farms. The project would not directly connect to businesses or residences in the area and would not change local electrical service. Accordingly, impacts due to stray voltage are anticipated to be negligible.

Transmission lines, however, can induce voltage on a distribution circuit that is parallel and immediately under the transmission line. This is discussed in Section 10.6.5.

10.6.4.3 Mitigation

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to grounding, electric field, and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between the ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the NESC. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

The sample route permit (Section 5.4.2 of Appendix H) contains the following mitigation related to electric fields: "The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms." The applicant has committed to work with landowners that have any issues with stray voltage following construction of the project.

10.6.5 Induced Voltage

The ROI for induced voltage is the ROW. It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line. This could induce a voltage on the object. Smaller conductive objects near the line could cause a nuisance shock to a person, but it is not a potential safety hazard. Metal buildings within the ROW might require grounding. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

10.6.5.1 Existing Conditions

It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line. Conductive objects include vehicles, including tractors and automobiles, in part because tires are made electrically conductive to eliminate static discharge building up when moving (reference (89)). This might induce a voltage on the object; the magnitude of the voltage depends on several factors, such as the size, shape, and orientation of the object along the ROW. Smaller conductive objects near the transmission line that are insulated or semi-insulated from the ground could cause a nuisance shock to a person from a small current passing through the person's body to the ground. If there were insulated pipelines, electric fences, telecommunication lines, or other conductive objects such as tractors or automobiles with greater lengths and sizes, induced voltage from a transmission line could produce a larger shock. This larger shock has not been found to be a health safety hazard (reference (90)). Similar to stray voltage, transmission lines could cause additional current on distribution lines where they parallel. If the distribution lines are not properly wired or grounded, induced voltage could be created.

10.6.5.2 Potential Impacts

Shocks from induced voltage from transmission lines are considered more of a nuisance than a danger. The transmission line would follow NESC standards, which require the steady-state (continuous) current between the earth and an insulated object located near a transmission line to be below 5 milliamps (mA). A shock at 5 mA is considered unpleasant, not dangerous, and allows for a person to still release the energized object that they are holding that is causing the shock (reference (91)). In addition, the Commission imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground. The standard is designed to prevent serious hazards from shocks when touching large objects parked under AC transmission lines of 500 kV or greater (reference (73)). In the Brookings County to Hampton 345 kV transmission line project (Commission docket number TL-08-1474), the ALJ and Commission determined that Minnesota's current electric field exposure standard of 8 kV/m is adequately protective of human health and safety (references (92); (93)).

10.6.5.3 Mitigation

The sample route permit (Section 5.3.4 of Appendix H) contains the following mitigation related to grounding, electric field, and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the ROW, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the ROW, except electric fences that parallel or cross the ROW, shall be grounded to the extent necessary to limit the induced short-circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the NESC. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

The applicant committed to meeting electrical performance standards. Appropriate measures would be taken to prevent induced voltage problems when the project parallels or crosses objects. Metal buildings might have unique issues due to induction concerns. For example, conductive buildings near power lines of 200 kV or greater must be properly grounded. Any person with questions about a new or existing metal structure can contact the applicant for further information about proper grounding requirements.

10.6.6 Electronic Interference

The ROI for electronic interference is the ROW. Transmission lines do not generally cause interference. If electronic interference does occur, in most cases it can be mitigated by either increasing the distance or adjusting the placement of the device to the transmission line or other transmission line structure. If ongoing interference due to a transmission line does occur, the applicant would be required to take feasible actions to restore electronic reception to pre-project quality. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

10.6.6.1 Existing Conditions

Electronic Interference refers to the disturbance of electrical circuits or equipment caused by electromagnetic radiation emitted from external sources, in this case, high-voltage transmission lines. Transmission lines generate EMFs depending on the distance from sources and the type of line configuration. The EMFs decrease as the distance increases from the conductors (reference (94)).

There are a number of FM and AM radio broadcasting stations that operate or can be heard within the project area, such as KYSM (103.5) FM, KJLY (104.5) FM, KBGY (107.5) FM, KMSU (89.7) FM, KNGA (90.5) FM, KRUE (92.1) FM, KATO (93.1) FM, KCHK (95.5) FM, KQCL (95.9) FM, K250CD (KDHL-AM) (97.9) FM, KEEZ (99.1) FM, KDHL (920) AM, KFOW (1170) AM, KFSP (1230) AM, KTOE (1420) AM.

There are also many television channels that broadcast throughout the project area. These channels are received from cable, satellite providers, and/or digital antennas.

Wireless internet and cellular phones use frequencies in the 900 MHz ultra-high frequency (UHF) range—a range for which impacts from corona-generated noise are anticipated to be negligible.

Global positioning systems (GPS) is used in daily life, aviation, vehicle navigation, surveying, aerial drones, and agricultural activities. GPS works by sending radio-frequency signals from a network of satellites to the receiver. Because of this, buildings, trees, and other physical structures have the potential to interfere with a GPS signal. GPS provides locational information for navigation between endpoints, as well as geographic orientation for farm and other equipment. GPS is used throughout the project area.

The Continuously Operating Reference Station (CORS) Network is a cooperative effort between MnDOT, other state agencies and institutions, counties, cities, and private enterprises, with the goal of providing

Global Navigation Satellite System (GNSS) corrections statewide. Using signals from all available GNSS satellites and receivers at over 140 known positions, MnCORS is able to continuously provide survey-grade positioning corrections via the internet. Users with Real-Time Kinematic (RTK) capable equipment can receive real-time corrections to their geospatial positions, yielding a more accurate horizontal and vertical measurement.

10.6.6.2 Potential Impacts

No impacts to electronic devices are anticipated. No GPS impacts are expected from the construction or operation of the project. Research evaluating the potential for interference in the use of GPS satellite-based microwave signals under or near power line conductors indicates it is unlikely that there would be electronic interference while using GPS (reference (95)). Interference would be more likely near a transmission line structure and unlikely under a transmission line (reference (96)) due to shadow effects.

Electronic interference from HVTLs can impact electronic communications like radios, television, and microwave communications in three ways: corona noise, shadowing effect, and gap discharge.

Corona "noise" primarily occurs in the radio frequency range of amplitude modulated (AM) signals. This generated noise typically occurs underneath a transmission line. It dissipates rapidly as the distance increases from the transmission line. FM radio receivers usually do not pick up interference from transmission lines because corona-generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (reference (97)). In most cases, the strength of the radio or television broadcast signal within a broadcaster's primary coverage area is great enough to prevent interference. Additionally, due to the higher frequencies of television broadcast signals (54 MHz and above), a transmission line seldom causes reception problems within a station's primary coverage area. Anticipated electric fields are below levels expected to produce significant levels of corona.

Shadowing effect comes from physically blocking communication signals. This primarily can impact two-way mobile radio communications and television signals. Digital and satellite television transmissions are more likely to be affected by shadowing generated by nearby towers. Interference could occur if the device was located immediately adjacent to a tower structure, blocking its signal. While television interference is rare, it can happen when a structure is aligned between a receiver and a weak, distant signal. Telecommunication towers can be susceptible to the shadowing effect.

Gap discharge interference is the most noticed form of power line interference with radio and television signals, and typically the most easily fixed. Gap discharges are usually caused by hardware defects or abnormalities on a transmission or distribution line, causing small gaps to develop between mechanically connected metal parts. As sparks discharge across a gap, they create the potential for electrical noise, which, in addition to audible noise, can cause interference with radio and television signals. The degree of interference depends on the quality and strength of the transmitted communication signal, the quality of the receiving antenna system, and the distance between the receiver and the power line. Because gap discharges are a hardware issue, they can be repaired relatively quickly once the issue has been identified.

10.6.6.3 Mitigation

The sample route permit (Section 5.4.3 of Appendix H) contains the following mitigation related to electronic interference: "If interference with radio or television, satellite, wireless internet, GPS-based agriculture navigation systems or other communication devices is caused by the presence or operation of the Transmission Facility, the Permittee shall take whatever action is necessary to restore or provide reception equivalent to reception levels in the immediate area just prior to the construction of the Transmission Facility. The Permittee shall keep records of compliance with this section and provide them upon the request of Commerce or Commission staff."

The applicant committed to taking feasible action to restore electronic reception to pre-project quality in the case of electronic interference. Interference could be due to line-of-sight obstruction (shadowing) in select areas but could be mitigated by either increasing the distance or adjusting the placement of transmission line structures and electronic antennas. For example, if interference occurs for an AM radio station within a station's primary coverage area where good reception existed before the project was built, reception can be regained by adjusting or moving the receiving antenna system. This is unlikely to occur to AM radio frequency, except for immediately under a transmission line, and interference would dissipate rapidly with increasing distance from the line.

10.7 Land-Based Economies

The ROI for land-based economies is the route width, except for tourism, which is the local vicinity. The ROI for recreation is more localized (the route width) as potential impacts to the tourism economy would be experienced at a broader scale. The short and long-term impacts of land-based economies are assessed for agriculture, forestry, mining, and tourism.

Constructing and operating the project could potentially affect land-based economies in the project area. Transmission lines are a physical, long-term presence on the landscape which could prevent or otherwise limit use of land for other purposes. The primary land-based economic activity in the project area is agriculture. Other potential economic activities connected to land usage in the project area include forestry, mining, and tourism. The primary means of mitigating impacts to land-based economies is prudent routing (that is, by choosing route alternatives that avoid such economies).

10.7.1 Agriculture

Agriculture is the predominant land-use within the ROI, and when structures are placed within an agricultural field, they would interfere with farming operations. Potential impacts are assessed through consideration of total agricultural land use, presence of prime farmlands, and agricultural practices. The footprint of the transmission line structures is land that can no longer be used for agricultural production and could adversely impact farms based on a variety of other factors. Impacts

to agriculture would be mitigated through implementation of an Agricultural Impact Mitigation Plan and prudent routing.

10.7.1.1 Existing Conditions

Segment 4's predominant land cover (approximately 76% of Segment 4 West's ROI, approximately 72% of Segment 4 West Modification's ROI, approximately 51% of Segment 4 East's ROI, and approximately 80% of the Segment 4 CapX Co-Locate Option's ROI) is agriculture (Map 61). In each of the counties within the ROI, crops account for more than half of the share of sales by type and the average farm size is 300 acres or less (Table 10-11). As noted in the joint certificate of need application and route permit application, principal crops include grain, soybeans, hay/haylage, sweet corn, corn for silage, green peas, corn for grain, and oats for grain. Farmers in the area also raise livestock, including hogs and pigs, dairy cows, beef cattle, and poultry.

Table 10-11 Segment 4 Agricultural Products Sold and Average Size of Farm

County	Market Value of Agricultural Products Sold (percent)		Average size of farm (acres)
	Crops	Livestock	
Goodhue [1]	57	43	300
Olmsted [2]	67	33	279

[1] Source: reference (209)
[2] Source: reference (243)

There are no apiaries or center pivot irrigation systems within the route widths of the Segment 4 options.

Three categories of soils identified by the Soil Survey Geographic Database (SSURGO) database are subject to protection under the FPPA: prime farmland, prime farmland when drained, and farmland of statewide importance. Prime farmland is defined by the NRCS as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. Prime farmland, when drained, includes soils that have the potential to be prime farmland but require drainage or hydrologic alteration to achieve high productivity. Farmland of statewide importance includes soils that are nearly prime, but are not as productive due to permeability, slope, erosion potential, or some other soil property.

The ROI includes areas of prime farmland, prime farmland if drained, and farmland of statewide importance (Map 69). Approximately 62% of Segment 4 West's ROI is designated prime farmland, approximately 65% of Segment 4 West Mod's ROI designated prime farmland, approximately 61% of Segment 4 East's ROI designated prime farmland, and approximately 55% of the Segment 4 CapX Co-Locate Option's ROI is designated prime farmland (Appendix G).

The 2024 directory of Minnesota organic farms from the MDA lists 29 potential organic farms in the three-county area (reference (100)). However, because organic farmers are not required to register with the MDA, there could be additional, unregistered organic farms within the project area. In addition, organic farm registration does not give the precise location of organic fields, only the registrant's mailing address.

Agriculture in this area also includes precision farming practices. Precision farming involves the use of global positioning systems (GPS) to guide farming equipment. One of the most precise types of GPS systems is known as real-time kinematic GPS (RTK GPS). Precision farming minimizes the potential for waste from, for example, duplicate row seeding or overlap in fertilizer or pesticide application.

10.7.1.2 Potential Impacts

Transmission lines have the potential to impact agriculture both temporarily and permanently. Temporary impacts result from transmission line construction, the extent of which is limited to the duration of construction, and annual transmission line inspections, the extent of which is temporary and periodic during operation. Impacts could include limiting the use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Temporary impacts from annual transmission line inspections might include pedestrian or light vehicle access, which would be limited to the ROW and areas where obstructions might require access from off the ROW. Impacts associated with annual transmission line inspections would be coordinated as part of easement negotiations between the applicant and the landowner before construction of the project.

Permanent transmission line impacts result from the placement of transmission line structures within crops, pasture, and other agricultural lands. The footprint of the transmission line structures is land that can no longer be used for agricultural production. This footprint can adversely impact farm income and property values depending on placement, structure type, and a variety of other factors. Permanent structures can have varying-sized footprints due to the structure design and distance from each other. The project anticipates using steel monopole structures with concrete pier foundations ranging from 6 to 8 feet in diameter and a typical span of 350 to 700 feet between structures (Section 3.2.1). Single-circuit and double-circuit structures are anticipated to have similar impacts to agriculture because farming can occur around both types.

Structures can impede the efficient use of farm equipment and can significantly limit the management options for agricultural operations. Presence of structures can also impede efficiency of a farming operation, as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields. Transmission line structures in agricultural fields could also potentially impede the use of irrigation systems such as center pivot 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 using the same practice.

While the presence of the project on or near an unregistered 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. For example, construction vehicles would need to be cleaned prior to entering organic farms to prevent tracking offsite soil or plant material onto the farm, and throughout operational maintenance of the ROW certain herbicides or pesticides could not be used on or near the organic farm. These measures would need to be coordinated on an individual basis between the applicant and the affected organic farm owner.

Livestock operations are present within the project area and could be temporarily affected during construction of the project. Construction activities could temporarily disrupt livestock access to pasture lands, and construction noise might disturb livestock. In addition, poultry could be sensitive to disease caused by pathogens introduced by offsite soils tracked on-site during construction.

Though stray voltage impacts are not anticipated to be caused by the project, stray voltage could be of concern to livestock farmers, particularly on dairy farms. NEV is by and large an issue associated with distribution lines and electrical service at a residence or on a farm (Section 10.6.4). Transmission lines do not create NEV stray voltage as they do not directly connect to businesses, residences, or farms (Section 10.6.4).

Transmission lines have the potential to interfere with RTK and standard GPS used for precision farming in two ways: (1) electromagnetic noise from a transmission line could potentially interfere with the frequencies used for RTK and standard GPS signals and (2) transmission line structures could cause line-of-site obstructions or create multi-path reflections such that sending and receiving of signals would be compromised. Interference could occur where the spectrum of transmission line electromagnetic noise overlaps the frequency spectrum used by RTK or standard GPS systems. As discussed earlier in this chapter, no GPS impacts are expected from the construction or operation of the project (Section 10.6.6).

Interference due to line-of-sight obstruction or multi-path reflection could occur in two ways: (1) obstruction of, or other reflection interference with, a GPS satellite signal and (2) obstruction of radio transmissions from an RTK base station to a mobile receiving unit. GPS uses information from multiple satellite signals to determine specific locations. Interference with one signal would not cause inaccurate navigation; however, simultaneous interference with two signals could lead to inaccurate navigation. Because simultaneous interference with two signals is relatively unlikely and any line-of-sight obstruction would be resolved with movement of the GPS receiver (for example, tractor) such that proper GPS reception would be quickly restored, line-of-sight obstruction impacts to precision farming systems are anticipated to be minimal and temporary.

A transmission line structure located very near an RTK base station could cause a line-of-sight obstruction in the signal from a base station. A transmission line structure near an RTK base station (within 100 feet) could also cause multi-path reflections that interfere in the signal from a base station. An RTK base station would need to be at least outside of the transmission line ROW, or 50 feet away. Multi-path reflections can also be caused by other structures and landscape features, including homes, trees, sheds, and sudden changes in ground elevation.

10.7.1.3 Mitigation

Mitigation and restoration measures for vegetation on landowner property are standard Commission route permit conditions. The sample route permit (Section 5.3.7 of Appendix H) contains the following mitigation related to land-based economies: “The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads.”

The applicant would implement an AIMP and reasonably restore and/or compensate landowners, as appropriate, for damages caused by the applicant as a result of transmission line construction. A draft version of the AIMP is provided in Appendix K. The applicant would work with landowners to determine whether to restore land and/or compensate landowners after discussions with them. The applicant would also implement a vegetation management plan to reduce impacts on agriculture, as appropriate.

To further mitigate impacts to agriculture and as described in the AIMP (Appendix K), the applicant would implement measures to reduce compaction, soil erosion, and sedimentation and would compensate producers for crop or livestock loss or damage. Post-construction restoration efforts would include restoration of any temporary access modifications and deep plowing to remove compaction. Both crop and livestock activities would be able to continue around project structures and facilities after construction.

The applicant notes in the joint certificate of need application and route permit application that no impacts are anticipated to affect agricultural activities during winter as the crop fields are unplanted and the ground is frozen. Construction is anticipated to occur year-round, and impacts to agriculture could be avoided in winter months.

Impacts to agricultural operations could also be mitigated by prudent routing. Specifically, prudent routing could include selecting route alternatives that prioritize paralleling existing infrastructure (including roads and transmission lines) to maximize potential opportunity for ROW sharing and minimize potential interruptions or impediments to the use of farm equipment. Prudent routing would secondarily prioritize following existing division lines (including field, parcel, and section lines) where paralleling existing infrastructure is not an option. Following existing division lines could minimize impacts to the use of farm equipment if, for example, row crops start and stop along the division lines. Opportunities for paralleling existing infrastructure and division lines are summarized inTable 10-3.

10.7.2 Forestry

The ROI for the land-based economy of forestry is the route width. No notable forestry resources within Segment 4’s ROI were identified and potential impacts to forestry resources or operations are not anticipated.

10.7.2.1 Existing Conditions

None of the following resources were identified within the ROI:

- DNR forestry lands
- State forests
- Forests for the Future state conservation easement areas
- Sustainable Forest Incentive Act land
- School Trust land

As such, potential impacts to land-based economies for forestry would be negligible.

10.7.2.2 Potential Impacts

There are no notable forestry resources within the ROI of Segment 4 options and therefore no impacts to forestry operations are anticipated.

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

10.7.2.3 Mitigation

Impacts on forested areas would be reduced by minimizing the tree clearing to the extent feasible; however, tall-growing vegetation within the ROW would be cleared. The applicant would work with landowners to come to an agreement of any timber removed from private lands, as appropriate.

10.7.3 Mining

The ROI for the mining land-based economy is the route width. Potential impacts are assessed through identification of known, existing mining operations and assessing potential impacts to those operations given the potential introduction of the HVTL. Prospect mines, bedrock quarries, and a sand quarry are located within the ROI of Segment 4. One active

No impacts to active facilities are anticipated. If the potential for impacts to mining operations would occur, the applicant would be required to coordinate those impacts with the mining operator.

10.7.3.1 Existing Conditions

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.

Mining operations are prevalent in the project area and consist of aggregate mining operations and bedrock quarries owned either by individuals, private companies, or MnDOT. Three prospect mines (MnDOT ASIS Numbers 55036, 55007, and 55028), two bedrock quarries (MnDOT ASIS Numbers 55034 and 55037), and a sand quarry (MnDOT ASIS Number 55070) were identified within the route width of Segment 4 East. The prospect mines and quarries appear to be inactive based on a review of aerial imagery (Map 66).

A gravel pit, a prospect mine (MnDOT ASIS Number 55009), and a bedrock quarry (MnDOT ASIS Number 55086) were identified within the route width of Segment 4 West. The gravel pit appears to be inactive based on a review of aerial imagery (Map 66-4). The prospect mine and bedrock quarry appear to be active based on a review of aerial imagery (Map 66-12 and Map 66-13). The anticipated alignment of Segment 4 West does not cross any workspaces of active mining operations based on the aerial imagery.

Two gravel pits, a borrow pit, sand quarry (MnDOT ASIS Number 55098), a prospect mine (MnDOT ASIS Number 55009), and a bedrock quarry (MnDOT ASIS Number 55086) were identified within the route width of Segment 4 West Modification. The gravel pits and sand quarry appear inactive based on a review of aerial imagery (Map 66). The borrow pit, prospect mine, and bedrock quarry appear active based on a review of aerial imagery (Map 66-7, Map 66-12, and Map 66-13). The anticipated alignment of Segment 4 West Modification does not cross any workspaces of active mining operations based on the aerial imagery.

No aggregate operations were identified within the route width of Segment 4 CapX Co-Locate Option. Aggregate mining sites are primarily mined for local use such as making concrete for highways, roads, bridges, and other construction projects.

10.7.3.2 Potential Impacts

Existing aggregate mines and prospective sites could be negatively impacted by transmission line structures if the structures interfere with access to aggregate resources or the ability to remove them. Impacts are most likely to occur during transmission line construction if resource extraction must be ceased temporarily in order to safely string a transmission line. To the extent there are potentially recoverable aggregate reserves in the project area, construction of the project could limit the ability to successfully mine these reserves depending on the route selected for the project and the location of these reserves.

The construction of electrical utility facilities would likely interfere with any future geophysical surveys because the surveying technology cannot accurately assess what is underground when transmission lines are above the survey location.

Construction of the project would require sand and aggregate for structure backfill, concrete, and to maintain reliable access routes. Some of the aggregate material could come from local sources. Although demand would temporarily increase during construction, it’s anticipated that no new aggregate source facilities would be constructed, nor would any existing facilities be expanded.

10.7.3.3 Mitigation

If the potential for impacts to mining operations would occur, the applicant would be required to coordinate those impacts with the mining operator. The applicant noted in the joint certificate of need application and route permit application that they have been meeting with the operators of the Milestone Materials Rochester Landscape Supply Center, an active aggregate mining operation, to discuss the route and no impacts on facility operations are anticipated.

10.7.4 Tourism

The ROI for the tourism land-based economy is the local vicinity. Potential impacts are assessed through identification of known resources utilized by non-residents that would likely be recreating in the area and bringing in non-local revenue (or tourism dollars) to the area. Most opportunities for tourist activities within the ROI include use of publicly accessible lands and water for outdoor activities (Section 10.5.8). Impacts to tourism are anticipated to be negligible to minimal.

10.7.4.1 Existing Conditions

Recreational opportunities identified within the ROI include publicly accessible lands and waters used for outdoor activities (Section 10.5.8). Nonresidents or tourists could visit the project area to take advantage of the area's hunting and fishing opportunities. Public and designated lands are discussed in Section 10.9.6.

Tourism opportunities within the ROI beyond outdoor activities were not identified. Human-built tourism in the counties includes county fairs, arts and crafts fairs, farmers markets, and smaller community events. These events and other opportunities for tourism are advertised in nearby incorporated towns and the activities are not located within the ROI.

10.7.4.2 Potential Impacts

Impacts to the tourism economy are anticipated to be negligible to minimal.

10.7.4.3 Mitigation

If the potential for temporary interference with public access to trails (i.e., Douglas State Trail) is identified, the applicant would attempt to avoid or limit trail closures to the maximum extent practicable. No restricted access to other recreational areas that may be used by tourists is anticipated.

10.8 Archaeological and Historic Resources

The ROI for archaeological and historic resources is the route width. Direct and indirect impacts could occur from construction and operation of the project. Direct impacts to archaeological and historic resources could result from construction activities such as ROW clearing, placement of structures, temporary construction areas, and vehicle and equipment operation. Direct impacts could also result from the removal of historic buildings or structures. Direct impacts to historic resources could occur if the project is located near or within view of a resource (typically a historic building, structure, or TCP).

Potential impacts are assessed through identification of documented archaeological and historic resources within one mile of the route alternatives. An emphasis is placed on resources within the route widths, which could have the most potential impact.

10.8.1 Existing Conditions

Cultural resources consist primarily of archaeological sites and historic architectural resources. Archaeological sites are defined as the material remains of past human life or activities (reference (109)). Historic architectural resources are sites, buildings, and structures greater than 45 years in age that "create tangible links to the American past, whether in relation to historical events and people, traditional ways of life, architectural design, or methods of construction," as defined in the Minnesota Historic and Architectural Survey Manual (reference (110)). Traditional Cultural Properties (TCP) are also considered cultural resources. TCPs are defined as locations of significance to a community because of their association with important cultural practices and beliefs (reference (111)).

Federal laws and regulations, including Section 106 of the National Historic Preservation Act (NHPA) of 1966, its implementing regulations found in 36 CFR 800, and the Archaeological Resources Protection Act of 1979, provide the standards for cultural resources identification, evaluation, and mitigation of impacts. Pursuant to Section 106 of the NHPA, a historic property is any archaeological site, historic architectural resource, or traditional cultural property included in, or eligible for inclusion in, the National Register of Historic Places (NRHP). Potential cultural resources investigations that could be required under Section 106 include archaeological surveys, historic architectural surveys and/or TCP surveys which serve to identify TCPs. Section 106 applies to all undertakings that take place on federal lands, require federal permitting, and/or utilize federal funds.

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

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

Coordination with the Tribal Historic Preservation Offices (THPO) prevents impacts from the project to known TCPs. THPOs are officially designated by Tribes and serve the same function as a SHPO (reference (112)). THPOs assist with the preservation of Tribal historic properties and cultural traditions. They are also available to advise federal, state, and local agencies on the management of tribal interests. As noted in Section 8.1.1 of the joint certificate of need application and route permit application, the applicant has engaged with multiple tribes and is committed to continued engagement and consultation.

Minnesota is divided into nine Archaeological Regions, which were defined by former State Archaeologist Scott Anfinson (reference (113)), as part of a framework for building a predictive model developed by the Minnesota Department of Transportation (MNDOT) for the presence of archaeological sites, called the MnModel (reference (113)). These regions characterize features of the natural environment that have been fairly stable throughout precontact and contact periods. The distribution of resources among the nine regions is assumed to have influenced the distribution of precontact peoples (reference (113)).

Segment 4 falls within the Southeast Riverine Archaeological Region (Region 3). Region 3, the Southeast Riverine Archaeological Region, includes Dodge, Fillmore, Goodhue, Houston, Mower, Olmsted, Wabasha, and Winona counties, and portions of Dakota, Freeborn, Rice, and Waseca counties. This region was not glaciated during the Late Wisconsin Ice Age. The region is dominated by a stream-dissected landscape and contains three major river systems: the Cannon, Zumbro, and Root Rivers. No natural lakes are found within Region 3; however, valley bottom lakes are present along the Mississippi River. The climate is mild in the Southeast Riverine Region compared to the rest of the state. The average high temperature is 23 degrees Fahrenheit in January and 85 degrees Fahrenheit in July. Annual precipitation ranges between 28-30 inches. Faunal resources in this region during the late Holocene included deer and elk, with a small number of bison present in the upland areas. Aquatic resources could be found in the region's rivers and tributaries, and plant resources, such as prairie turnips and acorns were also present (reference (113)).

Human occupation of the Southeast Riverine Region, which remained unglaciated, occurred by approximately 11,200 BC. Early hunter gatherers maintained small group sizes and were very mobile, with subsistence patterns centered on hunting large and medium sized game animals. This period, known as the early Paleoindian, spanned from approximately 11,200 to 10,500 BC, and is characterized by its distinctive fluted projectile points (e.g., Clovis, Folsom, Holcombe). Early prehistoric artifacts (fluted and Plano projectile points) have been recovered in this region, though primarily as surface collections. There is potential for deeply buried precontact sites of all periods in floodplain alluvium. The late Paleoindian/early Archaic period (10,500 to 7,500 BC) saw an increase in subsistence diversification, evidenced in part in the archaeological record by a more diverse and specialized tool assemblage (reference (114)).

During this period and continuing into the Middle Archaic (7,500 to 3,000 BC), gradually increasing population sizes resulted in decreased, but still expansive, 'home range' areas for these hunter gatherers, who still relied heavily on larger forest game animals for subsistence. The suite of stone tools continued to increase during this period, and copper tools made their first appearance at the end of the middle Archaic (reference (114)).

The Late Archaic period (approximately 3,000 to 500 BC) is characterized by the appearance of exotic materials, such as marine shells, communal burial sites, and a more diverse material culture, including tools used in the manufacturing of dugout canoes. Copper tools were also prevalent during this time period. Lifeways during the late Archaic period relied more heavily on second-order foods, such as fish and other aquatic resources, as well as plant life (e.g., wild rice). The Late Archaic was a period of resource intensification and, therefore, saw a decrease in mobility and home range areas, and an increase in group sizes (reference (114)). In Region 2, many sites in the middle prehistoric period are located on islands and peninsulas on larger-sized lakes or along major rivers. Lifeways continued to evolve during the Woodland period (between 1,000 to 500 BC to approximately 1650 AD). The Woodland period is generally characterized by the appearance of pottery and burial mounds. Later, Woodland habitation sites in the Prairie Lakes region are most likely in river valleys, in sheltered, wooded areas.

Contact period sites (circa 1700) are mostly associated with the Santee Dakota tribes, and with French and Euroamerican fur traders (reference (113)).

The ROI for archaeological and historic architectural resources is the route width. However, for the purposes of analysis, documented archaeological and historic architectural resources were reviewed to understand the broader potential for archaeological and/or historic architectural resources within a one mile buffer of the Segment 4 alternatives.

Because proximity to fresh water and food resources was vital to the survival of the early inhabitants of Minnesota, archaeological sites are typically concentrated on well-drained upland terraces along bodies of water. In the project area for Segment 4, previously identified archaeological sites are mostly concentrated along the Zumbro River in Olmsted County.

To determine potential cultural resource impacts on cultural resources, known archaeological and historic sites in or adjacent to the project were identified through a review of the OSA's online portal and MnSHIP, the Minnesota SHPO's online portal. MnSHIP is a comprehensive database of documented historic architectural resources for the entire state, while the OSA portal is a database of previously recorded archaeological sites in the state. The OSA portal was also reviewed for estimated locations of historic cemeteries, as recorded in 2011 by Vermeer and Terrell (reference (115)). This study identified unrecorded historic cemeteries based on various forms of documentation, such as historic maps and aerial imagery. These cemeteries are often mapped to a much larger area, such as section or township level, than their actual locations, as the exact locations might not be known or verified. Therefore, even in cases wherein an unrecorded historic cemetery appears to intersect the segment's route width, the resource may not be present in this location. These unrecorded Euroamerican cemeteries are therefore discussed as an added precaution.

Documented archaeological and historic resources within the study area of Route Segment 4 are summarized in the following tables.

- Table 10-12 summarizes the number of archaeological and historic resources within the project area (one mile).
- Table 10-13 summarizes the number of archaeological and historic resources within the ROI (route width).

- Table 10-14 provides descriptions of the resources located within the Segment 4 route widths.

Map 70 shows the location of cultural resources within the ROI of Segment 4.

Additional cultural resources, beyond those summarized below, might be located during future survey efforts prior to construction.

Table 10-12 Segment 4, Number of Archaeological and Historic Resources within the Project Area

Segment ID	Archaeological Sites	Historic Architecture	Historical Cemeteries
Segment 4 West	7	173	8
Segment 4 West Mod	10	177	5
Segment 4 East	16	137	6
Segment 4 CapX Co-Locate Option	8	78	5

Table 10-13 Segment 4, Description of Archaeological and Historic Resources within the Project Area

Segment ID	Archaeological Sites	Historic Architecture	Historical Cemeteries
Segment 4 West	2	3	3
Segment 4 West Modification	4	6	2
Segment 4 East	5	34	2
Segment 4 CapX Co-Locate Option	2	5	1

Table 10-14 Segment 4, Description of Cultural Resources in the Route Width

Resource present within the ROI of:				Site/ Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
Segment 4 West	Segment 4 West Mod	Segment 4 East	Segment 4 CapX					
		X	X	21GD0248	Archaeological Site	Goodhue Good View	Recommended Eligible	Precontact lithic scatter consisting of 32 artifacts, including debitage, two cores and a Turin projectile point dating to the late Archaic Period. [1] Located in Section 28 of Township 109N, Range 15W.
		X		21GD0249	Archaeological Site	O'Brien	Recommended Not Eligible	Precontact lithic scatter consisting of debitage and a scraper. [2] Located in Section 34 of Township 109N, Range 15W.
		X		21OL0029	Archaeological Site	Davis	Recommended Not Eligible	Precontact lithic scatter including a late Archaic Period projectile point and lithic debitage. The site was reported to be heavily disturbed. [3] Located in Section 7 of Township 108N, Range 14W.
		X		21OL0030	Archaeological Site	Shady Lake	Unevaluated	Multicomponent artifact scatter consisting of a precontact lithic scatter and post-contact glass, metal, and brick. Two post-contact features were also identified, consisting of a limestone/sandstone retaining wall and a trash pit. [4] Located in Section 7 of Township 108N, Range 14W.
		X		21OL0032	Archaeological Site	South Branch	Unevaluated	Precontact lithic scatter including lithic debitage (Prairie du Chien chert flakes) and one core. The site was minimally disturbed and identified through subsurface testing. [5] Located in Section 18 of Township 108N, Range 14W.
			X	21OL0058	Archaeological Site	Zumbro Lake Ring	Unevaluated	Singular circular stone alignment of undetermined time period with one charcoal fragment within alignment. [6] Located in Section 11 of Township 108N, Range 14W.
X	X			21GDs	Archaeological Site	Pine Island Mill	Unevaluated	Indeterminate Alpha Site. Located in Section 31 of Township 109N, Range 15W.
X	X			21OL0076	Archaeological Site	Reuben Silvester Warner Homestead	Unevaluated	Post-contact farmstead site. Located in Section 36 of Township 108N, Range 14W.
	X			21OLh	Archaeological Site	Durango	Unevaluated	Post-contact nineteenth century townsite; alpha site. Located in Section 23 of Township 108N, Range 15W.
	X			21OLk	Archaeological Site	New Haven	Unevaluated	Post-contact townsite; alpha site. Located in Section 23 of Township 108N, Range 15W.
			X	OL-ORT-00042	Historic Architecture	Bridge 55520	Not Eligible	
	X			OL-NHT-00005	Historic Architecture	Farmhouse	Unevaluated	
	X			OL-NHT-00006	Historic Architecture	Railroad Bridge	Unevaluated	
	X			OL-NHT-00008	Historic Architecture	Railroad Bridge	Unevaluated	Constructed 1903
	X			OL-NHT-00017	Historic Architecture	Iron Bridge (razed)	Unevaluated	Constructed 1892
X	X			OL-ORT-00003	Historic Architecture	School	Unevaluated	
	X			XX-ROD-00185	Historic Architecture	U.S. Trunk Highway 52	Not Eligible	Constructed 1920; 1955
X				GD-PIC-00129	Historic Architecture	Culvert 93616	Not Eligible	
X		X	X	XX-ROD-00185	Historic Architecture	U.S. Trunk Highway 52	Not Eligible	Constructed 1920; 1955
		X	X	GD-PIT-00030	Historic Architecture	Farmstead	Unevaluated	Constructed 1960
		X		OL-CAS-00030	Historic Architecture	Bridge 55530	Not Eligible	
		X		OL-FRM-00017	Historic Architecture	Schultz Farmstead	Unevaluated	Constructed 1912
		X		OL-FRM-00018	Historic Architecture	Dorothy Schultz Barn	Unevaluated	
			X	OL-FRM-00027	Historic Architecture	Reinke Farmstead	Not Eligible	
		X		OL-HVH-00003	Historic Architecture	School	Unevaluated	
		X		OL-HVH-00012	Historic Architecture	Bridge 88733	Unevaluated	
		X		OL-NHT-00021	Historic Architecture	Leuck Farmstead	Unevaluated	Constructed 1930
		X		OL-NHT-00032	Historic Architecture	Bridge 6126	Unevaluated	
		X		OL-ORC-00017	Historic Architecture	House and Barn	Unevaluated	Constructed 1870
		X		OL-ORC-00021	Historic Architecture	Bascom Farmstead	Unevaluated	Constructed 1878
		X		OL-ORC-00024	Historic Architecture	House	Unevaluated	Constructed 1890
		X		OL-ORC-00025	Historic Architecture	House	Unevaluated	Constructed 1930
		X		OL-ORC-00030	Historic Architecture	House	Unevaluated	Constructed 1940
		X		OL-ORC-00031	Historic Architecture	House	Unevaluated	Single Dwelling; Constructed 1940
		X		OL-ORC-00035	Historic Architecture	Farmstead	Unevaluated	Constructed 1940
		X		OL-ORC-00058	Historic Architecture	Bridge 55031	Not Eligible	
		X		OL-ORC-00059	Historic Architecture	Bridge 55033	Not Eligible	
		X		OL-ORT-00005	Historic Architecture	Bridge 4939	Unevaluated	Constructed 1930

Resource present within the ROI of:				Site/ Resource Number	Resource Type	Resource Name / Description	NRHP Status	Notes
Segment 4 West	Segment 4 West Mod	Segment 4 East	Segment 4 CapX					
		X		OL-ORT-00006	Historic Architecture	Bridge 4940	Unevaluated	Constructed 1930
		X		OL-ORT-00013	Historic Architecture	William-Rucker Farmstead	Eligible	Constructed 1870
		X		OL-ORT-00014	Historic Architecture	Rueber Farmstead	Unevaluated	Constructed 1920
		X		OL-ORT-00015	Historic Architecture	Farmstead	Unevaluated	Constructed 1960
		X		OL-ORT-00018	Historic Architecture	House	Unevaluated	Constructed 1900
		X		OL-ORT-00019	Historic Architecture	House	Unevaluated	Constructed 1929
		X		OL-ORT-00020	Historic Architecture	Hewitt House	Unevaluated	Constructed 1940
		X		OL-ORT-00022	Historic Architecture	Love Cabin	Unevaluated	Constructed 1940
			X	OL-ORT-00023	Historic Architecture	Gould Farmstead	Unevaluated	Constructed 1878
		X		OL-ORT-00024	Historic Architecture	Gray Farmstead	Unevaluated	Constructed 1860
		X		OL-ORT-00025	Historic Architecture	Tavern Ell House and Motel Cabin	Unevaluated	Constructed 1933
		X		OL-ORT-00026	Historic Architecture	House	Unevaluated	Constructed 1930
		X		OL-ORT-00030	Historic Architecture	Cabin	Unevaluated	Constructed 1940
		X		OL-ORT-00031	Historic Architecture	Cabin	Unevaluated	Constructed 1940
		X		OL-ORT-00034	Historic Architecture	Barn	Unevaluated	Constructed 1925
		X		OL-ORT-00045	Historic Architecture	Bridge 8191	Unevaluated	
X	X	X	X	Cemetery ID 20716	Historic Cemetery	Catholic Cemetery	N/A	Mapped at the PLS Township level in Township 109N.
X				Cemetery ID 22692	Historic Cemetery	Othello Cemetery	N/A	Est. 1862. Mapped at the PLS Section level in Section 23, Township 108N, Range 15W.
X	X			Cemetery ID 22738	Historic Cemetery	Crofoot Cemetery	N/A	Est. 1865; one burial on the Amos Moulton farm. Mapped at the PLS Forty level in Section 35 of Township 108N, Range 14W.
		X		Cemetery ID 22685	Historic Cemetery	Fitch Cemetery	N/A	Also known as Ringe Fitch Cemetery and Greenwood Prairie Cemetery; est. 1864. Mapped at the PLS Forty level in Section 4 of Township 107N, Range 13W.

[1] Source: reference (285)
[2] Source: reference (292)
[3] Source: reference (293)
[4] Source: reference (294)
[5] Source: reference (295)
[6] Source: reference (282)

10.8.1.1 NRHP-Eligible Resources

There are two NRHP-eligible cultural resources within the ROI of Segment 4, including one archaeological site (21GD0248), which intersects the Segment 4 East and the Segment 4 CapX Co-Locate Option route widths, and one historic architectural resource (OL-ORT-00013), which intersects the Segment 4 East route width.

10.8.1.1.1 NRHP-Eligible Archaeological Site

There is one archaeological site that has been recommended eligible for listing on the NRHP: 21GD0248/Goodhue Good View.

Site 21GD0248/Goodhue Good View is a precontact lithic scatter on an upland hilltop consisting of 32 artifacts, including debitage, two cores and a Turin projectile point dating to the late Archaic Period (reference (285)). It was identified by David W. Kluth, Foth & Van Dyke Consultants during a Phase I and II archaeological investigation along Trunk Highway 52 in 2004. The consultants recommended the site be eligible for listing on the NRHP due to its potential to yield information about the Middle Archaic period. However, because the site did not intersect the ROW, no additional work was recommended at that time (reference (285)). This site intersects the route width east of the Rochester substation, in Goodhue County.

10.8.1.1.2 NRHP-Eligible Historic Architecture

There is one historic architectural resource eligible for listing on the NRHP: OL-ORT-00013/William-Rucker Farmstead.

Resource OL-ORT-00013/William-Rucker Farmstead consists of a domestic dwelling and 12 outbuildings, all but one of which were still standing at the time of reporting in 2001. The farmhouse, a front gable-and-wing building in the vernacular architectural style, was constructed in 1890. Other building features include a limestone foundation with a concrete skim coat, wood clapboard walls, and a shingled medium-pitched roof. A single-story kitchen addition was constructed in 1910, and a porch along the eastern façade was enclosed in 1925 (reference (296)).

The barn, constructed in 1915 is a two-story gambrel roof structure with an attached concrete stave silo and is a typical example of animal barns in the early twentieth century. The other associated structures include a single car garage (c. 1930), a border house (no longer standing), an equipment shed, a wood slat corncrib and a metal mesh corncrib, a possible hog house, a chicken coop, a well-house/pump house, and a Quonset-style structure (modern) (reference (296)).

This resource is eligible for listing on the NRHP under Criterion A for its associations with early twentieth century agriculture, as an example of a diversified farm. While some structural alterations have been made since the original construction, the SHPO determined (in 2001) that these changes did not compromise the resource's ability to qualify for listing on the NRHP under Criterion A.

10.8.2 Potential Impacts

Potential impacts are assessed through identification of documented archaeological and historic resources within one mile of the anticipated alignments. An emphasis is placed on resources within the route width (i.e., the ROI), which could have the most potential impact. Portions of Segment 4 alternatives could be double-circuited with existing transmission lines, reducing impacts to archaeological resources in those portions. However, within the double-circuited portions, structures may be replaced and/or relocated, which could result in additional ground disturbance. Portions of Segment 4 would parallel existing roadways, property lines, and transmission lines. Construction activities resulting in ground disturbance could impact archaeological resources. However, structures could be strategically placed to minimize impacts to below ground culture resources.

Impacts to archaeological and historic architectural resources could result from construction activities, such as ROW clearing, placement of structures, new access roads, temporary construction areas, vehicle and equipment operation, and removal of historic buildings or structures. Additional impacts can result from transmission line location and operation, such as placement within view of a resource (typically a historic building, structure, or TCP) that results in negative effect on the setting, feeling, and/or association of the resource in the viewshed. This issue is particularly applicable when considering cultural resources where the surrounding environment plays an essential role in defining the character.

The majority of the study area for Segment 4 is of unknown potential for the presence of archaeological sites, according to the Survey Implementation Model (MnModel 4) available on the OSA portal (reference (130)). However, this model shows high potential for sites along the Middle Fork Zumbro River, which is mostly applicable to Segment 4 East. Additional survey would help to determine whether previously identified or unidentified archaeological sites are present within the ROI.

Within the route width of Segment 4 West, there are two archaeological sites which are unevaluated for listing on the NRHP and one unevaluated historic architectural resource. Three unrecorded historic (Euroamerican) cemeteries may intersect the route width; however, these are all mapped at the PLS Forty, Section, or Township level, and the exact locations are unknown.

The route width of Segment 4 West Modification contains four archaeological sites that are unevaluated for listing on the NRHP, and five unevaluated historic architectural resources. Two unrecorded historic (Euroamerican) cemeteries may intersect the route width; however, these are mapped at the PLS Forty and Township level, and the exact locations are unknown.

The route width for Segment 4 East contains one NRHP-eligible archaeological site within its route width (site 21GD0248/Goodhue Good View) and two unevaluated archaeological sites. One NRHP-eligible historic architectural resource (OL-ORT-00013/William-Rucker Farmstead) and 29 unevaluated resources are also within the Segment 4 East route width. Two unrecorded historic (Euroamerican) cemeteries may intersect the route width; however, these are mapped at the PLS Forty and Township level, and the exact locations are unknown.

NRHP-eligible archaeological site 21GD0248/Goodhue Good View also intersects the route width of the Segment 4 CapX Co-Locate Option. One additional unevaluated archaeological site, and two unevaluated historic architectural resources are also present within the Segment 4 CapX Co-Locate Option route width. One unrecorded historic (Euroamerican) cemetery may intersect the route width; however this are mapped at the PLS Township level, and the exact location is unknown.

10.8.2.1 Segment 4 West

Segment 4 West parallels a combination of roads, property lines, and existing transmission lines for nearly all of its length; it could be double-circuited in part with an existing transmission line at its northernmost portion.

There are two archaeological sites that intersect the route width of Segment 4 West (these sites also intersect the route width of Segment 4 West Modification): 21GDs/Pine Island Mill and 21OL0076/Reuben Silvester Warner Homestead, both unevaluated for listing on the NRHP. Site 21GDs is an alpha site consisting of a post-contact mill. Though this site was reported based on historic documentation and has not been investigated by a qualified archaeologist, cultural materials associated with this site may be present within the route widths of Segment 4 West and 4 West Modification in Goodhue County before the segments separate to the south. This portion of both segments could be double-circuited along an existing transmission line, thereby reducing impacts to archaeological resources. Site 21OL0076 is a historic homestead site and is present within the route widths of Segment 4 West and 4 West Modification in Olmsted County, east of U.S. Highway 52. This portion of Segment 4 West and 4 West Modification would not be double-circuited along an existing transmission and would therefore have more potential to disturb below-ground cultural resources.

Three historic architectural resources are present within the route width of Segment 4 West. One resource (OL-ORT-00003/school), also present in the route width of Segment 4 West Modification, is unevaluated for the NRHP. This portion of the segment would not be double circuited or parallel existing infrastructure, therefore, the viewshed from this resource may be altered to include visibility of the transmission line. The remaining two resources (a culvert and a roadway) are not eligible.

The Catholic, Othello, and Crofoot cemeteries (post-contact Euroamerican cemeteries) may intersect the Segment 4 West width. However, these cemeteries are mapped at the PLS Township, Section, and Forty levels, respectively, which means that the cemeteries could be located anywhere within those polygons.

10.8.2.2 Segment 4 West Modification

The north-south portion of Segment 4 West Modification could be double-circuited, where it continues east following a property line but not existing infrastructure.

In addition to the two archaeological sites noted above that intersect the route widths for both Segment 4 West and 4 West Modification, two additional archaeological sites intersect the route width of Segment 4 West Modification in Olmsted County, where the Segments diverge: 21OLh/Durango and 21Olk/New Haven, both unevaluated for listing on the NRHP. Both resources are Alpha Sites consisting of post-contact townsites. Site 21Olk is encompassed within site 21OLh. Cultural resources associated with these sites may be present within the Segment 4 West Modification route width. However, this portion of the segment could be double-circuited with an existing transmission line, thereby reducing potential impacts to archaeological resources.

There are six historic architectural resources present in the route width of Segment 4 West Modification. Five of these are unevaluated for the NRHP, and one is not eligible. Of the five unevaluated resources, one is also present within the Segment 4 West route width (OL-ORT-00003/school). This portion of the segment would not be double circuited or parallel existing infrastructure. Therefore, the viewshed from this resource may be altered to include visibility of the transmission line. The remaining four unevaluated resources include two railroad bridges, a razed iron bridge, and a farmhouse. This portion of the segment could be double-circuited and therefore less likely to be impacted by the project.

The Catholic and Crofoot cemeteries (post-contact Euroamerican cemeteries) may intersect the Segment 4 West Modification route width. However, these cemeteries are mapped at the PLS Township and PLS Forty levels, respectively, which means that the cemeteries could be located anywhere within those polygons.

10.8.2.3 Segment 4 East

Segment 4 East follows U.S. Highway 52 for most of its length and includes some double-circuiting with an existing transmission line where it runs east/west.

Five archaeological sites intersect the route width of Segment 4 East, including one eligible for listing on the NRHP, two unevaluated, and two not eligible.

Site 21GD0248/Goodhue Good View is recommended eligible for listing on the NRHP (more information about this resource can be found in section 9.1.1.1 above). It intersects the route widths of both Segment 4 East and Segment 4 CapX Co-Locate Option in the northern portion of the segments. This portion of both segments could be double-circuited along an existing transmission line, thereby reducing the potential impacts to archaeological resources in this area.

Two unevaluated archaeological sites intersect the route width of Segment 4 East. Sites 21OL0030/Shady Lake (precontact habitation site) and 21OL0032/South Branch (precontact lithic scatter) intersect the route width in Olmsted County near Oronoco. This portion of Segment 4 East would not be double-circuited or parallel existing infrastructure. The project would therefore have greater potential to impact archaeological resources, if present, in this portion of Segment 4 East.

Two archaeological sites that have been recommended as not eligible for the NRHP (21GD0249/O'Brien and 21OL0029/Davis) intersect the route width in Goodhue and Olmsted Counties, respectively.

There are 34 historic architectural resources within the route width of Segment 4 East: one eligible, 29 unevaluated, and four not eligible for listing on the NRHP. The NRHP-eligible resource, OL-ORT-00013/ William-Rucker Farmstead, intersects the route width along U.S. Highway 52, south of Oronoco, along a portion of the segment that would not be double-circuited or parallel an existing transmission line. The majority of the unevaluated resources, including domestic dwellings, farmsteads, and bridges, are also concentrated along this portion of the segment. Therefore, the project would have the potential to alter the viewshed from these resources to include visibility of the transmission line and support structures.

The Catholic and Fitch cemeteries (post-contact Euroamerican cemeteries) may intersect the Segment 4 East route width. However, these cemeteries are mapped at the PLS Township and PLS Forty levels, respectively, which means that the cemeteries could be located anywhere within those polygons.

10.8.2.4 Segment 4 CapX Co-Locate Option

The Segment 4 CapX Co-Locate Option would parallel an existing transmission line (which is double-circuit capable) in its entirety but would not be double-circuited with this line.

In addition to eligible site 21GD0248/Goodhue Good View, which is present in both Segment 4 East and Segment 4 CapX Co-Locate Option, there is one additional archaeological site, unevaluated for the NRHP, present within the Segment 4 CapX Co-Locate Option route width. This site, 21OL0058/Zumbro Lake Ring is a circular stone alignment of undetermined time period. This portion of the Segment 4 CapX Co-Locate Option would parallel an existing transmission line but would not be double-circuited with that line, increasing the potential impacts to subsurface cultural resources, if present.

Five historic architectural resources intersect the route width of the Segment 4 CapX Co-Locate Option. Two of these resources are unevaluated for listing on the NRHP: GD-PIT-00030/farmstead and OL-ORT-00023/Gould Farmstead. Because the Segment 4 CapX Co-Locate Option would parallel an existing transmission line, impacts to these resources would likely be minimal, as the project would not significantly alter the viewshed or setting surrounding these farmsteads.

The Catholic Cemetery (post-contact Euroamerican cemetery) may intersect the Segment 4 CapX Co-Locate Option route width. However, this cemetery is mapped at the PLS Township level, which means that it could be located anywhere within the 36-square-mile area.

10.8.3 Mitigation

As noted in the joint certificate of need application and route permit application, the applicant designed routes to avoid physical impacts to known cultural resources. If a Route Permit is issued, and upon route selection, the applicant would consult with SHPO concerning additional required mitigation measures, and would develop a Phase I Cultural Resource Survey Strategy and associated Cultural Resource Survey Reconnaissance survey to identify unknown cultural resources along the proposed route. All investigations would be conducted by a professional archaeologist meeting the Secretary of the Interior's Standards for Archaeology as detailed in the Title 36 Code of Federal Regulations, Part 6. SHPO and interested Tribes will be consulted on methodology prior to completing the study.

As noted in Section 7.5.2 of the joint certificate of need application and route permit application, the applicant will develop an Unanticipated Discoveries Plan, which will outline protocol and mitigation measures, should archaeological resources or human remains be encountered during project construction. The plan will include contact information for SHPO officials, environmental inspectors, archaeologists, geologists, and county sheriffs.

The applicant has engaged, and will continue to engage, with THPOs and interested Tribes to share project information and to glean information about resources of tribal significance that may be impacted by the project.

10.9 Natural Environment

10.9.1 Air Quality

The ROI for air quality is the project area. Impacts can occur during construction and operation of a transmission line and substation. Potential impacts to air quality during construction would be intermittent, localized, short-term, and minimal. Impacts are associated with fugitive dust and exhaust and can be mitigated. Long-term impacts to air quality would also be minimal and are associated with the creation of ozone and nitrous oxide emissions along the HVTL and substations. These localized emissions would be below state and federal standards. Impacts are unavoidable and do not affect a unique resource.

10.9.1.1 Existing Conditions

The Clean Air Act is a federal law that regulates air emissions from stationary and mobile sources. The Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to set (NAAQS for six common air pollutants, referred to as “criteria pollutants”. The six criteria pollutants are ground-level ozone O_3, PM_{10} and $PM_{2.5}$, SO_2, nitrogen dioxide (NO_2), carbon monoxide (CO), and lead (Pb) (reference (131)). NAAQS are set to address the public health and welfare risks posed by certain widespread air pollutants (references (132); (133)).

The Clean Air Act identifies two classes of NAAQS: primary standards, which are limits set to protect the public health of the most sensitive populations, such as asthmatics, children, and the elderly; and secondary standards, which are limits set to protect public welfare, such as protection against visibility impairment or damage to vegetation, wildlife, and structures. Compliance with the national and state air quality standards in the state of Minnesota is assessed at the county level. Minnesota’s state air quality standards align with NAAQS. The EPA designates all counties traversed by Segment 4 to be in attainment for all NAAQS.

In Minnesota, air quality is monitored using stations located throughout the state. The MPCA uses data from these monitoring stations to calculate the Air Quality Index (AQI) on an hourly basis for O_3, $PM_{2.5}$, SO_2, NO_2, and CO. Each day is categorized based on the pollutant with the highest AQI value for a particular hour (reference (134)).

The Rochester air quality monitoring station is in Olmsted County, approximately 7 miles south of Segment 4. The station monitors for O_3 and $PM_{2.5}$. Table 10-15 summarizes the days in each AQI category at the Rochester monitoring station for the most recent five-year period available, 2019-2023.

Table 10-15 Days in Each Air Quality Index Category - Rochester Monitoring Station

Year	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy
2023	190	160	14	1	0
2022	280	78	1	0	0
2021	275	84	2	0	0
2020	292	73	1	0	0
2019	271	93	0	0	0

Air quality at the Rochester monitoring station has been considered "good" for the majority of the past five reported years. The reporting period 2023 had the largest number of days classified as moderate or worse, with 160 days classified as moderate, 14 days classified as unhealthy for sensitive groups, and one day classified as unhealthy.

10.9.1.2 Potential Impacts

Air emissions during construction would primarily consist of emissions from construction equipment and vehicles and would include pollutants such as CO_2, nitrogen oxides (NO_x), and PM. Dust generated from earth disturbing activities also gives rise to PM_{10}/$PM_{2.5}$. Double-circuiting with an existing transmission line would result in less PM_{10}/$PM_{2.5}$ emissions due to less ground disturbance. Adverse effects on the surrounding environment are expected to be negligible due to the temporary disturbance during construction and the intermittent nature of the emission- and dust-producing construction phases.

During operations, air emissions would not require any air quality permits. Small amounts of emissions would be associated with the intermittent project operation and maintenance activities via mobile combustion and particulate roadway dust generation.

During operation, small amounts of NO_X and O_3 would be created due to corona from the operation of transmission lines. The production rate of O_3 due to corona discharges decreases with humidity and less significantly with temperature. Rain causes an increase in O_3 production. In addition to weather conditions, design of the transmission line also influences the O_3 production rate. The O_3 production rate decreases significantly as the conductor diameter increases and is greatly reduced for bundled conductors over single conductors. Conversely, the production rate of O_3 increases with applied voltage (reference (135)). The emission of O_3 from the operation of a transmission line of the voltages proposed for the project would be minimal.

Emissions would be generated from fuel combustion during routine inspection and maintenance activities. The applicant would perform an annual aerial inspection of the line. Once every four years, crews would visually inspect the lines from the ground. Additionally, vegetation maintenance would generally occur once every four years. Emissions from routine inspection and maintenance activities would be minimal.

10.9.1.3 Mitigation

As noted in the joint certificate of need application and route permit application, if construction activities generate problematic dust levels, the applicant would employ construction-related practices to control fugitive dust as needed. This could include application of water or other commercially available non-chloride dust control agents on unpaved areas subject to frequent vehicle traffic, reducing the speed of vehicular traffic on unpaved roads, and covering open-bodied haul trucks.

As also noted in the route permit application, corona effects would be minimized during operation by using good engineering practices, such as the use of bundled conductors. A corona signifies a loss of electricity, so the applicant would engineer the transmission lines to limit corona.

10.9.2 Climate

The ROI for climate change is the project area. The impact analysis for climate considers existing patterns in the ROI and how the project could be impacted by climate change, as well as how the project could affect climate change. For the counties crossed by Segment 4, flood risk is moderate or major, and fire risk is moderate. The project would minimally contribute to climate change impacts as a result of GHG emissions. The project would be engineered to be resilient under changing climatic factors, including increased average temperatures and changes in precipitation intensities and quantities.

10.9.2.1 Existing Conditions

Climate change is observed as changes in temperature and precipitation patterns, increases in ocean temperatures and sea levels, changes in extreme weather events, and ecosystem changes. These changes are largely attributed to the greenhouse effect. As the amount of greenhouse gases (GHGs) in the Earth's atmosphere increases, the greenhouse effect causes the Earth to become warmer (reference (136)).

There are also naturally occurring climate variations. These are cyclical patterns caused by variations in ocean circulation and atmospheric pressure patterns that occur on timescales of weeks to decades. Increased global surface temperatures could change these natural climate patterns and the resulting impact on regional precipitation and temperature anomalies (reference (137)).

Warmer and wetter conditions have been observed in Minnesota since observations first began in 1895, especially in the past several decades. An increase in precipitation volume and intensity has also been observed, including large-area extreme rainstorms. A rise in temperatures, particularly during the winter season in Minnesota, has been occurring as well. These trends are expected to continue (reference (138)).

To understand how climate change is anticipated to affect the project area, historical and projected climate data is considered, as well as climate hazard projections.

Climate projections are based on the Minnesota dynamically downscaled climate model data that was developed by the University of Minnesota and are summarized in three scenarios: Shared Socioeconomic Pathway (SSP) 245, SSP370, and SSP585. SSP is a measure adopted by the Intergovernmental Panel on Climate Change (IPCC) to represent various greenhouse gas concentration pathways as well as social and economic decisions (reference (139)).

SSP245 represents a "Middle of the Road" scenario where economic, social, and technological trends follow historical patterns, population growth is moderate, and inequality persists. Additionally, SSP245 includes an intermediate emissions scenario, where a net radiative forcing of 4.5 watts per meter squared (W/m^2) is received by the earth due to the greenhouse gas (GHG) effect and emissions begin to decrease around 2040 (reference (139)).

SSP370 represents a "Regional Rivalry" scenario where nations focus on regional issues instead of cross-collaboration and development. SSP370 also includes a high emissions scenario, where a net radiative forcing of 7.0 W/m^2 is received by the earth (reference (139)).

SSP585 represents a "Fossil-fueled Development" scenario where there is increased development in competitive markets driven by an increased global consumption of fossil fuels. SSP585 also includes a very high emissions scenario, where a net radiative forcing of 8.5 W/m^2 is received by the earth and no emissions are reduced through 2100 (reference (139)).

Table 10-16 shows the modeled historical and projected temperature values for the project.

Table 10-16 Modeled Historical and Projected Temperature Trends for the Project

Scenario	Time Period	Average Daily Temperature (°F) – Ensemble Mean	Minimum Daily Temperature (°F) – Ensemble Mean	Maximum Daily Temperature (°F) – Ensemble Mean
Historical	1995-2014	44.9	35.4	57.3
SSP245	2040-2059	48.6 (3.7)	39.2 (3.9)	60.8 (3.5)
SSP245	2060-2079	49.9 (5.0)	40.6 (5.3)	62.0 (4.7)
SSP245	2080-2099	51.6 (6.7)	42.2 (6.8)	63.8 (6.5)
SSP370	2040-2059	50.0 (5.1)	40.2 (4.9)	62.7 (5.4)
SSP370	2060-2079	52.0 (7.2)	42.4 (7.0)	64.6 (7.3)
SSP370	2080-2099	53.9 (9.0)	44.5 (9.1)	66.1 (8.8)
SSP585	2040-2059	49.2 (4.3)	39.8 (4.4)	61.4 (4.1)
SSP585	2060-2079	51.9 (7.0)	42.6 (7.3)	63.9 (6.6)
SSP585	2080-2099	56.2 (11.3)	47.3 (11.9)	67.9 (10.6)

[1]Values in parentheses represent the difference from the modeled historical value.

Table 10-17 shows the model historical and projected precipitation values for the project.

Table 10-17 Modeled Historical and Projected Precipitation Trends for the Project

Scenario	Time Period	Total Annual Precipitation (in) - Ensemble Mean
Historical	1995-2014	35.3
SSP245	2040-2059	37.1 (1.8)
SSP245	2060-2079	36.3 (1.1)
SSP245	2080-2099	34.3 (-1.0)
SSP370	2040-2059	30.0 (-5.3)
SSP370	2060-2079	31.6 (-3.7)
SSP370	2080-2099	34.6 (-0.7)
SSP585	2040-2059	35.3 (0.1)
SSP585	2060-2079	38.6 (3.3)
SSP585	2080-2099	40.6 (5.3)

[1] Values in parentheses represent the difference from the modeled historical value.

The EPA CREAT provides 100-year storm intensity projections to help with planning for water, wastewater, and stormwater utilities and stormwater utilities (references (140); (141)). A 100-year storm is an event that has a one percent chance of occurring in a given year. The CREAT tool considers two time periods, 2035 and 2060. For each time period, two scenarios are considered, from a 'Not as Stormy' future to a 'Stormy' future. Within the counties traversed by the project, the 2035 time period shows a 1 to 5 percent increase in the 100-year storm intensity for the ‘Not as Stormy’ scenario, and an 11 to 20 percent increase for the ‘Stormy’ scenario. The 2060 time period shows a 6 to 10 percent increase in the 100-year storm intensity for the ‘Not as Stormy’ scenario, and a 26 to 30 percent increase for the ‘Stormy’ scenario.

The EPA Streamflow Projections Map summarizes general projections related to streamflow under climate change (reference (142)). The EPA Streamflow Projections Map for 2071 to 2100 (RCP 8.5) anticipates a general change in average streamflow of streams within the project area of Segment 4 by a ratio of 1.21 to 1.26 (90th percentile) under wetter projections and a ratio of 0.83 (10th percentile) under drier projections when compared to baseline historical flows (1976 to 2005).

The First Street Risk Factor risk assessment and map tool was used to determine a risk assessment for each of the counties traversed by Segment 4 to help identify current and future climate change risks (reference (143)). Table 10-18 summarizes risks for flood, fire, wind, air quality, and heat as defined by Risk Factor (144); (145); (146); (147); (148)).

Table 10-18 Climate Change Risks for Counties Traversed by Segment 4

County	Flood Risk	Fire Risk	Wind Risk	Air Quality Risk	Heat Risk
Goodhue	Moderate	Moderate	Minor	Minor	Minor
Olmsted	Moderate	Moderate	Minor	Minor	Minor
Wabasha	Major	Moderate	Minor	Minor	Minor

Flood risk is moderate or major for all counties. The fire risk is moderate for all counties. The wind risk, air quality risk, and heat risk are all minor for all counties.

10.9.2.2 Potential Impacts

The project would result in GHG emissions that could minimally contribute to climate change impacts, such as changes in temperature, precipitation, and extreme weather events. These emissions are discussed in Section 10.9.4. Double-circuiting with an existing transmission line would result in less GHG emissions from land use change. The climate change risks most susceptible to the project include increases in 100-year storm frequencies and soil erosion from increased storm intensities. The project could also be susceptible to more frequent wildfires.

10.9.2.3 Mitigation

The project would be engineered to be resilient under changing climatic factors including increased average temperatures and changes in precipitation intensities and quantities.

There may be periods of dry weather and concerns of wildfires. However, the transmission lines would be maintained following or exceeding NERC reliability standards that address vegetation management, including the increase of noxious weeds that could occur from changed conditions that allow them to spread. Surface water temperatures could increase in locations where the project requires tree clearing along shorelines, increasing sun exposure. This would be exacerbated by increased temperatures.

10.9.3 Geology and Topography

The ROI for geology and topography is the route width. Structure foundations have the potential to impact bedrock including karst. To minimize impacts, micrositing and structure foundation design would account for the presence of karst if present, the applicant would adhere to temporary dewatering and stormwater runoff regulations as required. Minimal impacts are anticipated to topography along the route width given that original surface contours are regraded and revegetated to the extent feasible.

10.9.3.1 Existing Conditions

Surface geology consists of thick quaternary-aged glacial deposits from the most recent Wisconsin glaciation and includes loamy diamicton and associated outwash of the Browerville Formation. Thin layers of pre-Wisconsin “old tills” and sediment covered bedrock are also present. Colluvium and floodplain alluvium are also common (reference (149)). Thickness of the surface deposits varies depending on the location and type of deposit; thickness generally ranges from less than 10 feet to over 300 feet (reference (150)). The project area is underlain by bedrock formed primarily during the Ordovician periods in the Paleozoic Era, and consists of limestone, sandstone, shale, and dolostone (reference (151)).

Karst features are common in southeast Minnesota. Surface karst features include, but are not limited to, sinkholes, caves, stream sinks, and springs. Several karst features, including four springs, two drain tile outlets, and 16 sinkholes, are located within the route width (Table 10-19; references (152); (153)).

Table 10-19 Karst Features Within Route Width

Segment	Karst Feature	Karst Feature ID	Map
Segment 4 West	Spring	MN55:A00321	Map 62-2
Segment 4 West	Spring	MN55:A00342	Map 62-2
Segment 4 West	Tile Outlet	55T0000115	Map 62-2
Segment 4 West	Tile Outlet	55T0000116	Map 62-2
Segment 4 West	Sinkhole	55D0000697	Map 62-2
Segment 4 West; Segment 4 West Modification	Sinkhole	55D0000924	Map 62-2, Map 62-3
Segment 4 West; Segment 4 West Modification	Sinkhole	55D0000923	Map 62-3
Segment 4 West Modification	Spring	MN55:A00320	Map 62-2
Segment 4 East	Sinkhole	55D0000777	Map 62-3
Segment 4 East	Sinkhole	55D0000967	Map 62-3
Segment 4 East	Spring	MN55:A00200	Map 62-3
Segment 4 CapX Co-Locate Option	Sinkhole	79D0000113	Map 62-1
Segment 4 CapX Co-Locate Option	Sinkhole	55D0000769	Map 62-3
Segment 4 CapX Co-Locate Option	Sinkhole	55D0000755	Map 62-3
Segment 4 CapX Co-Locate Option	Sinkhole	55D0000756	Map 62-3
Segment 4 CapX Co-Locate Option	Sinkhole	55D0000757	Map 62-3
Segment 4 CapX Co-Locate Option	Sinkhole	55D0000758	Map 62-3
Segment 4 CapX Co-Locate Option	Sinkhole	55D0000759	Map 62-3
Segment 4 CapX Co-Locate Option	Sinkhole	55D0000760	Map 62-3
Segment 4 CapX Co-Locate Option	Sinkhole	55D0000761	Map 62-3
Segment 4 CapX Co-Locate Option	Sinkhole	55D0000762	Map 62-3
Segment 4 CapX Co-Locate Option	Sinkhole	55D0000763	Map 62-3

Elevations range from about 930 feet AMSL to 1,100 feet AMSL along route width. Topography is generally flat with localized areas of steeper slopes occurring adjacent to waterbodies.

The project area seismic risk is very low; it is located within an area rated as less than a two-percent chance of damage from natural or human-induced earthquake in 10,000 years (reference (154)).

The type of landslide most common in Minnesota is shallow slope failure triggered by a heavy rain event. This slope failure is generally less than 3 feet deep, but can erode the entire length of a slope. Deeper landslides, mudflows, and debris flows are much less common in Minnesota than in more mountainous areas. Less destructive landslides, such as slow-moving earthflows and soil creep, can also occur when soil moisture and shallow groundwater saturate sediments during heaving rain events or snowmelt. Human factors, including inadequate storm water management, undercutting of slopes, placement of artificial fill, and land-use changes, such as urbanization and agricultural practices, can lead to erosion and landslides (reference (155)). The USGS United States Landslide Inventory has no records of landslides within the route width of Segment 4 reference (156)).

An active limestone quarry located west of Cascade at Route Connector 4Q is discussed further in Section 10.7.3.

10.9.3.2 Potential Impacts

Thick glacial deposits on the west near Pine Island thin out towards the east within the "driftless area" where glacial drift deposits are uncommon or absent and bedrock is present just below the ground surface. Construction and operation of transmission line projects can impact geology through temporary, construction-related impacts and/or long-term impacts.

Karst features identified within the route width include four springs, two drain tile outlets, and 16 sinkholes as summarized in Table 10-20. The presence of sinkholes is an indication of active karst. Active karst is a terrain having distinctive landforms and hydrology created primarily from the dissolution of soluble rocks within 50 feet of the land surface. Pollutants being carried by stormwater runoff can pass rapidly through the subsurface into the groundwater, creating a greater risk of groundwater contamination than is found in other soil types (reference (271)).

Table 10-20 Segment 4 Karst Features within the Route Width

Segment	Spring (count)	Drain Tile Outlet (count) (count)	Sinkhole (count)
Segment 4 West	2	2	3
Segment 4 West Modification	1	0	2
Segment 4 East	1	0	2
Segment 4 CapX Co-Locate Option	0	0	11 (10 of which are also along Segment 3 at the Zumbro River crossing)

Impacts to topography, such as the creation of abrupt elevation changes are not expected. Transmission line structures would be installed at existing grade. Changes in slope are not anticipated during the project, so there would be limited risk of landslides.

10.9.3.3 Mitigation

The applicant would conduct geotechnical evaluations prior to project construction to identify structure placements and avoid impacts to subsurface geological features.

Geotechnical analyses would evaluate whether karst areas are present at structure locations, and micro-siting and structure foundation design would account for the presence of karst. If geotechnical analyses determine karst features are present where construction will occur, the applicant will comply with MPCA stormwater requirements and would prohibit infiltration of stormwater runoff within 1,000 feet up-gradient or 100 feet down-gradient of active karst features.

Should grading occur for installation of the HVTL structures, it would be restricted to establishing a flat, safe workspace. Major topographical changes to the landscape would not occur. Once construction is complete, disturbed areas would be regraded to restore original surface contours and revegetated to the maximum extent feasible.

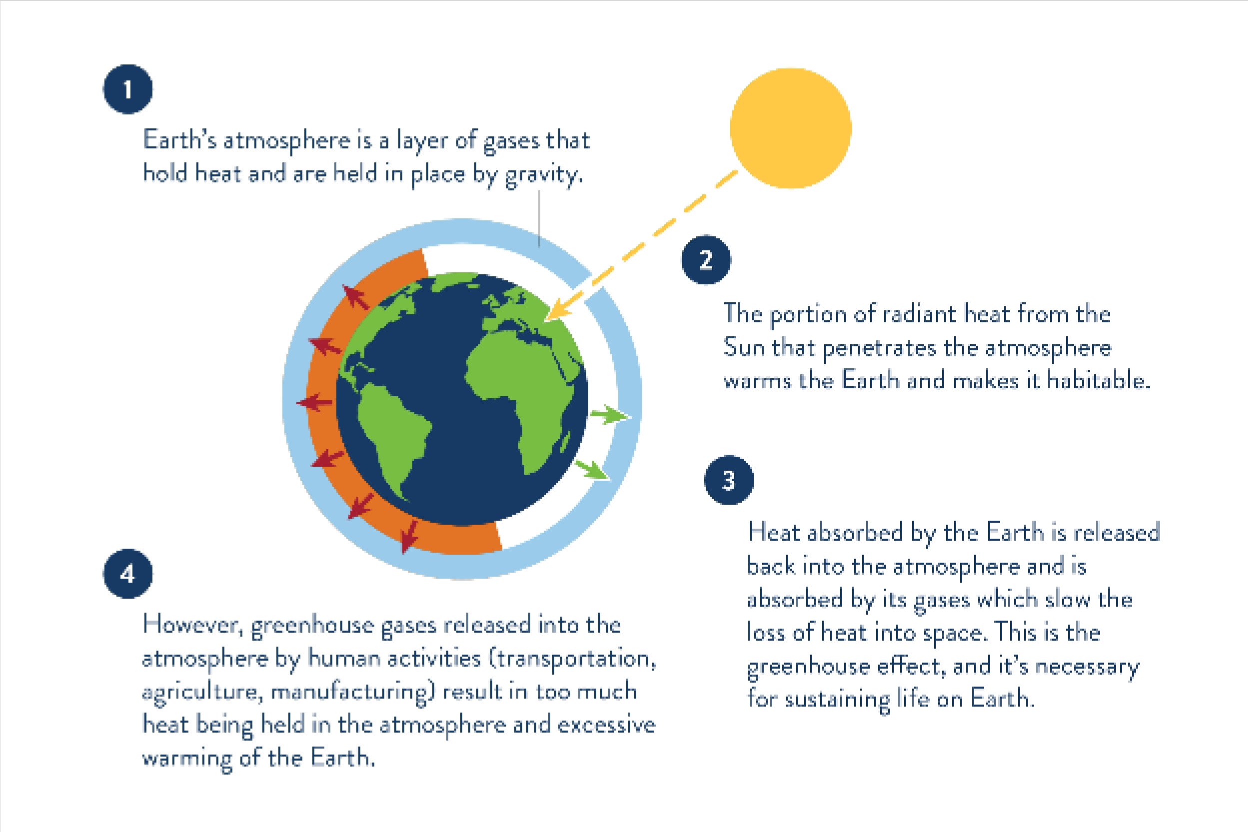
10.9.4 Greenhouse Gases

The ROI for greenhouse gas (GHG) emissions is the ROW. Construction activities would result in short-term increases in GHG emissions because of the combustion of fossil fuels in construction equipment and vehicles. These emissions would be short-term and dispersed over the ROI; therefore, total emissions would be minimal and not result in a direct impact to any one location. Maintenance activities would also cause GHG emissions, but to a much lesser extent. Operational impacts from formation of nitrous oxide and release of sulfur hexafluoride would be minimal. Impacts are unavoidable but can be minimized.

10.9.4.1 Existing Conditions

GHGs are gases that trap heat in the atmosphere. Some of the solar radiation that reaches Earth’s surface radiates back toward space as infrared radiation. GHGs trap heat in the atmosphere from the absorption of this infrared radiation, which causes a rise in the temperature of Earth’s atmosphere, as illustrated in Figure 10-6. This warming process is known as the greenhouse effect (reference (157)).

Figure 10-6 Greenhouse Gases and Earth's Atmosphere



The most common GHGs include CO_2, CH_4, N_2O, and fluorinated gases. GHG emissions are calculated as CO_2e, which is equal to the global warming potential (GWP) for each pollutant multiplied by the potential pollutant emissions. CO_2e normalizes all GHG emissions to CO_2 for comparability across different pollutants. Human GHG emissions are responsible for about two-thirds of the energy imbalance that is causing Earth's temperature to rise, which has direct and cascading effects on weather and climate patterns, vegetation, agriculture, disease, availability of water, and ecosystems (reference (158)).

Climate change and decarbonization have been discussed for decades at all levels of government, as well as in global, national, and local institutions. The state of Minnesota has established a goal for the reduction of GHG emissions, set forth in Minnesota Statute § 216H.02:

> *It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions by at least the following amounts, compared with the level of emissions in 2005: (1) 15 percent by 2015; (2) 30 percent by 2025; (3) 50 percent by 2030; and (4) to net zero by 2050.*

Minnesota Statute § 216B.1691 Renewable Energy Objectives, which became effective in 2023, requires all electric utilities to generate or procure 100 percent of electricity sold to Minnesota customers from carbon-free sources by 2040, with an interim goal of 80 percent (for public utilities) and 60 percent (for

other electric utilities) carbon-free electricity by 2030. Carbon-free sources are those that generate electricity without emitting CO_2. Electric utilities are also required to generate or procure 55 percent of electricity sold to Minnesota customers from an eligible energy technology by 2035. Eligible energy technology includes technology that generates electricity from solar, wind, and certain hydroelectric, hydrogen, and biomass sources (Minnesota Statute §216B.1691).

10.9.4.2 Potential Impacts

GHG emissions associated with the construction and operation of the project consist of direct emissions generated from combustion sources (for example, mobile on- and off-road sources) and land use change. Double-circuiting with an existing transmission line would result in less GHG emissions from land use change. Indirect emissions associated with the operation of the project include the GHG emissions associated with electrical consumption.

Construction emissions from mobile combustion were calculated for on-road vehicles and off-road construction equipment. Construction emissions from combustion sources are anticipated to be similar for each alternative. Therefore, the total construction combustion emissions and length of the applicant-proposed segments were used to calculate an emission rate per segment length, in metric tons CO_2e/mile, to quantify combustion emissions for each alternative. Construction emissions from temporary land use changes were calculated with an assumed construction duration of 60 days for each land use change area. The calculated emission rate per segment length is 70.86 metric tons CO_2e/mile. GHG emissions calculations are summarized in Appendix L.

Identified GHG emissions associated with operation of the project include direct emissions generated from combustion sources (for example, mobile on- and off-road sources) and land use change, and indirect emissions from electrical consumption. Operational emissions from mobile combustion are anticipated to be similar for each alternative. Therefore, operational emissions from mobile combustion have only been calculated for the applicant-proposed segments. Operational emissions from temporary land use changes were calculated with the assumption that forest land, cropland, and settlement land would be converted to grassland following completion of the project and for the duration of operations. Operational emissions from electrical consumption are assumed to be negligible and have not been calculated.

The Prevention of Significant Deterioration (PSD) is a Clean Air Act permitting program for new or modified major sources of air pollution in attainment areas. It is designed to prevent NAAQS violations, preserve and protect air quality in sensitive areas, and protect public health and welfare (reference (159)). The current threshold for new facilities with operational GHG emissions is 100,000 tons CO_2e per year. Estimated project GHG emissions are below this threshold.

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

routinely because they are largely attributed to faulty equipment and leakage. Equipment containing SF_6 is designed to avoid SF_6 emissions (reference (160)).

10.9.4.3 Mitigation

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

The project would ultimately result in a net decrease of GHG emissions during operation, as it would facilitate the replacement of legacy fossil fuel generation with renewable resources. The project would also increase regional transmission reliability and allow additional carbon-free energy sources to be integrated into the power supply. The project will therefore assist in achieving climate goals.

10.9.5 Groundwater

The ROI for groundwater is the ROW. Documented active wells and DWSMA/WHPAs are present within the ROI. The associated wellhead protection plans should be reviewed by the applicant. To minimize impacts, the applicant would store materials, including fuel and gasoline, in sealed containers to prevent spills, leaks, or other discharges to soil and groundwater in accordance with the SWPPP during construction. Potential impacts to groundwater could also occur during construction (specifically installation of foundations) if artesian groundwater conditions are present and the confining layer is breached. Artesian groundwater conditions can be found throughout the state of Minnesota and are not limited to certain areas of geography. Provided the pressurized conditions and extents are identified and understood, and a plan is implemented to manage pressurized groundwater conditions should they be encountered, impacts would be minimized and/or mitigated.

10.9.5.1 Existing Conditions

The DNR divides Minnesota into six groundwater provinces based on bedrock and glacial geology. The aquifers within these provinces occur in two general geologic settings: bedrock and unconsolidated sediments deposited by glaciers, watercourses, and waterbodies. The ROW crosses the Karst Province. Sediment in these provinces is thin or absent and, therefore, not used or relatively unimportant as aquifers, except in major river valleys where sediment thickness is greater. The Karst Province is underlain by productive bedrock aquifers, however those closest to the land surface are suspectable to impacts by human activities (reference (161)).

Groundwater flow direction in these shallow, unconsolidated sediments is expected to follow surface topography and surface water flow. However, groundwater flow direction could vary depending on factors such as the presence of shallow bedrock, underground utilities, and/or other surficial features. The depth to the water table ranges from less than 10 feet to greater than 50 feet below ground surface along ROW (reference (162)).

The EPA defines a SSA or principal source aquifer area as:

- One that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer
- Where contamination of the aquifer could create a significant hazard to public health
- Where there are no alternative water sources that could reasonably be expected to replace the water supplied by the aquifer.

There are currently no EPA-designated SSAs along ROW (reference (163)).

Wells are abundant within the project area. The MWI, which is managed by the MDH, provides information about wells and borings such as location, depth, geology, construction, and static water level at the time of construction. According to the MWI, there are approximately 10 domestic wells within the ROW (Table 10-21; reference (164)).

Table 10-21 MWI Active Water Wells within ROW

MWI Unique Well ID	Status	Depth (Feet)	Static Water Level (Feet) on MWI Report	Use	Segment	Map
672703	Active	149	96	Domestic	Segment 4 West; Segment 4 West Mod; Segment 4 North-North Option; Segment 4 North-South Option	Map 62-3
733181	Active	200	120	Domestic	Segment 4 West; Segment 4 West Mod; Segment 4 North-North Option; Segment 4 North-South Option; Segment 4 South-North Option; Route Connector 4Q	Map 62-3
220903	Active	282	22	Domestic	Segment 4 East	Map 62-1, Map 62-2
256061	Sealed	171		Domestic	Segment 4 East; Segment 4 South-North Option; Segment 4 South-South Option	Map 62-2, Map 62-3

MWI Unique Well ID	Status	Depth (Feet)	Static Water Level (Feet) on MWI Report	Use	Segment	Map
601271	Active	347	45	Domestic	Segment 4 East; Segment 4 South-North Option; Segment 4 South-South Option	Map 62-3
1000010624	Active	375	Unknown	Domestic	Segment 4 East; Segment 4 South-North Option; Segment 4 South-South Option	Map 62-3
1000011183	Active	160	Unknown	Domestic	Segment 4 East; Segment 4 South-North Option; Segment 4 South-South Option	Map 62-2, Map 62-3
1000011189	Active	150	44	Domestic	Segment 4 East; Segment 4 South-North Option; Segment 4 South-South Option	Map 62-2, Map 62-3
1000011200	Active	100	Unknown	Domestic	Segment 4 East	Map 62-2, Map 62-3
1000020010	Unknown	Unknown	unknown	Unknown	Segment 4 East; Route Segment 4E Equivalent	Map 62-1, Map 62-2

The WHPA program administers the public and non-public community water supply source-water protection (SWP) in Minnesota. WHPAs are areas surrounding public water supply wells that contribute groundwater to the well. In these areas, contamination on the land surface or in water can affect the drinking water supply. WHPAs for public and community water-supply wells are delineated based on a zone of capture for 10-year groundwater time-of-travel to the well and are available through a database and mapping layer maintained by MDH (reference (165)). The viewer also includes the DWSMA and DWSMA Vulnerability. DWSMAs are delineated areas within the WHPA and are managed in a wellhead protection plan, usually by a city.

Table 10-22 summarizes the DWSMAs/WHPAs included in the MDH database that are crossed by ROW.

Table 10-22 Summarizes the DWSMAs/WHPAs included in the MDH database that are crossed by ROW

County	DWSMA/WHPA Name	Location	Vulnerability to Contamination	Map
Goodhue, Olmsted	Pine Island	Segment 4 West; Segment 4 West Modification	Moderate	Map 62-1
Olmsted	Oronoco	Segment 4 East	High	Map 62-1, Map 62-2, Map 62-3
Olmsted	Sargent's Landscape Nursery	Segment 4 West; Segment 4 West Modification; Segment 4 North-North Option; Segment 4 North-South Option	Moderate-High	Map 62-1, Map 62-3
Olmsted	Sunrise Valley Mobile Home Park (Domaille Engineering Inc.)	Segment 4 East; Segment 4 West; Segment 4 West Modification; Segment 4 North-North Option; Segment 4 North-South Option; Route Connector 4Q	Moderate	Map 62-3

A Special Well and Boring Construction Area, or well advisory, is a mechanism which provides for controls on the drilling or alteration of public and private water-supply wells, and environmental wells in an area where groundwater contamination has, or might, result in risks to public health. There are no MDH-designated Special Well and Boring Construction Areas along the ROW (reference (166)).

Flowing wells and borings are drilled holes that encounter an aquifer with sufficient natural pressure to force water above the ground surface, so that water will flow without pumping. Flowing artesian conditions exist when a low permeability confining layer, such as clay or shale, overlies the aquifer. This puts the groundwater under pressure because the material doesn't permit water to flow through it. When a well or boring is completed, the confining layer is breached, creating a pressure relief valve that allows the water to rise above the top of the aquifer. If the pressure in the aquifer is great enough to force water to rise above the land surface, the well flows. Flowing conditions can also occur in an unconfined aquifer, most often at lower elevations in groundwater discharge areas near rivers, lakes, or other waterbodies. These unique features can be found throughout the state of Minnesota and are not limited to certain areas or geography (reference (167)).

10.9.5.2 Potential Impacts

When an unexpected artesian condition is found, it can have a substantial impact that could compromise the condition and use of the area in which the flow is encountered, and could cause challenges with construction of transmission line tower foundations along the routes. Artesian groundwater conditions, when unintentionally encountered, can cause excavation stability issues and uncontrolled release of groundwater at the ground surface and to surface waters. If uncontrolled, artesian groundwater conditions can be extremely difficult to repair and in some instances are un-repairable. However, subsurface investigations and construction in artesian groundwater conditions can be completed successfully provided the pressurized conditions and extents are identified and understood, and a plan is implemented to manage pressurized groundwater conditions should they be encountered.

10.9.5.3 Mitigation

The applicant would coordinate with the DNR, as necessary, to confirm that ground disturbing activities such as geotechnical investigation and structure installation placement do not disrupt groundwater hydrology.

The applicant would conduct geotechnical evaluations prior to project construction to identify locations where potential groundwater impacts could occur.

Depending on the results of the geotechnical evaluations, the applicant would obtain a Water Appropriation Permit from DNR if groundwater dewatering activities would be greater than 10,000 gallons of water per day or 1 million gallons per year.

The applicant would assess any wells identified within the ROW during project construction to determine if they are open, and seal them, if necessary, in accordance with MDH requirements.

Indirect impacts to groundwater can be mitigated by avoiding or minimizing impacts to surface waters. Measures to control soil erosion and sedimentation would be implemented during construction activities.

Four DWSMAs/WHPAs are crossed by ROW as summarized in Table 10-23. Associated wellhead protection plans would be reviewed by the applicant. During construction, the applicant would store materials, including fuel and gasoline, in sealed containers to prevent spills, leaks, or other discharges to soil and groundwater in accordance with the SWPPP during construction.

Table 10-23 DWSMAs/WHPSs Crossed by Segment 4

Segment	Pine Island	Oronoco	Sargent’s Landscape Nursery	Sunrise Valley Mobile Home Park (Domaille Engineering Inc.)
Segment 4 West	X	--	X	X
Segment 4 West Modification	X	--	X	X
Segment 4 East	--	X	--	X
Segment 4 CapX Co-Locate Option	--	--	--	--

10.9.6 Public and Designated Lands

The ROI for public and designated lands is the ROW. No public lands, such as local parks, state forests, or national forests, were identified. No designated lands with conservation easements are located within the ROI.

10.9.6.1 Existing Conditions

No locally-owned (city or county), state-owned, or federally-owned lands are present within the ROI.

This EIS also notes where privately held land that could also be subject to special designations is present within the ROI. This includes lands that are part of various conservation easement programs, including the Reinvest in Minnesota (RIM) Reserve program and Conservation Reserve Enhancement Program (CREP).

10.9.6.2 Potential Impacts

No impacts to public or designated lands are anticipated as a result of any of the Segment 4 alternatives.

10.9.6.3 Mitigation

No impacts are anticipated, and therefore, no mitigation is proposed.

10.9.7 Rare and Unique Natural Resources

Rare and unique natural resources include federally and state protected species and sensitive ecological resources. The ROI for protected species is the project area (1 mile), and the ROI for sensitive ecological resources is the route width. Impacts to protected species are evaluated by reviewing documented occurrences of these species within the ROI. Potential impacts to sensitive ecological resources, which could provide suitable habitat for protected species, are evaluated by assessing the presence of these resources within the ROI.

One federally protected species and several state protected species have been documented within the ROI for Segment 4. Potential direct or indirect impacts to protected species could occur should they be present within or near the ROW during construction or maintenance activities. While more mobile species would leave the area for nearby comparable habitats, non-mobile species, such as vascular plants or nesting birds, could be directly impacted. Several sensitive ecological resources, such as native plant communities, intersect the ROI for Segment 4. Construction activities also have the potential for direct impacts to sensitive ecological resources if they are present within the area subject to construction disturbance. Long-term impacts would involve permanent clearing of vegetation in areas identified as sensitive ecological resources, which could indirectly impact any protected species associated with these habitats.

Several measures could be implemented to avoid, minimize, or mitigate impacts to protected species and sensitive ecological resources, including those provided in the DNR's Natural Heritage Review response (Appendix M). Some measures are specific to the protected species and their associated

habitats and could include rare species surveys to confirm ahead of construction activities or monitoring during construction. Measures to avoid, minimize, or mitigate impacts include, but are not limited to, prudent routing, implementation of BMPs, working in already disturbed areas, and working in frozen ground conditions. The applicant committed to continuing to work with the DNR to minimize and mitigate potential impacts.

10.9.7.1 Existing Conditions

Federally endangered or threatened species are protected under Section 7 of the ESA of 1973 and are typically evaluated and protected by the USFWS. Data on federal protected species were reviewed using the USFWS IPaC online tool.

At the state level, the evaluation and protection of Minnesota's rare and unique natural resources are overseen by the DNR Division of Ecological and Water Resources through the identification and evaluation of threatened and endangered species and sensitive ecological resources. State endangered or threatened species are protected under the Minnesota Endangered Species Statute (Minnesota Statute § 84.0895).

The DNR Natural Heritage Inventory System (NHIS) database (License Agreement #2022-008) was used to assess the presence of state protected species within the Segment 4 project area. Although the NHIS database does not represent a comprehensive survey, it provides information on the potential presence of protected species. The NHIS is continually updated as new information becomes available and is the most complete source of data on Minnesota's protected species. Although reports or queries might not show records for state-protected species within the vicinity of a project, it does not necessarily mean that they are not present. It could simply mean that the area has not been surveyed or that records have not been reported to the DNR.

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

Map 71 provides an overview of sensitive ecological resources within Segment 4. In order to protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on any maps.

10.9.7.1.1 Federal Protected Species

The USFWS IPaC online tool was queried on January 17, 2025, for a list of federally threatened and endangered species, proposed species, candidate species, and designated critical habitat that may be present within the Segment 4 project area (Appendix M). The IPaC query identified seven federal species that could potentially be in the vicinity of Segment 4, including two endangered species, one threatened species, three proposed endangered or threatened species, and an experimental population, nonessential species. The IPaC query also indicated that Segment 4 intersects proposed designated critical habitat for the rusty patched bumble bee (*Bombus affinis)*. The species identified in the IPaC query and their typical habitats are summarized in Table 10-24.

Table 10-24 Federal Species Potentially Present within Vicinity of Segment 4

Scientific Name	Common Name	Federal Status	State Status	Habitat
Myotis septentrionalis	Northern long-eared bat	Endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Bombus affinis	Rusty Patched bumble bee	Endangered	Watchlist	Areas with consistent flowering vegetation throughout the growing season. Overwinter in upland forests and woodlands.[1]
Lespedeza leptostachya	Prairie bush clover	Threatened	Threatened	Bedrock outcrop prairie or north-, northeast, or northwest-facing mesic prairie to dry prairie.[1]
Perimyotis subflavus	Tri-colored bat	Proposed endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Argynnis idalia occidentalis	Western regal fritillary	Proposed threatened	Not listed	Tall grass prairie, wet fields, meadows, marshes.[2]
Danaus plexippus	Monarch butterfly	Proposed threatened	Not listed	Areas with a high number of flowering plants. Presence of milkweed (*Asclepias* spp.) to complete the caterpillar life stage.[3]
Grus americana	Whooping crane	Experimental population, non-essential	Not listed	Wetlands, lakes, ponds, rivers, and agricultural fields.[4]

[1] Habitat information from reference (175)).
[2] Habitat information from reference (176)).
[3] Habitat information from reference (177)).
[4] Habitat information from reference (178)).

Federally proposed threatened or endangered species are species that the USFWS has determined are in danger of extinction throughout all or a significant portion of their range and have proposed a draft rule to list them as threatened or endangered. Proposed species are not protected by the take prohibitions of the federal ESA. A non-essential experimental population is a designation that refers to a population that has been established within its historical range under Section 10(j) of the ESA to aid in recovery of the species. Species designated as non-essential experimental populations are only protected by the federal ESA within a national wildlife refuge or a national park; the route widths of Segment 4 West, Segment 4 West Modification, Segment 4 East, or the Segment 4 CapX Co-Locate Option do not intersect a national wildlife refuge or a national park.

10.9.7.1.2 State Protected Species

The DNR's NHIS database was queried in January 2025 (Barr License Agreement LA-2022-008), to determine if any state endangered, threatened, or special concern species have been documented within 1 mile of Segment 4 West, Segment 4 West Modification, Segment 4 East, or the Segment 4 CapX

Co-Locate Option; the DNR uses a 1 mile buffer as a standard distance to capture the range of species that have already been documented and could be present in a particular area, given presence of suitable habitat. The NHIS database identified records for three state endangered species, nine state threatened species, and 10 state special concern species within 1 mile of Segment 4 West, Segment 4 West Modification, Segment 4 East and/or the Segment 4 CapX Co-Locate Option. State endangered, threatened, and the watchlist/federally endangered species documented in the NHIS database, along with their typical habitats, are summarized in Table 10-25. State special concern species documented in the NHIS database within 1 mile of Segment 4 West, Segment 4 West Modification, Segment 4 East and/or the Segment 4 CapX Co-Locate Option are summarized in Appendix M. While these species are tracked by the DNR, they are not legally protected under the Minnesota Endangered Species Statute.

Table 10-25 Natural Heritage Information System Database Records of State or Federally Threatened or Endangered Species within 1 Mile of Segment 4 West, Segment 4 West Modification, Segment 4 East, and Segment 4 CapX Co-Locate Option

Scientific Name	Common Name	Type	Federal Status[1]	State Status[1]	Habitat[2]	Segment 4 West			Segment 4 West Modification			Segment 4 East			Segment 4 CapX Co-Locate Option		
						ROW	Route width	1 mile	ROW	Route width	1 mile	ROW	Route width	1 mile	ROW	Route width	1 mile
Acris blanchardi	Blanchard's cricket frog	Frog	Not listed	END	Littoral zone of lakes, medium rivers and streams, small rivers and streams, marsh, floodplain forest, river shore, lake shore.	X	X	X	X	X	X			X			
Arcidens confragosus	Rock pocketbook	Mussel	Not listed	END	Medium to large rivers.	X	X	X	X	X	X			X			
Lanius ludovicianus	Loggerhead shrike	Bird	Not listed	END	Upland native and non-native grasslands; perching sites contain shrubs or small trees.			X									
Actinonaias ligamentina	Mucket	Mussel	Not listed	THR	Medium to large rivers.									X			
Alasmidonta marginata	Elktoe	Mussel	Not listed	THR	Medium to large rivers.			X	X	X	X	X	X	X			X
Arnoglossum plantagineum	Tuberous Indian-plantain	Vascular plant	Not listed	THR	Native mesic prairies.			X			X	X	X	X	X	X	X

Scientific Name	Common Name	Type	Federal Status[1]	State Status[1]	Habitat[2]	Segment 4 West			Segment 4 West Modification			Segment 4 East			Segment 4 CapX Co-Locate Option		
						ROW	Route width	1 mile	ROW	Route width	1 mile	ROW	Route width	1 mile	ROW	Route width	1 mile
Crotalus horridus	Timber rattlesnake	Reptile	Not listed	THR	Forested bluffs, south-facing rock outcrops, and bluff prairies.					X	X						
Emydoidea blandingii	Blanding's turtle	Reptile	Not listed	THR	Calm, shallow waters with rich, aquatic vegetation for foraging and adjacent sandy uplands for nesting.	X	X	X	X	X	X						
Lasmigona costata	Fluted-shell	Mussel	Not listed	THR	Medium to large rivers.			X		X	X	X	X	X			X
Lespedeza leptostachya	Prairie bush clover	Vascular plant	THR	THR	Bedrock outcrop prairie or north-, northeast, or northwest-facing mesic prairie to dry prairie.			X			X						
Napaea dioica	Glade mallow	Vascular plant	Not listed	THR	Stream banks, floodplains, and terrace forests in the valleys of small to medium sized streams.	X	X	X	X	X	X			X			X
Venustaconcha ellipsiformis	Ellipse	Mussel	Not listed	THR	Headwater reaches of rivers in gravel riffles.		X	X		X	X		X	X			X

[1] "END" = endangered; "THR" = threatened
[2] Habitat information from reference (175)).

10.9.7.1.3 Sensitive Ecological Resources

The DNR has established several classifications for sensitive ecological resources across the state, many of which are scattered throughout the Segment 4 geographic area (Map 71). Some of these sensitive ecological resources are crossed by the ROI for Segment 4 West, Segment 4 West Modification, Segment 4 East, and/or the Segment 4 CapX Co-Locate Option, including Sites of Biodiversity Significance (SBS) and native plant communities.

The DNR maps SBS and assigns a biodiversity significance rank to sites surveyed across the state. These ranks are used to communicate statewide native biological diversity of each site and help to guide conservation and management activities (reference (180)). As shown on Map 71, several SBS are in the vicinity of Segment 4. The DNR assigns biodiversity significance ranks, as follows:

- **Outstanding** – best occurrences of the rarest species and native plant communities.
- **High** – good quality occurrences of the rarest species and high-quality examples of native plant communities.
- **Moderate** – occurrences of rare species, moderately disturbed native plant communities.
- **Below** – sites with moderately disturbed native plant communities, but lacking occurrences of rare species).

The DNR identifies and maps areas containing native plant communities across the state. A native plant community is a group of native plants that interact with each other and their environment in ways that have not been greatly altered by modern human activity or introduced organisms (reference (181)). The DNR provides a state conservation status to each native plant community, as follows:

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

As shown on Map 71, several native plant communities intersect the ROI for Segment 4 West, Segment 4 West Modification, Segment 4 East, and/or the Segment 4 CapX Co-Locate Option, including the following types and associated state conservation status (or range of statuses if multiple subtypes):

- Southern Dry – Mesic Oak – Hickory Woodland; S3
- Southern Mesic Oak – Basswood Forest; S3
- Southern Dry – Mesic Oak – Aspen Forest; S3,S4
- Southern Mesic Maple-Basswood Forest; S2, S3

- Red Oak – White Oak Forest; S3
- Elm – Ash – Basswood Terrace Forest; S2
- Southern Mesic Prairie; S2, S3
- Southern Wet-Mesic Hardwood Forest; S2, S3
- Oak – Shagbark Hickory Woodland; S3

10.9.7.2 Potential Impacts

Project construction and operation have the potential to impact protected species and sensitive ecological resources. Construction-related potential short-term impacts on federally or state protected wildlife species would be similar to those described for non-listed species in Section 10.9.12.2 and could include displacement during construction activities that generate noise, dust, or disturbance of habitat. Ground disturbing activities (e.g., grading), permanent clearing of vegetation, and construction activities in areas identified as sensitive ecological resources could impact protected species associated with these habitats.

10.9.7.2.1 Federal Protected Species

The species identified in the IPaC query are potentially present within the vicinity of Segment 4 West, Segment 4 West Modification, Segment 4 East, and/or the Segment 4 CapX Co-Locate Option, where suitable habitat is present.

The NHIS database does not document the presence of northern long-eared bats, maternity roost trees, or hibernacula within 1 mile of Segment 4 West, Segment 4 West Modification, Segment 4 East, or the Segment 4 CapX Co-Locate Option. However, suitable forested habitat is present in the route widths of Segment 4 West, Segment 4 West Modification, Segment 4 East, and the Segment 4 CapX Co-Locate Option. Impacts to northern long-eared bats could occur if tree clearing or construction takes place during the bat’s active season, when the species are breeding, foraging, or raising pups in forested habitat. Bats could be injured or killed if occupied trees are cleared during the active season, and the species could be disturbed during clearing or construction activities due to noise or human presence.

The NHIS database does not identify any records of tricolored bats within 1 mile of Segment 4 West, Segment 4 West Modification, Segment 4 East, and the Segment 4 CapX Co-Locate Option. However, forested areas within the route widths of Segment 4 West, Segment 4 West Modification, Segment 4 East, and the Segment 4 CapX Co-Locate Option could provide suitable habitat for the species. Potential impacts to tricolored bats would be similar to those described for northern long-eared bats.

As noted in Table 10-25, the NHIS database identifies records of prairie bush clover within 1 mile of Segment 4 West and Segment 4 West Modification; however, this species has not been identified within the route width or ROW. Suitable prairie habitat for this species could be present within the route widths of Segment 4 West, Segment 4 West Modification, Segment 4 East, and the Segment 4 CapX Co-Locate Option. Impacts to prairie bush clover could occur should this species or suitable habitat be present in areas undergoing grading or clearing activities associated with project construction.

The NHIS database does not identify any documented records of rusty patched bumble bees within 1 mile of Segment 4 West, Segment 4 West Modification, Segment 4 East, or the Segment 4 CapX Co-Locate Option. Although the route widths and rights-of-way of Segment 4 West, Segment 4 West Modification, Segment 4 East, and the Segment 4 CapX Co-Locate Option are primarily agricultural, suitable foraging habitat for rusty patched bumble bees is present in non-agricultural areas with flowering plants and suitable overwintering habitat is present in the forested areas within the route widths. In addition, as shown on Map 71-2 and Map 71-3, Segment 4 West, Segment 4 West Modification, and Segment 4 East intersect proposed designated critical habitat for the rusty patched bumble bee and a rusty patched bumble bee high potential zone, an area identified by the USFWS where rusty patched bumble bees are likely to be present. Potential impacts to rusty patched bumble bees could occur as a result of ground disturbing activities and/or removal of vegetation that serves as habitat.

The NHIS database does not track documented records of western regal fritillary. Suitable habitat for western regal fritillary is present in the wet meadows and marshes that intersect the route widths of Segment 4 West, Segment 4 West Modification, Segment 4 East, and the Segment 4 CapX Co-Locate Option. Potential impacts to western regal fritillary could occur as a result ground disturbing activities and/or removal of vegetation that serves as habitat.

The NHIS database does not track documented records of monarch butterflies. Suitable habitat for monarch butterflies is present in the non-agricultural parts of the route width and ROW of Segment 4 West, Segment 4 West Modification, Segment 4 East, and the Segment 4 CapX Co-Locate Option. Potential impacts to monarch butterflies could occur as a result ground disturbing activities and/or removal of suitable reproductive (milkweed plants) or feeding (flowering plants) habitat.

Whooping cranes are rare in the state of Minnesota, and the NHIS database does not track documented records of them. Potential impacts to whooping cranes would be similar to those described for other waterfowl/avian species in Section 10.9.12.2.

10.9.7.2.2 State Protected Species

The state threatened and endangered species identified in Table 10-25 and special concern species identified in Appendix M are known to occur in the vicinity of Segment 4 West, Segment 4 West Modification, Segment 4 East, and the Segment 4 CapX Co-Locate Option where suitable habitat is present. The discussion below is focused on potential impacts to state threatened and endangered species; however, impacts to and mitigation measures for special concern species would generally be similar for many species occupying similar habitats.

As noted in Table 10-25, two state threatened vascular plant species, tuberous Indian-plantain and glade mallow, have been documented within 1 mile of Segment 4 West, Segment 4 West Modification, Segment 4 East, and the Segment 4 CapX Co-Locate Option. Suitable habitat for both state protected vascular plant species could be present in the ROW of Segment 4 West, Segment 4 West Modification, Segment 4 East, and Segment 4 CapX Co-Locate Option and as noted in Table 10-25, the tuberous

Indian-plantain has been documented within the ROW of Segment 4 East and Segment 4 CapX Co-locate Option and glade mallow was documented within the ROW of Segment 4 West and Segment 4 West Modification. If present, these species and/or their habitats could be impacted as a result of grading and/or clearing activities associated with project construction.

Potential impacts to the state and federally threatened prairie bush clover, which has been documented within 1 mile of Segment 4 West and Segment 4 West Modification, are discussed under federally protected species (Section 10.9.7.2.1).

The timber rattlesnake has been documented within the route width of Segment 4 West Modification and suitable habitat could also be present in the route width of Segment 4 West, Segment 4 East, and the Segment 4 CapX Co-locate Option. Potential impacts to timber rattlesnakes could occur during project construction as a result of ground disturbing activities in forested bluffs or south-facing rock outcrops.

Blanding's turtles and Blanchard's cricket frogs have been documented within the ROW of Segment 4 West and Segment 4 West Modification. Suitable habitat for Blanding's turtles and Blanchard's cricket frogs could also be present in the ROW of Segment 4 East and the Segment 4 CapX Co-locate option. Potential impacts to Blanding's turtles could occur during project construction as a result of construction equipment and ground disturbing activities in wetland habitat and adjacent sandy upland nesting habitat.

The loggerhead shrike has been documented within 1 mile of Segment 4 West. Suitable habitat for loggerhead shrike is present within the route width of Segment 4 West, Segment 4 West Modification, Segment 4 East, and the Segment 4 CapX Co-locate option. Potential impacts to the loggerhead shrike would be similar to those described for other avian species in Section 10.9.12.2.

Watercourses would be spanned by Segment 4 West, Segment 4 West Modification, Segment 4 East, and the Segment 4 CapX Co-Locate Option; as such, direct impacts to the state protected mussel and fish species identified in Table 10-25 are not anticipated.

10.9.7.2.3 Sensitive Ecological Resources

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

Creation of new transmission line rights-of-way or expansion of existing rights-of-way through sensitive ecological resources could impact protected species associated with habitats within them. This could occur as a result of habitat conversion or fragmentation, or due to the placement of structures and other infrastructure within them. The route widths and rights-of-way of Segment 4 West, Segment 4 West Modification, Segment 4 East, and the Segment 4 CapX Co-Locate Option would intersect sensitive ecological resources, as summarized in Table 10-26 and shown on Map 71. However, as discussed in Section 10.4, 49 percent of Segment 4 West Modification could be double-circuited with an existing 161 kV line and 26 percent of Segment 4 East could be double-circuited with existing 69 kV line. Segment 4 West and the Segment 4 CapX Co-Locate Option would not double-circuit existing transmission lines but they would parallel existing transmission line rights-of-way for 33 and 84 percent of their lengths, respectively. In addition, Segment 4 West, Segment 4 West Modification, and Segment 4 East would all parallel existing road rights-of-way. In areas where double-circuiting with an existing transmission line would occur and/or where the segments would parallelexisting transmission line and/ or road rights-of-way would occur, impacts to sensitive ecological resources would be minimized.

The route width and ROW of Segment 4 West, Segment 4 West Modification, Segment 4 East, and Segment 4 CapX Co-locate would intersect several SBS, with Segment 4 East intersecting the least acreage of SBS. The route width and ROW of Segment 4 West, Segment 4 West Modification, and Segment 4 CapX Co-locate would intersect several native plant communities. The route width of Segment 4 East intersects a native plant community, but its ROW avoids it.

Segment 4 West and Segment 4 West Modification would intersect an SBS (ranked moderate) and associated forested native plant communities (Red Oak – White Oak Forest, Elm – Ash – Basswood Terrace Forest, and Oak – Shagbark Hickory Woodland) near the Zumbro River (Map 66-13). This area does not contain existing transmission line or road rights-of-way; as such, Segment 4 West and Segment 4 West Modification would result in fragmentation of these sensitive ecological resources. All other sensitive ecological resources intersected by the ROW of Segment 4 West, Segment 4 West Modification, Segment 4 East, and Segment 4 CapX Co-locate would occur in areas where double-circuiting would occur or an existing transmission line or road ROW would be paralleled.

Although impacts to sensitive ecological resources would be minimized by double-circuiting with an existing transmission line or paralleling existing transmission line or road ROW through sensitive ecological resources, permanent vegetation removal beyond existing rights-of-way could be required.

Table 10-26 Sensitive Ecological Resources within the Route Width and ROW of Segment 4 West, Segment 4 West Modification, Segment 4 East, and Segment 4 CapX Co-Locate Option

Resource	Units	Segment 4 West		Segment 4 West Modification		Segment 4 East		Segment 4 CapX Co-locate Option	
		Route width	ROW	Route width	ROW	Route width	ROW	Route width	ROW
Sites of Biodiversity Significance	Outstanding rank (acres)	0	0	0	0	0	0	0	0
	High rank (acres)	22	1	19	1	1	0	0	0
	Moderate rank (acres)	30	3	34	3	10	0	63	5
	Below rank (acres)	28	2	5	0	19	<1	46	4
	Total acres	80	6	58	4	30	<1	109	9
Native Plant Communities	Conservation Status S1 (community is critically imperiled), S2 (community is imperiled), or S3 (community is vulnerable to extirpation or extinction) (acres)	37	3	47	3	8	0	28	3
	Total acres (Conservation Status S1-S5)	37	3	47	3	8	0	28	3

10.9.7.3 Mitigation

Through prudent routing and implementation of BMPs and mitigation measures, impacts to federally or state protected species and sensitive ecological resources can be minimized. The primary means to mitigate potential impacts to federally and state protected species is to avoid routing through habitat used by these species. Additionally, impacts can be mitigated by incorporating species (or species type) specific BMPs in coordination with the USFWS and/or the DNR. The primary means to mitigate impacts to sensitive ecological resources is by avoiding and/or spanning these communities if possible. In addition, double-circuiting and/or paralleling existing rights-of-way, would reduce the potential for fragmentation of these resources.

Mitigation and minimization measures for potential impacts to rare and unique natural resources are not standard Commission route permit conditions. However, as noted in Appendix H, there are standard route permit conditions to minimize potential impacts to vegetation and avian species, which would be applicable to minimizing impacts to federal and state protected species and sensitive ecological resources; these are summarized in Section 10.9.10.3 and Section 10.9.12.3, respectively.

As summarized in their route permit application, the applicant has committed to the following measures to minimize the potential for impacts to federal and state protected species and sensitive ecological resources:

- Obtaining available USFWS and DNR rare species databases prior to construction activities to determine locations where the routes and structures are near or adjacent to known locations of listed species.
- Conducting rare species surveys in those areas and similar high-quality habitats preferred by listed species.
- Avoiding impacts to federal- and state-listed species to the maximum extent practicable and coordinating with the appropriate federal and/or state agency in the unlikely event of unavoidable impacts to listed species.
- Continuing to work with the DNR to refine the final alignments and reduce impacts to natural resource sites.
- Potentially incorporating some seasonal restrictions, such as fencing of rare features, and vegetation restoration as applicable.
- Working with the DNR to refine the final alignments and reduce impacts to SBS and native plant communities.
- Implementation of integrated vegetation management plans associated with its existing pollinator initiative, which was created to enhance pollinator habitat.

In its Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR recommended the following to minimize potential impacts to sensitive ecological resources:

- Avoid working in Minnesota Biological Survey and rare (S1-S3) native plant communities.
- As much as possible, operate within already-disturbed areas.
- Retain a buffer between proposed activities and Minnesota Biological Survey Sites.
- Confine construction activities to the opposite side of the road from Minnesota Biological Survey Sites. If this is not feasible, confine construction activities to the existing road rights-of-way.
- Minimize vehicular disturbance in the area (allow only vehicles necessary for the proposed work).
- Do not park equipment or stockpile supplies in the area.
- Do not place spoil within Minnesota Biological Survey Sites or other sensitive areas.
- If possible, conduct the work under frozen ground conditions.
- Inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of invasive species.
- Use effective erosion prevention and sediment control measures.

- Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible.
- Use only weed-free mulches, topsoils, and seed mixes. Of particular concern is birdsfoot trefoil (*Lotus corniculatus*) and crown vetch (*Coronilla varia*), two invasive species that are sold commercially and are problematic in prairies and disturbed open areas, such as roadsides.

In its Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR recommended the following to minimize potential impacts to state-listed species:

- To minimize potential impacts to loggerhead shrike, tree and shrub removal must not occur within potential habitat during the breeding season, April through July. If avoiding tree or shrub removal within potential habitat from April through July is not feasible, a qualified surveyor will need to conduct a survey for active nests before any trees or shrubs will be removed.
- To avoid impacts to Blanding's turtles, the following avoidance measures are required:
    - Avoid wetland and aquatic impacts during hibernation season, between September 15th and April 15th, if the area is suitable for hibernation.
    - Erosion and sediment control should be limited to wildlife friendly erosion control to avoid the inadvertent take of Blanding's turtles.
    - Hydro-mulch products should not contain any materials with synthetic (plastic) fiber additives, as the fibers can re-suspend and flow into waterbodies.
    - Construction areas, especially aquatic or wetland areas, should be thoroughly checked for turtles before the use of heavy equipment or any ground disturbance.
    - Check any holes that have been left unattended for prolonged periods for turtles before being filled.
    - The DNR's Blanding's turtle flyer must be given to all contractors working in the area (reference (183)).
    - Illegal collection is a concern with wood turtles; therefore, no signs that would bring attention to the presence of wood turtles should be posted.
    - Monitoring during construction should be completed, and any sightings should be reported to Reports.NHIS@state.mn.us including date, observer, location, and photograph of the Blanding's turtle.
    - If turtles are in imminent danger, they must be moved by hand out of harm's way, otherwise they are to be left undisturbed. Directions on how to move turtles safely are found in reference (184)).
- To avoid impacting timber rattlesnakes, the following avoidance measures are required:
    - Crews working the area should be advised that if they encounter any snakes, the snakes should not be disturbed.

- Erosion and sediment control should be limited to wildlife friendly erosion control to avoid the inadvertent take of timber rattlesnakes.

- Timber rattlesnake precautions may include, but are not limited to, the following recommendations:
    - Wear appropriate personal protection equipment, such as thick pants, boots, and leather gloves.
    - Care should be taken around stockpiled materials as snakes may be using these materials for shelter.
    - Sightings should be reported to Reports.NHIS@state.mn.us; including date, observer, location, and photograph of the timber rattlesnake.
- To avoid impacts to aquatic species, stringent erosion prevention and sediment control practices should be maintained throughout the duration of the project to prevent adverse debris and material from impacting downstream populations.
- To avoid impacting state protected plants, all known occurrences of state protected plant species and all potential habitats must be avoided. If this is not feasible, a qualified surveyor will need to (1) resurvey known occurrences and (2) determine if suitable habitat exists within the activity impact area and, if so, conduct a survey prior to any project activities.
- To minimize impacts to northern long-eared bats and other bat species, tree removal should be avoided from June 1 through August 15.

10.9.8 Soils

The ROI for soils is the ROW. Existing soil types and associated qualities are reviewed to better understand the most likely impacts to occur as a result of construction activities. Nearly all soils within the ROI have a moderate or severe rutting hazard rating. Common soil impacts include rutting, compaction, and erosion. Potential impacts would be short-term during construction, localized, and can be minimized. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicant would obtain a NPDES/State Disposal System Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicle trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored in a suitable location. Disturbed areas would be promptly seeded after construction.

10.9.8.1 Existing Conditions

Soil information for Segment 4 was obtained from the USDA-Natural Resource Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database. Map 72 shows the surface soil textures across

Segment 4. Soil types within the ROI of Segment 4 were reviewed to identify soil characteristics that could be more prone to impacts in some areas versus others (Table 10-27).

Table 10-27 Segment 4 NRCS Mapped Soils within ROI

Segment ID	Buffer Width (ft.)	Total Acreage	Compaction Prone *Medium or higher rating (acres (%))*	Erosion Hazard *Moderate or higher rating (acres (%))*	Rutting Hazard *Moderate or severe rating (acres (%))*	Hydric Soils[1] *67-99% or 100% (acres (%))*	Revegetation Concerns[2] *NCC class of 3 or greater (acres (%))*
Segment 4 West	50	286	245 (86%)	184 (64%)	283 (99%)	26 (9%)	20 (7%)
Segment West Modification	50	275	192 (89%)	141 (51%)	273 (99%)	19 (7%)	14 (5%)
Segment 4 East	50	238	223 (94%)	146 (61%)	232 (98%)	4 (2%)	19 (8%)
Segment 4 CapX Co-Locate Option	50	199	192 (97%)	153 (77%)	197 (99%)	3 (1%)	34 (17%)

[1] A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil profile. Hydric soils are typically associated with lowlands and wetlands and are rated by their proportion of hydric soil in the map unit.
[2] Soils with a non-irrigated land capability classification of 3 or greater were considered to have low revegetation potential.

Nearly all of the soils within the ROI of Segment 4 have a moderate or severe rutting hazard rating. Ratings in this hazard category indicate the potential of surface rut formation through the operation of heavy, wheeled equipment. Ratings are based on depth to the water table, rock fragments on or below the surface, the classification of the soil material based on the Unified Soil Classification System, depth to a restrictive layer, and slope. A rating of "moderate" indicates that rutting is likely, and "severe" indicates that ruts form readily.

Most of the soils within the ROI of Segment 4 have a medium or higher soil compaction rating. Soil compaction occurs when moist or wet soil particles are pressed together, reducing pore space between them, and is primarily caused by heavy vehicular traffic or permanent structure placement. Soils are rated based on their susceptibility to compaction from the operation of ground-based equipment for planting, harvesting, and site preparation activities when soils are moist. A “medium” rating means that after the initial compaction (that is, the first equipment pass), the soil can support standard equipment with only minimal increases in soil density. A “high” rating means that the soil will continue to compact after each equipment pass.

10.9.8.2 Potential Impacts

Transmission line projects have the potential to impact soils during construction and operation of the project. Construction might require some amount of grading to provide a level surface for safe operation of construction equipment. In addition, potential topsoil and subsoil mixing might result from the excavation, stockpiling, and redistribution of soils during installation of transmission line structures. Localized soil erosion, compaction, and topsoil and subsoil mixing could affect revegetation within temporary work areas.

10.9.8.3 Mitigation

The sample route permit (Section 5.3.8 of Appendix H) includes the following measures to mitigate impacts to soils:

> *"The Permittee shall implement those erosion prevention and sediment control practices recommended by the Minnesota Pollution Control Agency (MPCA) Construction Stormwater Program. If construction of the Transmission Facility disturbs more than one acre of land or is sited in an area designated by the MPCA as having potential for impacts to water resources, the Permittee shall obtain a National Pollutant Discharge Elimination System/State Disposal System Construction Stormwater Permit from the MPCA that provides for the development of a Stormwater Pollution Prevention Plan that describes methods to control erosion and runoff.*
>
> *The Permittee shall implement reasonable measures to minimize erosion and sedimentation during construction and shall employ perimeter sediment controls, protect exposed soil by promptly planting, seeding, using erosion control blankets and turf reinforcement mats, stabilizing slopes, protecting storm drain inlets, protecting soil stockpiles, and controlling vehicle tracking. Contours shall be graded as required so that all surfaces provide for proper drainage, blend with the natural terrain, and are left in a condition that will facilitate re-vegetation and prevent erosion. All areas disturbed during construction of the Transmission Facility shall be returned to pre-construction conditions."*

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicant would obtain a NPDES/State Disposal System Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicle trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored in a suitable location. Disturbed areas would be promptly seeded after construction. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

10.9.9 Surface Water

The ROI for surface water is the route width. Impacts to surface waters were assessed by identifying watercourses and waterbodies and considering their proximity to the project and special designations. Segment 4 CapX Co-Locate Option's anticipated alignment crosses the most watercourses but would parallel existing transmission lines at most of the crossing locations. Segment 4 East and Segment 4 CapX Co-Locate each cross a PWI basin. Direct impacts caused by structures

placed in surface waters would be avoided by spanning surface waters. Direct impacts to other resources can cause indirect impacts to surface waters. For example, construction activities near surface waters could cause riparian vegetation disturbance and surface erosion, which can lead to runoff impacting surface waters. In addition to spanning surface water crossings, impacts to surface waters would be mitigated through implementation of the SWPPP, AIMP, and VMP.

10.9.9.1 Existing Conditions

Several federal and state laws regulate watercourses and waterbodies. The Clean Water Act (CWA) establishes the structure for regulating the discharge of materials into waters of the United States and for developing water quality standards for surface waters (U.S. Code [USC]: Chapter 33 § 1311 and 1344). The CWA could potentially regulate several types of activities and their impacts associated with the project.

Watercourses and waterbodies may be regulated under Section 10 of the Rivers and Harbors Act (USC Chapter 33 § 401) and Section 404 of the CWA (USC Chapter 33 § 328.3 and 1344). The Rivers and Harbors Act regulates activities such as excavating, dredging, and altering the course of Section 10 designated waters (USC Chapter 33 § 403). Section 404 of the CWA prohibits discharge of dredged or fill materials without a permit. It provides legal protection to more waterbodies than the Rivers and Harbors Act, namely all jurisdictional waters of the United States, including navigable waters, interstate waters, and wetlands with a significant nexus to navigable waters (USC Chapter 33 § 320). The USACE holds both Section 10 and Section 404 permitting authority.

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

Section 303(d) of the CWA requires states 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. Waters that do not meet their designated uses because of water quality standard violations are listed as impaired. In Minnesota, the MPCA has jurisdiction over determining 303(d) waters which are described and listed as impaired.

Some watercourses and waterbodies are designated as public waters and are listed in the PWI by the state of Minnesota. The statutory definition of a public water is found in Minnesota Statute § 103G.005, Subdivision 15a (Minnesota Statute §103G.005). These water resources are under the jurisdiction of the DNR, and a DNR license to cross public waters would be required when an activity would cross, change, or diminish the course, current, or cross-section of public waters by any means, including filling, excavating, or placing materials in or on the beds of public waters. PWI watercourse crossings are unavoidable, and the applicant would be required to coordinate with the DNR to obtain licenses to cross.

Minnesota regulates trout streams according to Minnesota Statute § 6264.0050. As provided by Minnesota Rules 6135.1100, subpart 4, item B: Crossings on or under the beds of streams designated by the commissioner of natural resources as trout waters shall be avoided unless there is no feasible alternative. When unavoidable, maximum efforts shall be taken to minimize damage to trout habitat.

Minnesota designates some water resources as Outstanding Resource Value Waters because of their exceptional qualities. Minnesota Statute § 7050.0180 prohibits, or stringently controls, new or expanded discharges from either point or nonpoint sources to outstanding resource value waters.

Segment 4 is in the Minnesota River and Lower Mississippi River Basins and crosses two major watersheds, as delineated by the USGS: Zumbro River (8-digit Hydrologic Unit Code (HUC) 07040004) and Buffalo Whitewater (8-digit HUC 07040003). According to the WHAF, the mean watershed score for these two major watersheds ranges from 41 to 50 on a 100-point scale (reference (185)). The mean watershed score is the average score of five separate components: hydrology, geomorphology, biology, connectivity, and water quality. At the state scale, mean watershed scores tend to decrease further downstream. Urban watershed degradation is attributed, in part, to impervious surfaces, intensity of water use, and point source pollution (reference (186)).

Map 62 shows the watercourses in the route width of Segment 4. Surface waters in the route width of Segment 4 include rivers and streams (watercourses) and lakes and ponds (waterbodies). Major watercourses within the route width of Segment 4 include, but are not limited to: Harkcom Creek, Middle Fork Zumbro River, North Branch Middle Fork Zumbro River, Plum Creek, South Branch Middle Fork Zumbro River, South Fork Zumbro River, and unnamed watercourses. Several of these watercourses are designated as public watercourses in the PWI and are also classified as impaired waters (Map 62). None of the watercourses crossed by Segment 4 are designated as Outstanding Resource Value Waters, Section 10 navigable waters (reference (187)), or trout streams.

Map 62 shows the waterbodies in the route width of Segment 4. The route width of Segment 4 includes waterbodies identified by the NHD, including Shady Lake and Zumbro Lake. Of these waterbodies, none are designated as trout lakes by the DNR, one is designated as a public water in the PWI, and one is listed as an impaired waterbody.

The DNR Shallow Lakes Program works to protect and enhance wildlife habitat on larger lakes that are dominated by shallow water; these shallow lakes serve as important habitat to wildlife species (reference (188)); designated shallow wildlife lakes are discussed in Section 10.9.12. The DNR maps certain waterbodies as Lakes of Biological Significance based on the unique presence of aquatic plants or animals (reference (182)); Lakes of Biological Significance are discussed in Section 10.9.7.

The route width of Segment 4 includes 100-year floodplains designated by the FEMA (Map 62). Several watercourses are associated with these 100-year floodplains:

- The route width of Segment 4 West includes the 100-year floodplains of the North Branch Middle Fork Zumbro River, Middle Fork Zumbro River, South Branch Middle Fork Zumbro River, and Zumbro River.
- The route width of Segment 4 West Modification includes the 100-year floodplain of the North Branch Middle Fork Zumbro River, Middle Fork Zumbro River, South Branch Middle Fork Zumbro River, and Zumbro River.
- The route width of Segment 4 East includes the 100-year floodplains of the South Fork Zumbro River, Middle Fork Zumbro River, and South Branch Middle Fork Zumbro River.
- The route width of the Segment 4 CapX Co-Locate Option includes the 100-year floodplain of the Zumbro River.

10.9.9.2 Potential Impacts

The project was designed to span watercourses, waterbodies, and floodplains to the extent practicable and to minimize the number of structures in surface water resources where these resources cannot be spanned or crossings cannot use double-circuiting. The maximum transmission line structure span distance for watercourses, waterbodies, and floodplains for a 161 kV transmission line is 350 to 700 feet. The crossing length of most of these resources is less than 700 feet, meaning that the project is expected to be able to span most floodplains. The anticipated alignment of Segment 4 West and Segment 4 West Modification would cross a wetland and floodplain adjacent to the North Brand Middle Fork Zumbro River in a floodplain that exceeds 700 feet in length (Map 66-1). However, there is an existing transmission line crossing the resource. No structures would be placed within the surface waters that can be spanned by Segment 4, and no direct impacts on these watercourses and waterbodies are anticipated.

Segment 4 crosses NHD, PWI, and impaired watercourses (Table 10-28). The PWI watercourses and impaired streams crossed by the anticipated alignments for Segment 4 include the following:

- **Public Watercourses:** Segment 4 East crosses the South Fork Zumbro River, Middle Fork Zumbro River, and an unnamed creek. The Segment 4 CapX Co-Locate Option crosses the Zumbro River and an unnamed watercourse. Segment 4 West and Segment 4 West Modification cross the North Branch Middle Fork Zumbro River, Middle Fork Zumbro River, South Branch Middle Fork Zumbro River, and South Fork Zumbro River, and unnamed watercourses.
- **Impaired Watercourses:** Segment 4 East, Segment 4 West, and Segment 4 West Modification each cross the Middle Fork Zumbro River, South Branch Middle Fork Zumbro River, and South Fork Zumbro River.

Table 10-28 Segment 4 Watercourse Crossings

Watercourse Crossings	Segment 4 West	Segment 4 West Mod	Segment 4 East	Segment 4 CapX Co-Locate Option
PWI Watercourses	5	5	3	1
NHD Watercourses	29	25	22	30
Impaired Watercourses	3	3	3	0

Segment 4 crosses PWI basins, both of which are adjacent to watercourses. Segment 4 East crosses Shady Lake, a PWI basin adjacent to Zumbro River, Middle Fork (Map 66-18). Segment 4 CapX Co-Locate Option crosses Zumbro Lake, a PWI public water basin adjacent to the Zumbro River (Map 66-27).

Despite spanning waterbodies and watercourses, indirect impacts associated with crossing these resources could occur during construction. Removal of vegetation and soil cover could result in short-term water quality impacts due to increased turbidity. Construction impacts could also remove riparian or shoreline forest areas within the ROW that currently assist with water attenuation and decreasing erosion impacts. In addition to habitat changes, vegetation clearing could increase light penetration to watercourses, potentially resulting in localized increases in water temperatures and changes to aquatic communities, especially those that rely on cold water such as trout.

Impacts to floodplains during construction would include soil disturbance and vegetation removal. Vegetation clearing within a floodplain, especially tree removal, can greatly destabilize the area, make it more prone to ongoing erosion and sediment issues, and further contribute to water quality issues. The project might require that transmission line structures be placed within these FEMA-designated floodplains.

10.9.9.3 Mitigation

The sample route permit (Section 5.3.9 of Appendix H) includes the following measures to mitigate impacts to surface water:

- Space and place structures at variable distances to span and avoid watercourses and floodplains.
- Contain soil excavated from riparian areas and not place it back into the riparian area.
- Access riparian areas using the shortest route possible in order to minimize travel and prevent unnecessary impacts.
- Do not place staging or stringing set-up areas within or adjacent to water resources, as practicable.
- Assemble structures on upland areas before they are brought to the site for installation.
- Restore water resource areas disturbed by construction activities to pre-construction conditions in accordance with the requirements of applicable state and federal permits or laws and landowner agreements.

- Meet the USACE, DNR, Minnesota BWSR, and local units of government water resource requirements.

Mitigation measures are anticipated to prevent and minimize impacts to watercourses and waterbodies. The applicant would obtain a NPDES Construction Stormwater permit from the MPCA for construction of the project which requires development of a SWPPP that identifies BMPs to be used during construction to minimize erosion and sedimentation. Per the stormwater permit, additional BMPs would be required for work near special waters which include impaired waters. Sediment barriers, such as silt fence, straw bales, and bio-logs, would be used along waterways and slopes during construction to minimize soil erosion and sedimentation. The Applicant would maintain water and soil conservation practices during construction and operation of the project to protect topsoil and adjacent water resources and minimize soil erosion. If tree removal is required along waterways, trees would be cut, leaving the root systems intact to retain bank stability. Construction would be completed according to NPDES permit requirements and an approved AIMP and VMP.

Impacts would be mitigated by using BMPs. Watercourses would only be crossed by construction equipment where required to support construction activities. Crossing PWI waters would require a DNR license to cross public waters and work near special or impaired waters would require additional BMPs as detailed in the construction stormwater permit. According to the joint certificate of need application and route permit application, the applicant would work with the DNR to confirm that all proper licenses and approvals are obtained for public water crossings. Further, the joint certificate of need application and route permit application also states that through the licensing process, the applicant would work with the DNR to determine appropriate mitigation measures for these crossings.

10.9.10 Vegetation

The ROI for vegetation is the ROW. Impacts to vegetation are primarily evaluated by examining vegetative landcover types within the ROW. Most existing vegetation is agricultural.

Potential short-term impacts, such as clearing, compacting, or otherwise disturbing vegetation, could occur during construction and maintenance activities. Potential long-term impacts on vegetation would occur where structures are located or where conversion of forested vegetation to low-growing vegetation would be required. Impacts would be localized and unavoidable.

Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation including but not limited to implementation of the VMP and AIMP. The applicant committed to working with state and local agencies to coordinate appropriate BMPs for noxious weeds and also committed to implementing integrated vegetation management plans associated with its existing pollinator initiative.

10.9.10.1 Existing Conditions

The DNR and the U.S. Forest Service (USFS) have developed an ECS for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features (reference (10)). The ECS splits the state of Minnesota into Ecological Provinces, Sections, and Subsections.

Segment 4 is within the Eastern Broadleaf Forest Province. The Eastern Broadleaf Forest Province is characterized as a transition zone between semi-arid portions of Minnesota that were historically prairie and semi-humid mixed coniferous-deciduous forests to the northeast (reference (189)). Within this province, Segment 4 West, Segment 4 West Mod, Segment 4 East, and Segment 4 CapX Co-Locate Option cross the Oak Savanna and Rochester Plateau subsections.

The project crosses the Oak Savanna subsection in Rice, Waseca, and Goodhue Counties. Vegetation in the Oak Savanna subsection consisted predominantly of bur oak savanna, with areas of tallgrass prairie and maple-basswood forest, before European settlement. Bur oak savanna was found on rolling moraine ridges at the western edge of the subsection and in dissected ravines at the eastern edge. Tallgrass prairie concentrated on gently rolling portions of the landscape, in the center of the subsection. Maple-basswood forest was found in steep, dissected ravines or where stream orientation reduced fire frequency or severity. At present, the subsection is dominated by agricultural vegetation, with urban development accelerating along the northern boundary (reference (12)).

The project crosses the Rochester Plateau subsection in Goodhue County. Prior to European settlement, vegetation in the subsection consisted of tallgrass prairie and bur oak savanna. At present, the Rochester Plateau subsection is heavily farmed, with small areas characteristic of oak openings and barrens (reference (199)).

In general, the vegetation resources across the project are dominated by agricultural vegetation and crops, including grain, soybeans, hay/haylage, sweet corn, corn for silage, green peas, corn for grain, and oats for grain (Section 10.7.1). Map 61 provides an overview of landcover types according to the NLCD across Segment 4, and Table 10-29 summarizes the landcover types within the ROW. The NLCD is derived from Landsat imagery along with various other data sources. As such, it provides only an approximation of existing landcover types.

Segment 4 is largely rural and agricultural land, with pockets of developed areas that are broken up by vegetated riverbanks. Segment 4 CapX Co-Locate Option is primarily agricultural land (80 percent), with only small portions of developed, forested, and herbaceous land. Segment 4 East is primarily agricultural and developed land (43 percent and 40 percent, respectively), with smaller areas of herbaceous, forested, and barren land. A majority of Segment 4 West is agricultural land (70 percent), with areas of developed, forested, and herbaceous land. Segment 4 West Modification is primarily agricultural land (63 percent), with larger areas of developed (20 percent), and small portions of forested and herbaceous lands. Developed land areas include rural existing roadways, residential lots, and businesses concentrated around the cities of Pine Island, Oronoco, and Rochester. Wetlands are discussed in Section 10.9.11 and native plant communities and other sensitive ecological resources are discussed in Section 10.9.7.

Table 10-29 Landcover Types within the ROW of Segment 4

Landcover Type	Segment 4 West		Segment 4 West Mod		Segment 4 East		Segment 4 CapX Co-Locate Option	
Agricultural (cultivated crops and hay/pasture)	201 acres	70%	175 acres	63%	102 acres	43%	159 acres	80%
Barren Land (rock/sand/clay)	<1 acre	<1%	<1 acre	<1%	2 acres	1%	0 acres	0%
Developed (low-high intensity; open space)	33 acres	11%	56 acres	20%	94acres	40%	6 acres	3%
Forest (upland and wetland)	34 acres	12%	28 acres	10%	10 acres	4%	19 acres	9%
Herbaceous (upland and wetland)	18 acres	6%	17 acres	6%	29 acres	12%	13 acres	7%
Open Water	<1 acres	<1%	<1 acres	<1%	<1 acres	<1%	2 acres	1%
Shrub/Scrub (upland and wetland)	0 acres	0%	0 acres	0%	0 acres	0%	<1 acres	<1%
Total acres	286 acres		276 acres		238 acres		199 acres	

10.9.10.2 Potential Impacts

Impacts to landcover associated with the project would primarily be associated with ROW clearing within rangeland and agricultural areas. Construction of the project would result in short-term impacts on existing vegetation, including localized physical disturbance and soil compaction. 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. These impacts to low growing vegetation would be temporary, having the ability to regrow after construction. Vegetation would be permanently removed where structures and foundations would be installed. Construction would also result in long-term impacts to vegetation by permanently removing high growing and forested vegetation within the ROW where present; the ROW would be maintained with low-growing vegetation during operations. The clearing of trees and tall vegetation is required for the construction, maintenance, and safe operation of the project.

Construction and maintenance activities have the potential to result in the introduction or spread of noxious weeds and other non-native species. Noxious weeds, which are regulated under Minnesota Statute 18, can be introduced to new areas through propagating material like roots or seeds transported by contaminated construction equipment. Activities that could potentially lead to the introduction of noxious weeds and other non-native species include ground disturbance that leaves soils exposed for extended periods, introduction of topsoil contaminated with weed seeds, vehicles importing weed seed, and conversion of landscape type, particularly from forested to open settings. Noxious weeds establish more quickly on disturbed soil surfaces than native vegetation and in turn displace existing native land cover without proper controls in place.

Segment 4 East has the smallest percentage and acreage of NLCD-mapped forested land cover, with the Segment 4 CapX Co-Locate Option, Segment 4 West, and Segment 4 Modification having comparable percentages but varying acreages. However, the Segment 4 West Modification would have the greatest opportunity for double-circuiting, and the forested vegetation within the existing ROW would already be cleared and maintained. These areas of forest have generally already been fragmented. Conversion from forest to open habitats in the ROW could have impacts on native vegetation by altering environmental conditions, such as light penetration; this could alter the vegetation community adjacent to the ROW and increase the potential spread of noxious weeds and other non-native species.

10.9.10.3 Mitigation

Mitigation and minimization measures for potential impacts to vegetation resources are standard Commission route permit conditions (Appendix H, 5.3.10, 5.3.11, 5.3.12, and 5.3.13) and include the following:

- Minimize number of trees to be removed in selecting the ROW, specifically preserving to the maximum extent practicable windbreaks, shelterbelts, living snow fences, and vegetation in areas such as trail and stream crossings where vegetative screening could minimize aesthetic impacts.
- Remove tall growing species located within the transmission line ROW that endanger the safe and reliable operation of the transmission line. Leave undisturbed, to the extent possible, existing low growing species in the ROW or replant such species in ROW to blend the difference between the ROW and adjacent areas, to the extent that the low growing vegetation will not pose a threat to the transmission line or impede construction.
- Employ BMPs to avoid the potential introduction and spread of invasive species on lands disturbed by construction activities. Develop an Invasive Species Prevention Plan and file with the Commission prior to construction.
- Take all precautions against the spread of noxious weeds during construction. Site appropriate seed certified to be free of noxious weeds should be used, and to the extent possible, native seed mixes should be used.
- Restrict pesticide use to those pesticides and methods of application approved by the Minnesota Department of Agriculture, DNR, and the U.S. EPA. Selective foliage or basal application shall be used when practicable.

As summarized in the route permit application, the applicant has committed to the following measures as the primary means to mitigate impacts to vegetation and minimize the potential for the introduction or spread of noxious weeds and invasive species:

- Limiting vehicle traffic to roads and pathways along the proposed ROW and within previously disturbed areas to the extent practicable
- Restricting equipment to narrow paths within the proposed ROW

- Spanning areas of sensitive vegetation
- Installing the line as a double circuit with an existing transmission line
- Routing parallel or adjacent to existing rights-of-way, such that tree removal is minimized

The applicant committed to working with the state and counties crossed by the project to identify where noxious weeds may be present and develop appropriate BMPs to minimize impacts. The applicant will implement a vegetation management plan to mitigate impacts and restore lands impacted by construction, as provided in the applicant's route permit application. Furthermore, the applicant committed to implementing integrated vegetation management plans associated with its existing pollinator initiative, created to enhance pollinator habitat. The plans minimize chemical use by avoiding broadcast applications and employ spot treatments for control of invasive species.

10.9.11 Wetlands

The ROI for wetlands is the ROW. Impacts to wetlands were evaluated by examining wetland type, size, and potential for spanning. There are more acres of wetlands within Segment 4 West's ROI and Segment 4 West Modification's ROI compared to Segment 4 East's ROI and the Segment 4 CapX Co-Locate Option's ROI. However, portions of Segment 4 West and Segment 4 West Modification will parallel existing transmission lines or be double-circuited with existing transmission lines, respectively. Less clearing within forested wetlands would be required for Segment 4 East and the Segment 4 CapX Co-Locate Option compared to Segment 4 West and Segment 4 West Modification.

Localized direct impacts to wetlands would include vegetation clearing, movement of soils, and construction traffic, which could alter or impair wetland functions. Forested wetlands would be subject to long-term impacts given their conversion to non-forested wetlands. Wetland crossings longer than 700 feet might require one or more structures to be placed in the wetland, resulting in small, localized permanent wetland impacts.

Impacts can be minimized using BMPs. Wetland impacts would be regulated and could require permits. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW, moving the anticipated alignment to a least impactful alignment within the route width, or minimizing clearing required in forested wetlands by selecting a route with an existing ROW where the project could be double-circuited.

10.9.11.1 Existing Conditions

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

Minnesota also has state-level regulations focused on protecting wetlands. The Minnesota Wetland Conservation Act (WCA) (Minnesota Rules 8420) is administered by the BWSR under Minnesota Rules 8420.0100, subpart 3, 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 (1) avoid disturbing the wetland if feasible, (2) minimize wetland impacts, and (3) replace lost wetland acres, functions, and values. Certain activities are exempt from the WCA, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation.

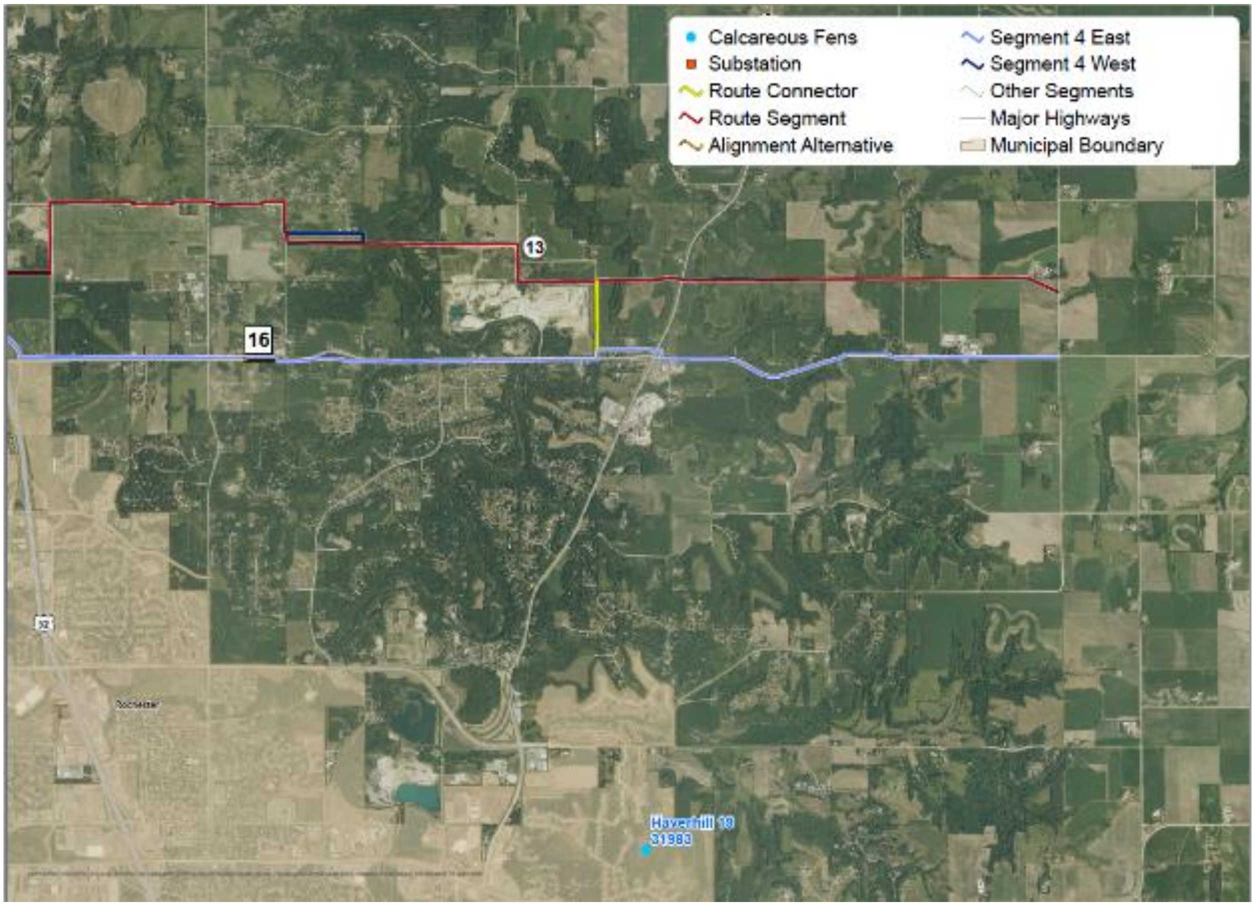
A second state-level program that offers protection to the state's waters and wetlands is the PWI program administered by the DNR (Minnesota Statute § 103G.005). The DNR regulates work below the ordinary high-water level of PWI wetlands and waters through the public waters work permit program. Examples of work activities addressed by this program include filling, excavation, bridges and culverts, dredging, structures, and other construction activities.

Wetlands are areas with hydric (wetland) soils, hydrophytic (water-loving) vegetation, and wetland hydrology (inundated or saturated much of the year). Wetlands detain floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. Wetland types vary widely due to differences in topography, soils, hydrology, vegetation, water chemistry, climate, and other factors.

Calcareous fens are rare and distinctive peat-accumulating wetlands that receive groundwater rich in calcium and other minerals. The WCA, authorized by Minnesota Statute Section 103G.223, states that calcareous fens may not be filled, drained, or otherwise degraded, wholly or partially, by any activity, except as provided for in a management plan approved by the commissioner of the DNR. The DNR regulates calcareous fens under Minnesota Rules 8420.0935.

The USFWS National Wetlands Inventory (NWI), as updated by the DNR, identifies wetland complexes and isolated wetlands within the ROI of Segment 4 (Map 62). Wetland types in Segment 4 generally include seasonally flooded wetlands, wet meadows, shallow marshes, deep marshes, shallow open water, shrub swamps, wooded swamps, and riverine wetlands. As shown on Map 62, wetlands in the ROI are mostly non-forested, and no PWI wetlands are intersected by the ROI for Segment 4. One calcareous fen (Haverhill 19 site) is located approximately 3.6 miles south of Segment 4 West, Segment 4 West Modification, and Segment 4 East (Figure 10-7) .

Figure 10-7 Location of Haverhill 19 Calcareous Fen



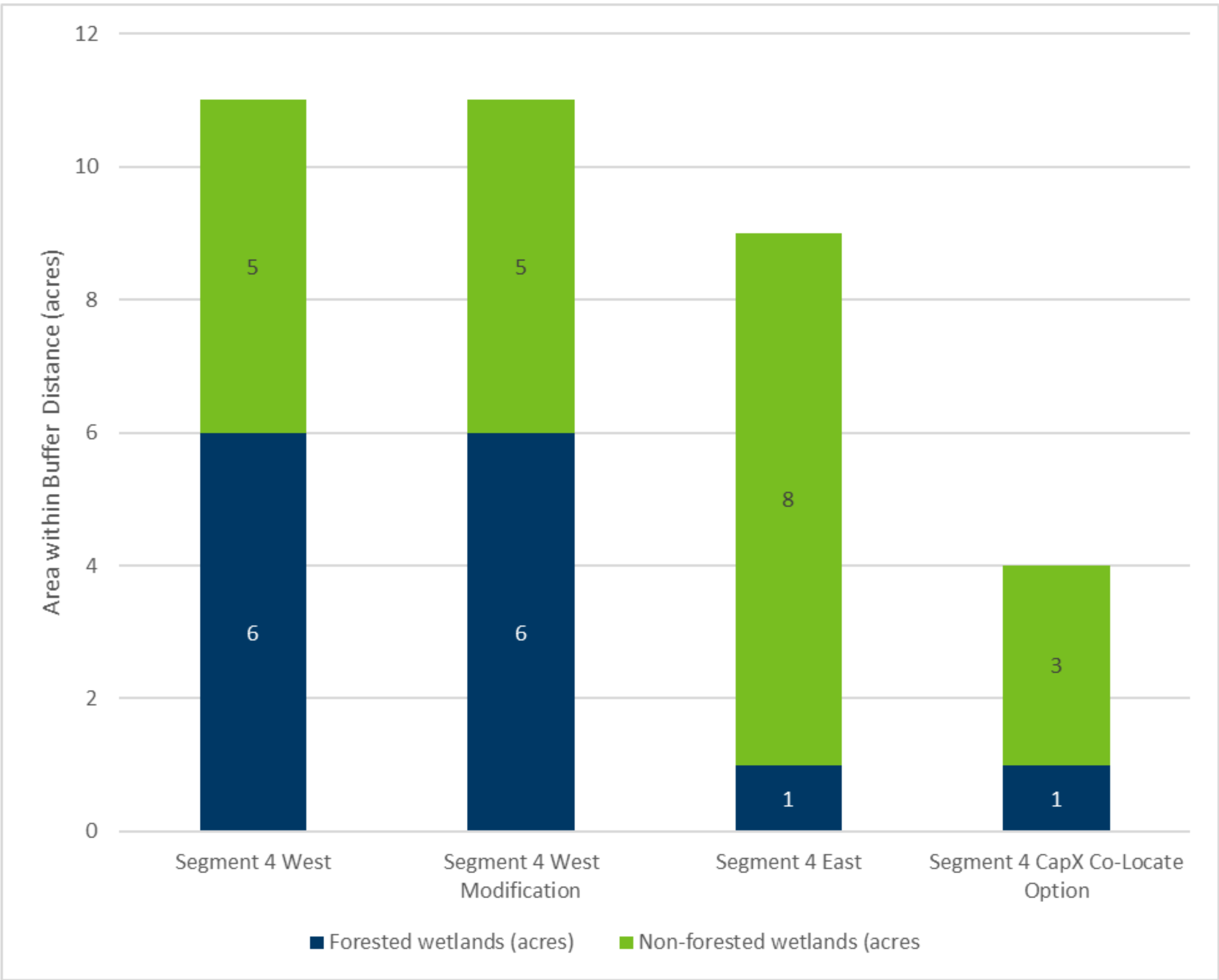
10.9.11.2 Potential Impacts

The proposed transmission line could temporarily or permanently impact wetlands if they cannot be avoided during project design. Construction of transmission line structures typically includes vegetation clearing, movement of soils, and construction traffic. These activities could alter or impair wetland functions. Even small changes in hydrology (for example, periods of inundation, changes in flow, and sedimentation) can impair wetland function. Any wetland that would receive permanent transmission line infrastructure would also be impacted long term during operation of the project due to equipment access through the wetland for maintenance.

Transmission lines cannot be safely or reliably operated with trees growing within the ROW. As such, existing trees must be removed throughout the ROW, including forested wetlands. Forested wetlands, within any new transmission line ROW, would likely undergo a permanent change in wetland/vegetation type. Wetlands can also be impacted by soil erosion and sediment deposition during construction. Sedimentation and ground disturbance in wetlands can make them more susceptible to the establishment of invasive plant species, such as reed canary grass, which would adversely impact wetland function by reducing vegetative biodiversity and altering wildlife habitat.

The ROW of Segment 4 West and the Segment 4 West Modification have more acres of forested wetland and total wetland acreage than Segment 4 East and the Segment 4 CapX Co-Locate Option (Figure 10-8). As discussed in Section 10.4, 49 percent of Segment 4 West Modification could be double-circuited with an existing 161 kV line and 26 percent of Segment 4 East could be double-circuited with existing 69 kV line. Segment 4 West and the Segment 4 CapX Co-Locate Option would parallel existing transmission line ROWs for 33 and 84 percent of their lengths, respectively. Therefore, forested wetlands within these existing transmission line corridors have already been partially cleared, and less clearing of forested wetlands would be needed.

Figure 10-8 Wetlands within ROW of Segment 4



In most cases, wetlands can be spanned to avoid placing structures within them. However, wetland crossings longer than 700 feet might require one or more structures to be placed within the wetland. The anticipated alignments of Segment 4 West and Segment 4 West Modification would cross a wetland wider than 700 feet, where existing transmission line is not present, and could therefore require pole placement within the wetlands.

In its Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR noted that many of the unique characteristics of calcareous fens result from the upwelling of groundwater through calcareous substrates. Because of this dependence on groundwater hydrology, calcareous fens can be affected by nearby activities or even those several miles away. Activities that affect surface water flows (e.g., stormwater flow, erosion), or activities that affect groundwater hydrology (e.g., groundwater pumping, contamination, discharge, or excavation) can impact calcareous fens.

10.9.11.3 Mitigation

Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width.

The sample route permit (Section 5.3.9 of Appendix H) includes the following measures to mitigate impacts to wetlands:

- Develop wetland impact avoidance measures and implement them during construction of the project.
- Space and place the structures at variable distances to span and avoid wetlands.
- Limit unavoidable wetland impacts as a result of the placement of structures to the immediate area around the structures.
- Construct in wetland areas during frozen ground conditions where practicable and according to permit requirements by the applicable permitting authority.
- Use wooden or composite mats to protect wetland vegetation when construction during winter is not possible.
- Contain soil excavated from the wetlands and not place it back into the wetland.
- Access wetlands using the shortest route possible in order to minimize travel through wetland areas and prevent unnecessary impacts.
- Do not place staging or stringing set up areas within or adjacent to wetlands, as practicable.
- Assemble structures on upland areas before they are brought to the site for installation.
- Restore wetland areas disturbed by construction activities to pre-construction conditions in accordance with the requirements of applicable state and federal permits or laws and landowner agreements.
- Meet the USACE, DNR, Minnesota BWSR, and local units of government wetland requirements.

In order to avoid impacting or altering the Haverhill 19 fen, the applicant could obtain a no effect concurrence decision from the DNR prior to construction, given Segment 4’s location within 5 miles of the fen. If the DNR determines the no effect concurrence is required, the applicant would need to demonstrate that any temporary or permanent disturbance from any project-related activities, including dewatering (amount, timing, and duration), is avoided. In its Natural Heritage Review response for the joint certificate of need application and route permit application (MCE 2023-00832; Appendix M), the DNR noted that to ensure compliance with WCA, the applicant would be required to contact the

Calcareous Fen Program Coordinator for further coordination. If, through further coordination, the DNR determines if any impacts to the fen would occur during any phase of the project, the applicant could be required to develop a Calcareous Fen Management Plan in coordination with the DNR, as specified in Minnesota Statute § 103G.223. A special condition could be added to the route permit to direct the applicant to coordinate with DNR to ensure an appropriate plan and protections are in place.

10.9.12 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width. Impacts to wildlife and wildlife habitat are assessed both by considering wildlife inhabiting the ROI as well as assessing the presence of potential habitat for wildlife within the ROI, including areas that are preserved or managed for wildlife. Potential short-term, localized impacts to wildlife could occur from displacement during construction or maintenance activities. Potential long-term impacts could occur as a result of habitat loss, conversion, or fragmentation.

Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife and associated habitat. The primary means for mitigating impacts to wildlife or associated habitat is to avoid areas known to contain high-quality habitat or which serve as migratory corridors. Use of existing rights-of-way can minimize habitat loss and fragmentation. Impacts to wildlife can also be minimized by spanning habitats and minimizing the number of structures in high-quality habitat through the use of specialty structures.

10.9.12.1 Existing Conditions

Wildlife inhabiting the ROI are typical of those found in disturbed habitats associated with agriculture and rural and suburban development. Watercourses and waterbodies and areas of natural vegetation, such as wetlands, forested areas, and open herbaceous areas, also provide habitat for wildlife in the area. Wildlife species inhabiting the ROI are generally adapted to disturbance associated with agricultural activities and human settlement. Typical species include mammals such as deer, fox, squirrels, coyote, and racoons; songbirds, such as robins and red-winged blackbirds; waterfowl, such as eagles and wood ducks; reptiles, such as snakes and turtles; amphibians, such as toads and frogs; and aquatic biota such as fish and mussels.

The state of Minnesota is in the Mississippi Flyway of North America. The Mississippi Flyway is a bird migration route that encompasses the Great Plains of the U.S. and Canada. Migratory birds use portions of the Mississippi Flyway as resting grounds during spring and fall migration, as well as breeding and nesting grounds throughout the summer. Suitable habitat for migratory birds is present throughout Segment 4.

Migratory birds are protected under the Migratory Bird Treaty Act of 1918 (16 USC 703-712), which prohibits the taking, killing, possession, transportation, and importation of migratory birds, their eggs, parts, and nests. Bald eagles (*Haliaeetus leucocephalaus*) and golden eagles (*Aquila chrysaetos)* are protected under the MBTA and the federal Bald and Golden Eagle Protection Act (BGEPA; 16 USC

668-668d), which specifically prohibits the taking or possession of and commerce in, either alive or dead, or any part, nest, or egg of these eagles.

Minnesota is home to over 2,000 known native wildlife species, and over 300 of these species have been identified as SGCN because they are rare, their populations are declining, or they face serious threats that can cause them to decline, and thus have populations below levels desirable to promote their long-term health and stability. Minnesota's Wildlife Action Plan 2015-2025 includes a habitat approach, which focuses on sustaining and enhancing terrestrial and aquatic habitats for SGCN in the context of the larger landscapes (reference (191)). The Wildlife Action Plan lays out the basis for the long-term vision of a Wildlife Action Network composed of terrestrial and aquatic habitat cores and ROWs to support biological diversity and ecosystem resilience with a focus on SGCN. As shown on Map 60, several Wildlife Action Network corridors are scattered throughout Segment 4 and are crossed by the ROI for Segment 4 West, Segment 4 West Modification, Segment 4 East, and Segment 4 CapX Co-Locate Option. The Wildlife Action Network is a metric that can be used to assess buffers and connectors of habitats representing the diversity of habitat quality, supporting SGCN. As detailed by the DNR, "Consideration should be given to projects or activities that could result in the loss, degradation or fragmentation of habitat within the Wildlife Action Network, as habitat loss was identified as a substantial contributor to SGCN population declines" declines" (reference (191)).

Compared to the other segments, the ROI of Segment 4 does not intersect many lands that are preserved or managed for wildlife and associated habitat. Other than Wildlife Action Network corridors, the only other wildlife resource that intersects the ROI for Segment 4 is a USFWS Grassland Bird Conservation Area (GBCA) (Map 60).

The USFWS designates GBCAs priority areas for grassland protection and enhancement that are thought to provide suitable habitat for many or all priority grassland bird species in tall grass prairie. A GBCA intersects the ROI for Segment 4 West Modification (Map 60-1 and Map 60-2).

There are over 5,000 shallow lakes that are greater than 50 acres in size in the state of Minnesota; these shallow lakes serve as important habitat to wildlife species (reference (188)). Shady Lake is a shallow lake intersected by the ROI for Segment 4 East (Map 60-1). The DNR Shallow Lakes Program designates certain shallow lakes as shallow wildlife lakes; this designation allows them to protect and enhance wildlife habitat on these larger lakes (reference (196)). However, Shady Lake is not a DNR designated shallow wildlife lake, and no DNR designated shallow wildlife lakes intersect the Segment 4 ROI. Potential impacts to lakes, including Shady Lake, are discussed in Section 10.9.9.

In addition to the lands that are preserved or managed for wildlife, there are several sensitive ecological resources, such as native plant communities, that would also provide habitat for wildlife; these resources are discussed in Section 10.9.7.2.

10.9.12.2 Potential Impacts

General Wildlife Impacts

Construction activities that generate noise, dust, or disturbance of habitat could result in short-term, indirect impacts on wildlife. During project construction, wildlife would generally be displaced within and adjacent to the ROW. Clearing and grading activities could also affect birds' eggs or nestlings and small mammals that might be unable to avoid equipment. Many wildlife species would likely avoid the immediate area during construction and possibly not return following construction; the distance that animals would be displaced depends on the species and the tolerance level of each animal. However, comparable habitat is available adjacent to the project.

Construction of the project could result in long-term adverse impacts on wildlife due to loss, conversion, or fragmentation of habitat, particularly areas that are preserved and/or managed for wildlife, such as Wildlife Action Network corridors that intersect the route widths and rights-of-ways of Segment 4 West, Segment 4 West Modification, Segment 4 East, and Segment 4 CapX Co-Locate Option intersect, and the GBCA which intersects the route width and ROW of Segment 4 West Modification.

As discussed in Section 10.4, 48 percent of Segment 4 West Modification could be double-circuited with an existing 161 kV line and 26 percent of Segment 4 East could be double-circuited with existing 69 kV line. Segment 4 West and Segment 4 CapX Co-Locate Option would not double-circuit existing transmission lines but they would parallel existing transmission line rights-of-way for 33 and 84 percent of their lengths, respectively. In areas that would double circuit with an existing transmission line or parallel an existing transmission line ROW, impacts to wildlife and associated habitat would be minimized because habitat fragmentation has already occurred in these areas.

Table 10-30 Wildlife Resources within the Route Width and ROW of Segment 4 West, Segment 4 West Modification, Segment 4 East, and Segment 4 CapX Co-Locate Option

Resource	Units	Segment 4 West		Segment 4 West Modification		Segment 4 East		Segment 4 CapX Co-locate Option	
		Route width	ROW	Route width	ROW	Route width	ROW	Route width	ROW
Grassland Bird Conservation Areas	Acres	0	0	328	33	0	0	0	0
Wildlife Action Network corridors	High or medium-high rank (acres)	94	9	85	9	19	1	63	4
	Medium rank (acres)	0	0	5	0	14	1	2	0
	Low or medium-low rank (acres)	175	18	164	16	74	7	204	19
	Total acres	269	27	254	25	108	9	269	23

The route width and ROW of Segment 4 West Modification would intersect a GBCA, while Segment 4 West, Segment 4 East, and Segment 4 CapX Co-locate Option would avoid the GBCA. However, impacts would be minimized because Segment 4 West Modification would cross the GBCA in an existing transmission line corridor while double-circuiting a 161 kV line.

The route width and ROW of Segment 4 West, Segment 4 West Modification, Segment 4 East, and Segment 4 CapX Co-locate Option would intersect several Wildlife Action Network corridors. Segment 4 East would intersect less than half the acreage of Wildlife Action Network corridors as Segment 4 West, Segment 4 West Modification, and the Segment 4 West CapX Co-locate Option. Segment 4 West and Segment 4 West Modification would cross a Wildlife Action Network corridor located along the Zumbro River (Map 60-3 and Map 65-27). The area surrounding the Zumbro River in this location is densely forested and does not contain existing transmission line or road rights-of-way; as such, Segment 4 West and Segment 4 West Modification would result in habitat fragmentation in this area. All Wildlife Action Network corridors crossed by Segment 4 East and the Segment 4 CapX Co-locate Option would occur in areas that parallel existing transmission line or road rights-of-way, thereby minimizing new effects associated with habitat fragmentation.

Avian Impacts

Potential impacts to avian species (for example, songbirds, raptors, and waterfowl) could occur due to electrocution and collision with transmission line conductors. Electrocution occurs when an arc is created by contact between a bird and energized lines or an energized line and grounded structure equipment. Electrocution occurs more frequently with larger bird species, such as hawks, because they have wider wingspans that are more likely to create contact with the conductors.

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

As discussed above, impacts to wildlife and associated habitat would be minimized by double-circuiting with existing transmission lines and/or paralleling existing transmission line rights-of-way. However, the incidence of birds colliding with transmission lines is influenced by the number of horizontal planes in which the conductors are strung. Stringing the conductors in a single horizontal plane presents less of a barrier to birds crossing the transmission line ROW. Double-circuiting and paralleling existing transmission lines could require adding another horizontal plane, which could increase potential impacts to avian species in those areas.

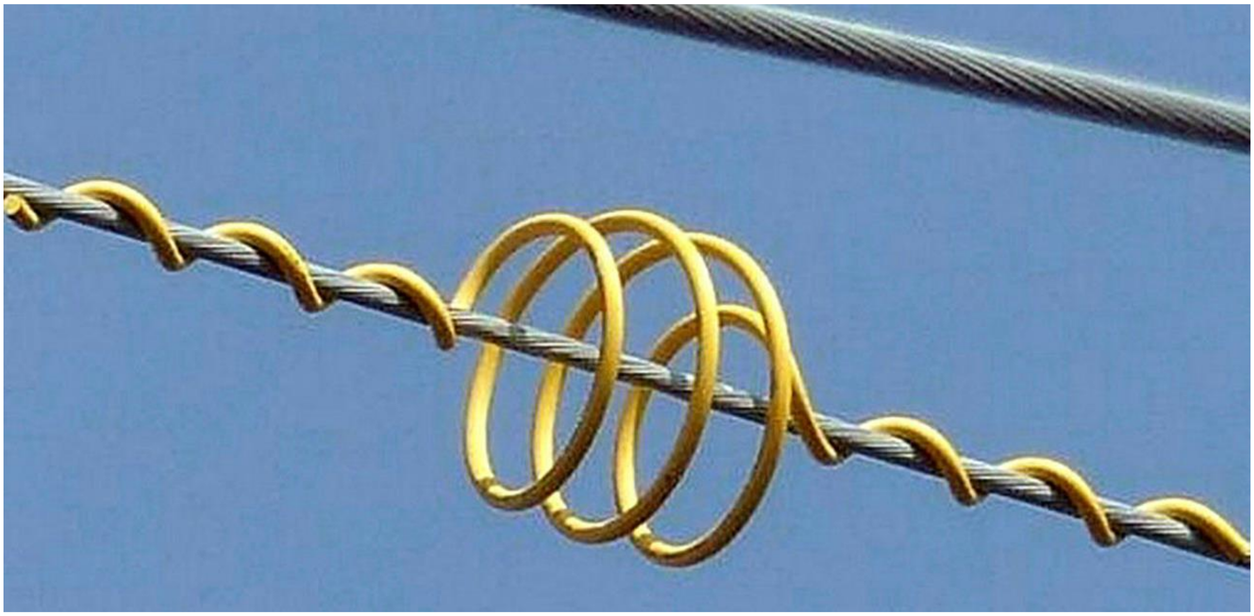
10.9.12.3 Mitigation

Potential impacts to wildlife and wildlife habitat can often be minimized or mitigated through several strategies. The primary strategy for mitigating impacts is to select route alternatives away from areas known to contain high-quality habitat or which serve as migratory corridors. Use of existing rights-of-way can minimize habitat loss and fragmentation. Impacts to wildlife can also be minimized by spanning habitats and minimizing the number of structures in high-quality habitat through the use of specialty structures.

Mitigation and minimization measures for potential impacts to avian species, including federally and/or state protected avian species, are standard Commission route permit conditions. As noted in Appendix H, as part of the Commission's route permit, the applicant, in cooperation with the DNR, would need to identify areas of the transmission line where bird flight diverters would be incorporated into the transmission line design to prevent large avian collisions attributed to visibility issues. A typical bird flight diverter installation is shown in Figure 10-9. In addition, standard transmission design would need to incorporate adequate spacing of conductors and grounding devices in accordance with Avian Power Line Interaction Committee standards to eliminate the risk of electrocution to raptors with larger wingspans that could simultaneously come in contact with a conductor and grounding devices.

As discussed in Section 10.9.10.3, there are several standard Commission route permit conditions to mitigate or minimize potential impacts to vegetation resources; these standard route permit conditions would also be applicable to mitigating and minimizing potential impacts to wildlife habitat.

Figure 10-9 Typical Bird Flight Diverter



As summarized in its route permit application, the applicant has committed to the following measures to minimize the potential for impacts to wildlife and wildlife habitat:

- Designing the route to avoid wildlife habitat identified to the extent possible during a constraints analysis completed during the routing process.
- Implementation of specific BMPs for protected species that would also be beneficial to wildlife in general; these are discussed in Section 10.9.7.2.
- Coordinating with the DNR and/or USFWS to identify wildlife migration pathways, particularly avian flyways crossed by the route alternatives, and to identify areas where transmission lines should be marked to minimize avian interactions.

Currently, the state of Minnesota does not track locations of bald eagles or their nests, and the USFWS does not have any public data available on eagle nests. The DNR is in the process of developing a database of eagle nest locations; however, it is not currently available. The DNR suggests reporting any eagle sightings on eBird (https://ebird.org/home); these reports will ultimately become part of the DNR's eagle database.

The USFWS bald eagle management guidelines indicate that activities within 660 feet of an active nest and occur within line of sight of the nesting location might have the potential to disturb nesting bald eagles (reference (198)). Impacts to bald eagles could be minimized by conducting a visual inspection for bald eagle nests not more than two weeks prior to the start of construction, if work will occur during the active nesting period for bald eagles (January 15th – July 31st). If an active nest is observed and if construction would need to take place during the time that the nest remains active, consultation with the USFWS would need to occur to determine the appropriate next steps. Under such a circumstance, a variety of options are available, including the presence of a biological monitor to observe and determine if project activities are resulting in disturbance, a shift in project schedule to avoid the active nesting season, or a submittal for an incidental take permit that would allow work to proceed even if it is likely to result in disturbance.

As summarized in their joint certificate of need application and route permit application, the applicant has committed to continuing coordination with the USFWS regarding the 2024 revised regulations for the issuance of permits for eagle incidental take and eagle nest take (Permits for Incidental Take of Eagles and Eagle Nests, 50 Code of Federal Regulations CFR, Parts 13 and 22, 2024).

10.10 Electric System Reliability

In the joint certificate of need application and route permit application, the applicant summarized MISO's reliability analysis findings and noted that the applicant completed their own examination of system reliability improvements yielded by the project. Reliability analyses studied all NERC contingency categories (P1-P7). These analyses support the purpose and need of the project.

The purpose of the project, as also discussed in Section 4.1, is to construct an HVTL to provide additional transmission capacity to reduce congestion and to improve electric system reliability throughout the region as more renewable energy resources are added to the high-voltage transmission system. The project would provide additional transmission capacity that is needed to mitigate current capacity issues and, as part of the LRTP Tranche 1 Portfolio, would address reliability violations as defined by the NERC at over 300 different sites across the Midwest. The project would increase transfer capability across the MISO Midwest subregion to allow reliability to be maintained for all hours under varying dispatch patterns driven by differences in weather conditions.

The joint certificate of need application and route permit application discussed that the existing 230 kV transmission system in eastern North Dakota and South Dakota plays a key role in transporting and delivering energy to customers in Minnesota, but the existing 230 kV system is currently at its capacity. The project, as part of LRTP Tranche 1, would provide a new 345 kV transmission line, which is designed to provide additional transmission capacity to mitigate current capacity issues on the existing 230 kV transmission system and to improve electric system reliability as more renewable energy resources are added throughout the region.

The applicant designed the project with the intent of meeting the project's electric system reliability needs. Reliability was also considered by the applicant in their alternatives analysis.

10.11 Costs that are Dependent on Design and Route

The applicant's overall project costs, as presented in the joint certificate of need application and route permit application and discussed in Section 3.5, are based on high and low-cost estimates of the project as a whole, and do not distinguish between the individual route segments and alternatives. The transmission line is expected to cost approximately $3.7 million per mile. The estimated project construction cost at the time of the application was between $524.7 million and $577.2 million. Also as discussed in Section 3.5, since the filing of the joint certificate of need application and route permit application, the applicant has updated this range of project costs to include alternatives, and the updated estimated cost is between $436.8 million and $583.8 million.[27]

Construction cost estimates rely on the best available information at the time of the estimate. Estimates include (1) transmission line structures and materials; (2) transmission line construction and restoration; (3) transmission line and substation permitting and design; (4) transmission line ROW acquisition; and (5) substation materials, substation land acquisition, and construction. The cost estimates assume the applicant would pay prevailing wages for applicable positions during project construction.

The following variables were considered when estimating project costs:

- Unexpected weather conditions,
- Environmental sensitivities resulting in the need for mitigation measures,
- Poor soil conditions in areas where no data was obtained,
- Transmission line outage constraints,
- Potential shallow bedrock,
- River crossings,

[27] Northern States Power Company, dba Xcel Energy: TESTIMONY-- T. Wendland Direct Testimony and Schedules, Docket No. 20253-216973-01

- Labor shortages,
- Market fluctuations in material pricing and availability, and
- Labor costs.

These cost estimates could increase over time for any number of reasons such as, but not limited to escalation, inflation and commodity pricing.

For the 161 kV transmission line portion, the high end of the cost range is for Segment 4 West Modification (which incorporates Route Segment 13, Appendix D). Segment 4 West Modification involves double-circuiting the new 161 line with the existing North Rochester – Northern Hills 161 kV line for approximately 11 miles starting at the North Rochester Substation to where it will connect with Route Option 4 West (Section 3.1.5.2 Segment 4 West Modification). The cost estimates in the joint certificate of need application and route permit application were based on a single-circuit 161 kV design. In contrast, this option involves constructing 11 miles of double-circuited 161/161 kV transmission line, which is more expensive than single-circuit construction due to the larger structures and additional conductor.

The low end of the cost range for the 161 kV transmission line, is for the Segment 4 CapX Co-Locate Option (which incorporates Route Segment 12, Appendix D). The Segment 4 CapX Co-Locate Option involves constructing the new 161 kV line parallel to the existing CapX2020 North Rochester – Mississippi River double-circuit 345/345 kV transmission line (Section 3.1.5.5 Segment 4 CapX Co-Locate Option). This option is estimated to be less expensive because it is approximately six miles shorter in length than Segment 4 West or Segment 4 East. A shorter route means less structures, less conductors, and less right-of-way, which results in lower overall costs. The applicant's testimony notes the total cost to construct the Segment 4 CapX Co-Locate Option is estimated to be $41.1 million.

10.12 Segment 4 Relative Merits

The Commission is charged with locating transmission lines in a manner that is "compatible with environmental preservation and the efficient use of resources" and that minimizes "adverse human and environmental impact(s)" while ensuring electric power reliability per Minnesota Statute § 216E.02. Minnesota Statute §216E.03, subdivision 7(b) identifies considerations that the Commission must consider when designating transmission lines routes. These considerations are further clarified and expanded by Minnesota Rule 7850.4100, which identifies the following 14 factors the Commission must consider when making a transmission line route permit decision:

A. effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services;
B. effects on public health and safety;
C. effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining;
D. effects on archaeological and historic resources;

E. effects on the natural environment, including effects on air and water quality resources, and flora and fauna;
F. effects on rare and unique natural resources;
G. application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity
H. use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries;
I. use of existing large electric power generating plant sites;
J. use of existing transportation, pipeline, and electrical transmission systems or rights-of-way;
K. electrical system reliability;
L. costs of constructing, operating, and maintaining the facility which are dependent on design and route;
M. adverse human and natural environmental effects which cannot be avoided; and
N. irreversible and irretrievable commitments of resources.

These routing factors are used to conduct a relative merits analysis of Segment 4 West, Segment 4 West Modification, Segment 4 East, and Segment 4 CapX Co-Locate with the exception of some elements of resource categories that are considered to have minimal impacts that might not vary significantly and/or the routing factors are not applicable. These include:

- Impacts on human settlements (factor A)— environmental justice, cultural values, noise, property values, socioeconomics, transportation, and public services.
- Impacts on public health and safety (factor B)—EMF, implantable medical devices, stray voltage, public and worker safety, induced voltage, and electronic interference.
- Impacts on the natural environment (factor E) – air quality, climate, geology and topography, floodplains, groundwater, and soils.

With respect to routing factor G, it is assumed that Segment 4 West, Segment 4 West Modification, Segment 4 East, and Segment 4 CapX Co-Locate are equal with regard to maximizing energy efficiencies and accommodating expansion of transmission capacity. With respect to environmental impacts, the examination of such impacts suggested by routing factor G is included in the discussion of other routing factors and elements that more specifically address an environmental impact (for example, effects on vegetation and wildlife, routing factor E, or rare and unique natural resources, routing factor F).

Routing factor I, the use of existing large electric power generating plant sites, is not relevant to this project and is not discussed further.

Routing factors M and N— the unavoidable and irreversible impacts of the project—are discussed in Chapter 12.

A relative merits analysis was completed to compare Segment 4 West, Segment 4 West Modification, Segment 4 East, and Segment 4 CapX Co-Locate using these routing factors. The analysis uses graphics

(Table 10-31) to provide a visual assessment of the relative merits for each route segment. The graphic for a specific routing factor or element is not meant to be indicative of the "best" route segment but is provided as a relative comparison to be evaluated together with all other routing factors. For routing factors where impacts are anticipated to vary, the graphic represents the magnitude of anticipated difference between these anticipated impacts and compares them across the different route options within a given region. For routing factors that express the state of Minnesota's interest in the efficient use of resources (for example, the use and paralleling of existing rights-of-way), the graphic represents the consistency of the route alternative with these interests and compares them to each other.
Table 10-32 summarizes the relative merits analysis for Segment 4.

Table 10-31 Guide to Relative Merits Analysis

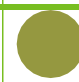
Consistency with Routing Factor or Anticipated Impacts	Symbol
Segment option is consistent with the routing factor OR Impacts are anticipated to be negligible to minimal or the impact is positive	
Segment option is consistent with routing factor but less so than the other options OR Impacts are anticipated to be minimal but the potential for impacts is greater than the other options or require special permit conditions OR Impacts are anticipated to be moderate	
Route is not consistent with routing factor or consistent only in part OR Impacts might be moderate but the potential for impacts is greater than the other options or might require special permit conditions OR Impacts are anticipated to be significant	

Table 10-32 Segment 4 Relative Merits

Routing Factor / Resource	Segment 4 West	Segment 4 West Mod	Segment 4 East	Segment 4 CapX Co-Locate Option	Summary
Factor A Human Settlement					
Aesthetics	◒	◒	◒	◒	Aesthetic impacts are anticipated to be moderate. The Segment 4 CapX Co-Locate Option has less residences within the ROW, route width, and local vicinity, with a total of 40 residences within the local vicinity compared to Segment 4 West (96), Segment 4 West Modification (113), and Segment 4 East (258). Segment 4 CapX Co-Locate also has less non-residential structures within the local vicinity. Segment 4 would result in aesthetic impacts to areas used for recreational purposes. Segment 4 West, Segment 4 West Modification, and Segment 4 East would introduce new crossings at the Zumbro River, a state water trail, where there is no existing infrastructure already present. Segment 4 West and Segment 4 East would have the most Zumbro River crossings without existing transmission line infrastructure. Segment 4 CapX Co-Locate would also cross the Zumbro trail, but in a location where existing transmission line infrastructure is present. Segment 4 West and Segment 4 West Modification would intersect the Douglas State Trail near Rochester once where there is no existing transmission line infrastructure. Segment 4 West Modification would be adjacent to the trail for around 8 miles. Segment 4 West could be double-circuited with or paralleling existing transmission lines for 18% of its length and 33% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads). Segment 4 West Modification could be double-circuited with or paralleling existing transmission lines for 49% of its length and 49% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads). Segment 4 East could be double-circuited with or paralleling existing transmission lines for 26% of its length and 33% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads). The Segment 4 CapX Co-Locate Option could be double-circuited with or paralleling existing transmission lines for 84% of its length, and 84% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads).

Routing Factor / Resource	Segment 4 West	Segment 4 West Mod	Segment 4 East	Segment 4 CapX Co-Locate Option	Summary
Displacement					Segment 4 West, Segment 4 West Mod, and the Segment 4 CapX Co-Locate Option do not contain any residences within the ROW. Segment 4 East has one residence that could be subject to displacement within ROW; however, the applicant has indicated no residences would be displaced. The Segment 4 CapX Co-Locate Option does not contain any non-residential structures within ROW. Segment 4 West has 1 non-residential structure, Segment 4 West Modification has 3 non-residential structures, and Segment 4 East has 2 non-residential structures, that could be subject to displacement within ROW.
Land Use and Zoning					Impacts to existing land use patterns, future land use planning, and local zoning are anticipated to be minimal within the counties crossed by Segment 4 West, Segment 4 West Modification, Segment 4 East, and the Segment 4 CapX Co-Locate Option.
Recreation					Recreational resources within the route width subject to impact include a publicly accessible trail system, public watercourses (including a designated state water trail), and snowmobile trails. Intermittent impacts would occur during construction and long-term impacts would include aesthetic impacts. Segment 4 West and Segment 4 West Modification route width contains the Douglas State Trail for 0.5 miles and 8.1 miles, respectively. Existing infrastructure, including roads and transmission lines, cross the trail in multiple locations. Impacts to the trail are anticipated to be minimal. Segment 4 West, Segment 4 West Mod, and Segment 4 East route widths cross the Zumbro River, a designated state water trail, in at least three locations, while the Segment 4 CapX Co-Locate Option only crosses it once. There are existing transmission lines at most of the crossings, including the one crossing of the Segment 4 CapX Co-Locate Option. The route width of the Segment 4 CapX Co-Locate Option contains the least linear feet of the watercourse. Three recreational resources noted by the public during scoping and subject to impacts are all in close proximity to Segment 4 West and include a private airstrip, the Rochester Archery Club, and the Rochester Aero Model Society. The city of Oronoco provided a letter during scoping stating its interpretation of how Segment 4 East would impact Oronoco City Park and the Lake Shady lakebed.
Factor C Land-Based Economies					

Routing Factor / Resource	Segment 4 West	Segment 4 West Mod	Segment 4 East	Segment 4 CapX Co-Locate Option	Summary
Agriculture	◒	●	●	◒	Most land within the route widths is agricultural (76% of Segment 4 West, 72% of Segment 4 West Modification, 51% of Segment 4 East, and 80% of the Segment 4 CapX Co-Locate Option) and impacts cannot be avoided but can be mitigated. Prudent routing (e.g., ROW sharing via double-circuiting or paralleling with existing infrastructure) could help minimize impacts. Segment 4 West shares or parallels existing infrastructure (transmission lines, roads, and railroads) for 46% of its length, Segment 4 West Modification shares or parallels existing infrastructure for 64% of its length, Segment 4 East shares or parallels existing infrastructure for 82% of its length, and the Segment 4 CapX Co-Locate Option shares or parallels existing infrastructure for 84% of its length.
Forestry	●	●	●	●	No notable forestry resources were identified within Segment 4 West, Segment 4 West Mod, Segment 4 East, or Segment 4 CapX Co-Locate Option's route width; therefore, no impacts to forestry are anticipated as a result of Segment 4.
Mining	◒	●	●	●	Gravel pits, quarries, and prospect mines were identified within the ROI of Segment 4 West, Segment 4 West Modification, and Segment 4 East. All but one appeared to be inactive; an active bedrock quarry is located within the ROI of Segment 4 West. No active gravel pits were identified within the Segment 4 CapX Co-Locate Option's route width; therefore, impacts to mining are anticipated to be minimal.
Tourism	●	●	●	●	Known events and other opportunities for tourism are advertised in nearby incorporated towns and the activities are not located within the ROI. Recreational opportunities identified within the ROI include publicly accessible lands and waters used for outdoor activities. Impacts to the tourism-based economy are anticipated to be negligible to minimal.
Factor D Archaeological and Historic Resources					

Routing Factor / Resource	Segment 4 West	Segment 4 West Mod	Segment 4 East	Segment 4 CapX Co-Locate Option	Summary
Archaeological					Segment 4 East and Segment 4 CapX Co-Locate's route width contain one (the same) NRHP-eligible archaeological site while Segment 4 West Modification and Segment 4 West contain none. Segment 4 West Modification has more unevaluated sites for the NRHP (4) compared to Segment 4 West (2), Segment 4 East (2), and Segment 4 CapX Co-Locate (1). Segment 4 West's route width contains more potential historic cemeteries (3) than Segment 4 West Modification (2), Segment 4 East (2), and Segment 4 CapX Co-Locate (1). However, the exact locations of the cemeteries are unknown. Survey efforts would be completed by the applicant and would inform potential impacts; impacts could be avoided and/or mitigated.
Historic					There is one eligible historic architectural resource within the route width of Segment 4 East. The NRHP-eligible resource, OL-ORT-00013/ William-Rucker Farmstead, intersects the route width along U.S. Highway 52, south of Oronoco, along a portion of the segment that would not be double-circuited or parallel an existing transmission line. Segment 4 East's route width has one previously documented NRHP-eligible historic architectural resource. Segment 4 East's route width includes more (29) historic architectural resources which are unevaluated for the NRHP compared to Segment 4 West Modification (5), Segment 4 CapX Co-Locate (2), and Segment 4 West (1). Survey efforts would be completed by the applicant and would inform potential impacts; impacts could be avoided and/or mitigated.
Factor E Natural Resources					
Public and Designated Lands					No locally-owned (city or county), state-owned, or federally-owned lands are present within the ROW for Segment 4 West, Segment 4 West Modification, Segment 4 East, or the Segment 4 CapX Co-Locate Option. No RIM land or CREP easements are located within the ROW for Segment 4 West, Segment 4 West Modification, Segment 4 East, or no Segment 4 CapX Co-Locate Option. No impacts to public or designated lands is anticipated.

Routing Factor / Resource	Segment 4 West	Segment 4 West Mod	Segment 4 East	Segment 4 CapX Co-Locate Option	Summary
Surface Water					Segment 4 East has the fewest number of watercourse crossings (22) and the Segment 4 CapX Co-Locate Option has the most (30); Segment 4 West and Segment 4 Modification have 29 and 25 watercourse crossings, respectively. Many of the watercourse crossings would occur in areas that would be double circuited with or paralleling existing transmission lines or highway ROW. Segment 4 East crosses Shady Lake, a PWI basin, and Segment 4 CapX Co-Locate Option crosses Zumbro Lake, a PWI basin; Segment 4 West and Segment 4 West Modification do not cross waterbodies or PWI basins.
Vegetation					Segment 4 West has the most acres of forested vegetation in the ROW (28 acres) and Segment 4 East has the least acres of forested vegetation in the ROW (10 acres). Given the proposed double-circuiting and/or paralleling of existing transmission line or road rights-of-way, fragmentation of forested areas has mostly already occurred where the rights-of-way intersect forested vegetation. However, the ROW of Segment 4 West and Segment 4 West Modification would intersect a densely forested area near the Zumbro River; this area of forest would be fragmented because no existing transmission line or road rights-of-way are present in this area.
Wetlands					The ROW of Segment CapX Co-Locate Option and Segment 4 East have the least amount of total wetland (4 acres and 9 acres, respectively), 1 acre of which is forested wetland, while Segment 4 West and Segment 4 West Modification have the most wetland (11 acres), 6 acres of which are forested wetland. One calcareous fen is located approximately 3.6 miles south of Segment 4 West and Segment 4 West Modification's ROW. Segment 4 West and the Segment 4 West Modification would cross one wetland wider than 700 feet, where existing transmission line is not present, and would therefore require pole placement within the wetlands.

Routing Factor / Resource	Segment 4 West	Segment 4 West Mod	Segment 4 East	Segment 4 CapX Co-Locate Option	Summary
Wildlife and Wildlife Habitat	◒	◒	◒	◒	The ROW of Segment 4 West Modification intersects a GBCA, while the rights-of-way of Segment 4 West, Segment 4 East, and the Segment 4 CapX Co-locate Option would avoid the GBCA. However, impacts would be minimized because Segment 4 West Modification would cross the GBCA in an existing transmission line corridor while double-circuiting a 161 kV line. The ROW of Segment 4 West, Segment 4 West Modification, Segment 4 East, and the Segment 4 CapX Co-locate Option would intersect several Wildlife Action Network corridors, with Segment 4 East intersecting the least acreage. Segment 4 West and Segment 4 West Modification would cross a Wildlife Action Network corridor in a densely forested area along the Zumbro River. No transmission line or road rights-of-way are present in this area; as such, Segment 4 West and Segment 4 West Modification would fragment habitat in this area.
Rare and Unique Natural Resources	◒	◒	◒	◒	The Segment 4 CapX Co-Locate Option and Segment 4 East have fewer NHIS records within a mile (5 and 8 records, respectively) compared to Segment 4 West and Segment 4 West Modification (10 records). Three non-aquatic protected species (glade mallow, Blanding's turtle, and Blanchard's cricket frog) have been documented within the ROW of Segment 4 West and Segment 4 West Modification and one non-aquatic protected species (tuberous Indian-plantain) has been documented within the ROW of Segment 4 East and the Segment 4 CapX Co-Locate Option. The ROW of the Segment 4 CapX Co-Locate Option would intersect the most acres of SBS (9 acres). The rights-of-way of Segment 4 West, Segment 4 West Modification, and the Segment 4 CapX Co-Locate option would intersect 3 acres of native plant communities, while the ROW of Segment 4 East would avoid native plant communities. Segment 4 West and Segment 4 West Modification would intersect an SBS (ranked moderate) and associated forested native plant communities (Red Oak – White Oak Forest, Elm – Ash – Basswood Terrace Forest, and Oak – Shagbark Hickory Woodland) near the Zumbro River. No existing transmission line or road rights-of-way are present in this area; as such fragmentation of these sensitive ecological resources would occur as a result of Segment 4 West or Segment 4 West Modification.

Routing Factor / Resource	Segment 4 West	Segment 4 West Mod	Segment 4 East	Segment 4 CapX Co-Locate Option	Summary
Minnesota Statute § 216E.03 - subdivision 7 (15e) (transmission lines)					
Paralleling Existing Transmission Line					Segment 4 West could be double-circuited for 7.7 miles which is 33% of its length. Segment 4 West Modification could be double-circuited for 11.3 miles which is 49% of its length. Segment 4 East could be double-circuited for 6.5 miles which is 33% of its length. Segment 4 CapX Co-Locate Option could be double-circuited for 13.7 miles which is 84% of its length.
Minnesota Statute § 216E.03 - Subdivision 7 (8) (roads/railroads)					
Paralleling Roads and Railroads					Segment 4 West would parallel roads or railroads for 3.2 miles which is 14% of its length. Segment 4 West Modification parallel roads or railroads for 6.0 miles which is 27% of its length. Segment 4 East would parallel roads or railroads for 14.4 miles which is 73% of its length. Segment 4 CapX Co-Locate Option would parallel roads or railroads for <.1 miles.
Factor H Paralleling Division Lines					
Paralleling existing survey lines, natural division lines, and agricultural field boundaries					Segment 4 West would follow existing division lines (field, parcel, and section lines) for 19.1 miles which is 81% of its length. Segment 4 West Modification would follow existing division lines (field, parcel, and section lines) for 19.1 miles which is 81% of its length. Segment 4 East would follow existing division lines (field, parcel, and section lines) for 18.3 miles which is 93% of its length. The Segment 4 CapX Co-Locate Option would follow existing division lines (field, parcel, and section lines) for 7.8 miles which is 48% of its length.
Factor J Paralleling Existing Infrastructure					

Routing Factor / Resource	Segment 4 West	Segment 4 West Mod	Segment 4 East	Segment 4 CapX Co-Locate Option	Summary
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.					Cumulatively, Segment 4 West parallels existing infrastructure (transmission lines, roads, or railroads) for 89% of its length. Cumulatively, Segment 4 West Modification parallels existing infrastructure (transmission lines, roads, or railroads) for 95% of its length. Cumulatively, Segment 4 East parallels existing infrastructure (transmission lines, roads, or railroads) for 95% of its length. Cumulatively, the Segment 4 CapX Co-Locate Option parallels existing infrastructure (transmission lines, roads, or railroads) for 90% of its length.
Factor L Costs					
Costs Dependent on Design and Route					The applicant's overall project costs, as presented in the joint certificate of need application and route permit application and discussed in Section 3.5, are based on high and low-cost estimates of the project as a whole, and do not distinguish between the individual route segments and alternatives. The application noted that the transmission line is expected to cost approximately $3.7 million per mile. The Segment 4 CapX Co-Locate Option is the shortest (16.4 miles) followed by Segment 4 East (19.6 miles), Segment 4 West Modification (22.7 miles), and Segment 4 West (23.6 miles). As discussed in Section 3.5, the applicant also provided updated costs including the alternatives in testimony.[28] The high end of the cost range for Segment 4 includes Segment 4 West Modification which as described in Section 10.11, would be the most expensive option given the 11 miles of double-circuiting compared to the other option's less expensive design to single-circuit. The low end of the cost range for Segment 4 includes Segment 4 CapX Co-Locate Option which as described in Section 10.11, would be the least expensive option given its length.

[28] Northern States Power Company, dba Xcel Energy: TESTIMONY-- T. Wendland Direct Testimony and Schedules, Docket No. 20253-216973-01

10.13 Segment 4 West Alternatives

The potential alternatives to Segment 4 West include Route Segment 4M and Route Segment 4R, both of which were proposed in the joint certificate of need application and route permit application. The potential impacts associated with these alternatives are summarized below and compared to their Segment 4 West equivalents.

10.13.1 Route Segment 4M

Route Segment 4M is approximately 1.0-mile long and parallels roads and crosses primarily agricultural and open land along the roadways (Map 66-5). The route segment would require a greenfield ROW. As noted in the joint certificate of need application and route permit application, it was identified in response to landowner comments about Segment 4 West not following existing property lines or other ROWs. The alternative parallels roads and crosses primarily agricultural and open land along the roadways.

Table 10-33 Route Segment 4M vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment 4M would follow a road ROW for its entire length. The equivalent to Route Segment 4M would follow an existing transmission line ROW for 25 percent of its length and field, parcel, or section lines for 48 percent of its length.
Human Settlement, Aesthetics	Route Segment 4M would have four residences and eight non-residential structures within 500 feet. The equivalent of Route Segment 4M would not have any residences or non-residential structures within 500 feet. Route Segment 4M would require a new transmission line corridor for all of its lengths, while its equivalent would take advantage of an existing transmission line corridor for 25 percent of its length.
Human Settlement, Transportation and Public Services	Route Segment 4M would be parallel to 85th Street NW and 110th Avenue NW; the equivalent would cross both of these roadways but would not run parallel to any roadways.
Land-Based Economies	Route Segment 4M would have less impact on agriculture than its equivalent because it parallels road ROW and does not cut across an agricultural field.
Archaeological and Historic Resources	There is one unevaluated historic architectural resource present in the route width of Route Segment 4M that is not present in the route width of its equivalent: OL-NHT-00036/Bridge L6315. This bridge is described as a concrete culvert along 85th Street NW, crossing the Plum Creek. Given its function and placement along existing infrastructure, impacts to this resource would be minimal and limited to the visibility of the transmission line for commuters along this route.
Natural Environment – Surface Waters and Wetlands	Route Segment 4M would have one stream crossing, while its equivalent would have two stream crossings.

Resource	Summary
Natural Environment - Vegetation	The NLCD does not indicate the presence of forested vegetation within the ROW of Route Segment 4M or its equivalent. However, based on aerial photographs, a similar amount of forested vegetation appears to be present in the ROW of Route Segment 4M and its equivalent. The forested areas in the ROW of Route Segment 4M have already been fragmented by the road ROW it parallels. The equivalent of Route Segment 4M would fragment forested vegetation in two areas, as it does not follow an existing corridor through these areas.
Natural Environment – Wildlife and Wildlife Habitat	Neither Route Segment 4M nor its equivalent would intersect areas preserved or managed for wildlife. Route Segment 4M would follow an existing road ROW for its entire length, while its equivalent would follow transmission line ROW for approximately one-quarter of its length. The equivalent of Route Segment 4M would result in fragmenting two small areas of forested habitat.

10.13.2 Route Segment 4R

Route Segment 4R is approximately 0.6-miles long and turns east and then south through primarily open and forested land. The route segment would require a greenfield ROW (Map 66-12 and Map 66-13). As noted in the joint certificate of need application and route permit application, it was identified to avoid a planned development noted by a landowner.

Table 10-34 Route Segment 4R vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment 4R would follow road ROW for 3 percent of its length but would follow field, parcel, or section lines for its entire length. The equivalent to Route Segment 4R would follow road ROW for 15 percent of its length and filed, parcel, or section lines for 58 percent of its length.
Human Settlement, Aesthetics	Route Segment 4R would have six residences within 500 feet, two of which are located within the ROW; the equivalent would have 5 residences within 500 feet, none of which are in the ROW. Both Route Segment 4R and its equivalent would have three non-residential structures within 500 feet; only Route Segment 4R would have a non-residential structure in the ROW.
Human Settlement, Displacement	Route Segment 4R would have two residences and one non-residential structure within 75 feet of its anticipated alignment (one within its ROW), its equivalent would not have any residences or non-residential structures within the ROW.
Human Settlement, Land Use and Zoning	As noted above, the purpose of Route Segment 4R is to avoid a planned development that was noted by the landowner.
Natural Environment - Vegetation	Route Segment 4R would impact more forested vegetation than its equivalent. However, the forested vegetation is already fragmented by agricultural activities.
Rare and Unique Natural Resources	No federal or state-protected species have been documented within the ROW or route width of Route Segment 4R or its equivalent. The ROW of Route Segment 4R and its equivalent would intersect the edge (<1 acre) of a SBS and associated native plant community. Route Segment 4R is adjacent to its boundaries (Map 66-13).

10.14 Segment 4 East Alternatives

The potential alternatives to Segment 4 East include two route segments (Route Segment 4C and Route Segment 4E) and one alignment alternative (Alignment Alternative 16). Route Segment 4C and Route Segment 4E were proposed in the joint certificate of need application and route permit application. The potential impacts associated with these alternatives are summarized below and compared to their Segment 4 East equivalents.

10.14.1 Route Segment 4C

Route Segment 4C is approximately 1.2-miles long and starts on 500th Street, then turns south following 203rd Avenue (Map 66-16). The joint certificate of need application and route permit application doesn't indicate why it was considered.

Table 10-35 Route Segment 4C vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment 4C would follow an existing transmission line for 41 percent of its length and a road for 25 percent of its length. The equivalent of Route Segment 4C would not follow any existing infrastructure (transmission line, road, or railroad). Both would follow field, parcel, or section lines for their entire lengths.
Human Settlement, Aesthetics	Route Segment 4C would have three residences and 16 non-residential structures within 500 feet; its equivalent would not have any residences or non-residential structures within 500 feet.
Human Settlement, Transportation and Public Services	Route Segment 4C would be parallel to 500th Street and 203rd Avenue; the equivalent of Route Segment 4C would cross 203rd Avenue but would not run parallel to any roadways.
Natural Environment – Wildlife and Wildlife Habitat	Neither Route Segment 4C nor its equivalent would intersect areas preserved or managed for wildlife. Route Segment 4C would parallel more transmission line and road rights-of-way; however, both Route Segment 4C and its equivalent traverse a landscape that is already highly fragmented by agriculture.

10.14.2 Route Segment 4E

Route Segment 4E is approximately 3.1-miles long. This alternative generally parallels Highway 52 and crosses behind businesses and through open land adjacent to and on the east side of the Highway 52 ROW (Map 66-17 and Map 66-18). As noted in the joint certificate of need application and route permit application, the applicant met with the Prairie Island Indian Community, who expressed interest in developing newly acquired property on the east side of the highway. Segment 4 East follows this recommendation. The alternative, Route Segment 4E, presents a second option on the east side of the highway, but with potential to impact the Prairie Island Indian Community's prospective development.

Table 10-36 Route Segment 4E vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	The equivalent of Route Segment 4E would follow a road ROW for its entire length; Route Segment 4E is slightly more offset from Highway 52 and would follow a road ROW for 68 percent of its length.
Human Settlement, Aesthetics	Route Segment 4E would have 5 residences and 16 non-residential structures within 500 feet; its equivalent would have 10 residences and 22 non-residential structures.
Human Settlement, Transportation and Public Services	Route Segment 4E would parallel more of Highway 52 (or closer to it) than its equivalent but would avoid crossing it, while the equivalent would cross Highway 52 twice.
Land-Based Economies	The equivalent of Route Segment 4E would have more impact on agriculture as it is further offset from the highway ROW and cross agricultural fields.
Natural Environment – Surface Waters and Wetlands	Route Segment 4E would cross the edge of Shady Lake while its equivalent would avoid the lake boundaries in this area but would cross floodplain associated with Shady Lake (Map 66-18).
Natural Environment - Vegetation	The ROW of Segment 4 East would impact more forested vegetation and would fragment a forested area.
Natural Environment – Wildlife and Wildlife Habitat	The ROW for the equivalent of Route Segment 4E would intersect the edge of a Wildlife Action Network corridor; no other areas preserved or managed for wildlife would be intersected by the ROW of Route Segment 4E or its equivalent. Habitat has already been fragmented by existing road infrastructure. The equivalent of Route Segment 4E would follow less road ROW and would fragment an area of forested habitat in an area where a road is not present.

Rare and Unique Natural Resources	The state threatened tuberous Indian-plantain has been documented in the ROW of both Route Segment 4E and its equivalent. The ROW of Route Segment 4E would avoid intersecting sensitive ecological resources, while its equivalent would intersect the edge (< 1 acre) of an SBS (ranked below) but would do so in an area that is already fragmented between road and transmission line ROW.

10.14.3 Alignment Alternative 16 (AA-16)

Alignment Alternative 16 shifts the anticipated alignment of Segment 4 East to the south side of 75th Street Northwest (Map 66-20). Alignment Alternative 16 would avoid clearing trees along the north side of 75th Street, which provide a visual and noise barrier from vehicle traffic for some of the residences along the north side of 75th street (Map 66-20). The alternative alignment would be located within the applicant-proposed route width. Alignment Alternative 16 would not follow any transmission line ROW; its equivalent would follow and double-circuit an existing 69 kV transmission line for its entire length. Both Alignment Alternative 16 and its equivalent would follow road ROW for their entire lengths. Alignment Alternative 16 would have nine residences and 11 non-residential structures within 500 feet; it's equivalent would have seven residences and 13 non-residential structures within 500 feet.

10.15 Segment 4 CapX Co-Location Alternative

10.15.1 Alignment Alternative 15 (AA-15)

Alignment Alternative 15 is approximately 1.2 miles long and is an alternative Zumbro River crossing location for Segment 4 CapX Co-Locate (Map 66-27). Segment 4 CapX Co-Locate crosses the Zumbro River adjacent to the CapX line, and Alignment Alternative 15 would cross the river further south, on the south side of County Road 12 (Map 66-27). It serves as a secondary option for crossing the Zumbro River.

10.16 North Rochester to Highway 52 Study Area

As described in Section 3.1.5.4, the North Rochester to Highway 52 Study Area isolates data for the Segment 4 West, Segment 4 West Modification, and Segment 4 East options so that they begin at Highway 52 and terminate at the North Rochester Substation. The purpose of this study area is to isolate the data not included in the second study area (Highway 52 to existing 161 kV line study area; Section 10.17). This allows for easier analysis of complete Segment 4 route options (Section 10.18). In other words, it presents data that can be used to combine with the data presented for east of Highway 52 without any built-in assumptions on which option is used in the Highway 52 to existing 161 kV Line Study Area (Connector 4Q) study area.

The three options included in this study area are illustrated in Figure 10-10 and are summarized below.

- 4W

    - 4W is comprised of 15.6 miles of Segment 4 West between Highway 52 and the North Rochester Substation.
- 4W Mod
    - 4W Mod is comprised of the 14.8 miles of Segment 4 West Modification between Highway 52 and the North Rochester Substation. In large part, this is the part of Segment 4 West Modification that could be double-circuited (Map 7).
- 4E
    - 4E is comprised of 12.2 miles of Segment 4 East between Highway 52 and the North Rochester Substation. In large part, this is the part of Segment 4 East that would parallel U.S. Highway 52 (Map 7).

The potential impacts of the three options in this study area are summarized in Table 10-37.

Figure 10-10 Segment 4 North Rochester to Highway 52 Line Study Area

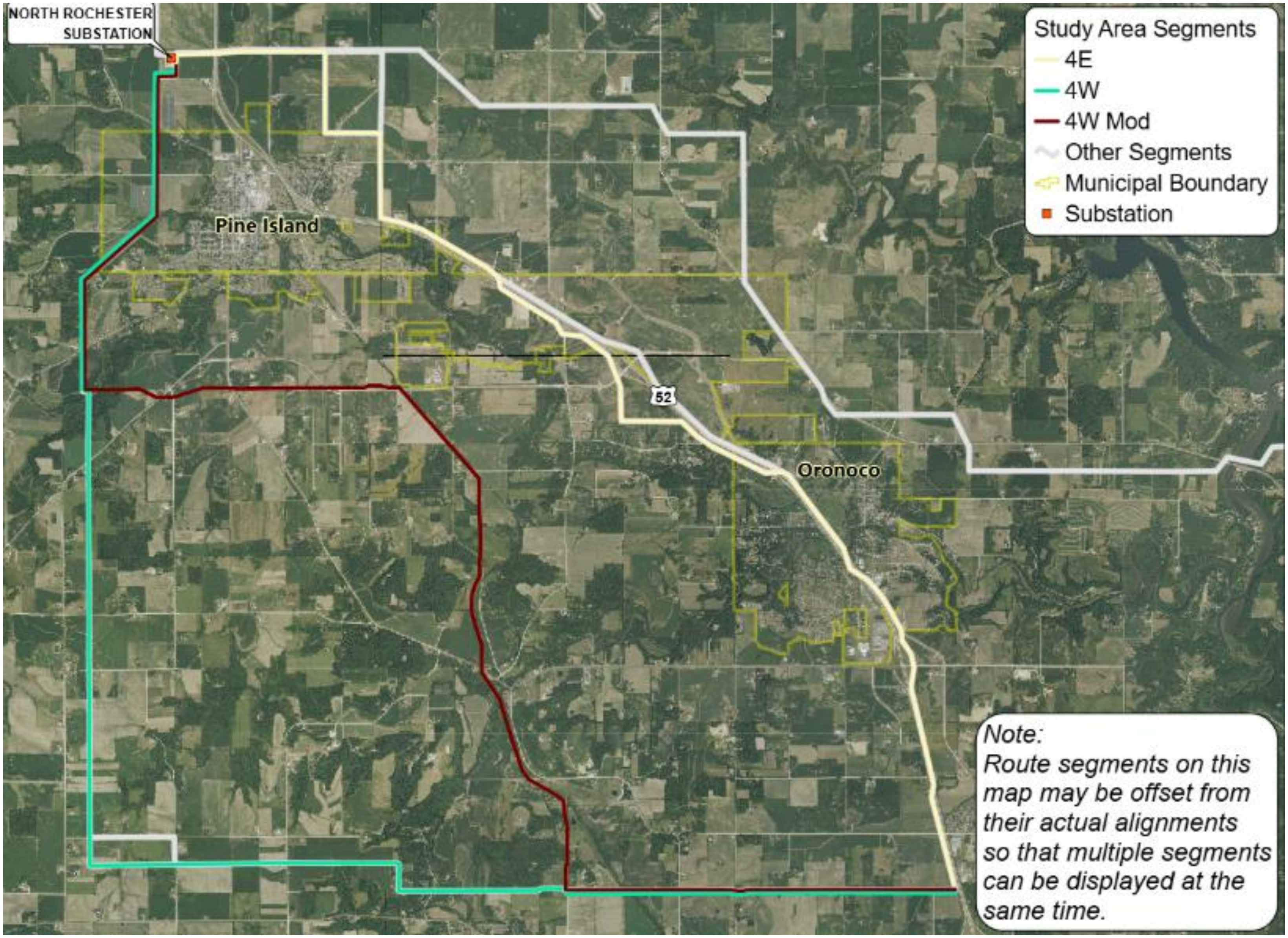


Table 10-37 Human and Environmental Impacts in Segment 4 North Rochester to Highway 52 Study Area

Resource	Element	Segment 4 North Rochester to Highway 52 Study Area			Notes
		4W	4W Mod	4E	
Length (miles)		15.6	14.8	12.2	
Opportunities for Double-Circuiting	Double-circuit with existing 161 kV line (miles, percent)	3.4 (21%)	11.3 (76%)	0	4W Mod has the greatest opportunity for double-circuiting; it could be double-circuited with an existing 161 kV transmission line for 11.3 miles (76% of its length). 4W has some opportunity for double-circuiting, while 4E does not.
	Total opportunity for double-circuiting (miles, percent)	3.4 (21%)	11.3 (76%)	0	
ROW Sharing / Paralleling	Transmission line (miles, percent)	7.7 (49%)	11.3 (76%)	1.4 (12%)	4W Mod and 4E would share or parallel existing infrastructure for 76% and 75% of their lengths, respectively. They also parallel more division lines compared to 4W (84% and 93% of their lengths, respectively).
	Roads (miles, percent)	0	2.8 (19%)	7.7 (63%)	
	Railroad (miles, percent)	0	0	0	
	Total ROW sharing or paralleling (transmission line, road, railroad, and pipeline) (miles, percent)	7.7 (49%)	11.3 (76%)	9.1 (75%)	
	Total ROW Paralleling (Parcel, section, and division lines) (miles, percent)	11.7 (75%)	12.5 (84%)	11.4 (93%)	
	Total ROW Paralleling (all) (miles, percent)	13.8 (88%)	14.3 (97%)	11.6 (95%)	
Human Settlement	Residences within 0 - 50 feet, ROW (count)	0	0	0	4E has the most residences and non-residential structures at every distance from the anticipated alignment; the only exception is residences within 50-250 feet, which 4W Mod has the most.
	Residences within 50-250 feet	4	11	5	
	Residences within 250 – 500 feet, Route Width (count)	18	22	52	
	Residences within 500 – 1,600 feet (count)	28	34	72	
	Total Residences (count)	50	67	129	
	Non-residential structures within 0 - 50 feet (count)	0	2	1	
	Non-residential structures within 50 - 250 feet (count)	8	24	25	
	Non-residential structures within 250 - 500 feet (count)	18	36	70	

Resource	Element	Segment 4 North Rochester to Highway 52 Study Area			Notes
		4W	4W Mod	4E	
	Non-residential structures within 500 - 1,600 feet (count)	62	46	97	
	Total Non-residential structures (count)	88	106	193	
Conservation Easements	RIM (acres in ROW)	0	0	0	The ROW does not contain any RIM or CREP easements.
	CREP (acres in ROW)	0	0	0	
Land-Based Economies	Agricultural land (acres in ROW)	155	128	77	The study area is comprised predominantly of agricultural land. Impacts to agricultural operations could be mitigated by prudent routing; specifically, prudent routing could include selecting route alternatives that prioritize paralleling existing infrastructure to maximize potential opportunity for ROW sharing and minimize potential interruptions or impediments of the use of farm equipment. 4W Mod and 4E would share or parallel the most existing infrastructure.
	Prime farmland (acres in ROW)	124	136	97	
Archaeology and Historic Architecture	Archaeological sites in route width (count in ROW, count in route width)	1	3	5	The route width of 4E intersects the most previously documented archaeological sites and historic architectural resources. The route widths of all three options intersect unrecorded cemeteries.
	Historic architectural resources in route width (count in ROW, count in route width)	1	4	28	
	Historic cemeteries (count in route width)	2	1	1	
Water Resources	NHD stream crossings (count)	19	15	17	4W Mod has the fewest number of watercourse crossings while 4W has the most. Only 4E would cross waterbodies. 4E has the least amount of
	PWI stream crossings (count)	4	4	2	
	Impaired stream crossings (count)	2	2	2	
	NHD lake crossings (count)	0	0	5	
	PWI basin/wetland crossings (count)	0	0	5	
	Forested wetlands (acres in ROW)	5	6	<1	

Resource	Element	Segment 4 North Rochester to Highway 52 Study Area			Notes
		4W	4W Mod	4E	
	Total wetlands (acres in ROW)	8	9	6	wetland and forested wetland in the ROW.
Vegetation	Forested landcover in the ROW (acres)	18	13	5	4W and 4W Mod would impact more forested vegetation than 4E. However, existing transmission lines and/or road ROW have already fragmented most of these areas.
Wildlife	Grassland Bird Conservation Areas (acres in ROW, acres in route width)	0 0	33 328	0 0	4W Mod is the only option that intersects a GBCA; however, impacts would be minimized because it would double-circuit an existing 161 kV line. 4E would intersect the least acreage of Wildlife Action Network corridors. However, with the exception of one small Wildlife Action Network corridor on 4W, all Wildlife Action Network corridors intersected by 4W, 4W Mod, and 4E would occur in areas where existing transmission line or road ROW is present, thereby minimizing new effects associated with habitat fragmentation.
	Wildlife Action Network Corridors (acres in ROW, acres in route width)	26 263	25 246	9 99	
Rare and Unique Natural Resources	State Threatened or Endangered Species (documented records in NHIS database; count in ROW, count in route width)	3 4	4 7	3 4	There are similar numbers of state threatened and endangered species documented within the ROW of all three options, and both aquatic and
	Sites of Biodiversity Significance (acres in ROW, acres in route width)	2 50	1 29	<1 20	

Resource	Element	Segment 4 North Rochester to Highway 52 Study Area			Notes
		4W	4W Mod	4E	
	Native Plant Communities (acres in ROW, acres in route width)	<1 16	<1 26	0 1	terrestrial state listed species have been documented with each ROW. The ROW of all three options would intersect minimal acreage of SBS and native plant communities and would do so along the edge of these resources or in areas where an existing transmission line or road ROW is present.

10.17 Highway 52 to Existing 161 kV Line Study Area

As described in Section 3.1.5.5, Connector 4Q connects Segment 4 West and Segment 4 East in Olmsted County and presents options for connecting north and south options from just east of Highway 52 to the existing 161 kV line. Connector 4Q could provide an opportunity to avoid or minimize impacts. The four options are illustrated in Figure 10-11 and are summarized below.

- Segment 4 North-North
    - This option is 7.9 miles long and would be a subpart of Segment 2 North (in other words, this option remains on the northern options and does not use Connector 4Q).
- Segment 4 South-South
    - This option is 7.4 miles long and would be a subpart of Segment 2 South (in other words, this option remains on the southern options and does not use Connector 4Q).
- Segment 4 North-South
    - This option is 8.4 miles long. West of Connector 4Q, this option uses the northern option. Then using Connector 4Q, this option uses the southern option leading to the area's end point.
- Segment 4 South-North
    - This option is 7.8 miles long. West of Connector 4Q, this option uses the southern option. Then using Connector 4Q, this option uses the northern option leading to the area's end point.

The potential impacts of the four options in this study area are summarized in Table 10-38.

Figure 10-11 Segment 4 Highway 52 to Existing 161 kV Line Study Area

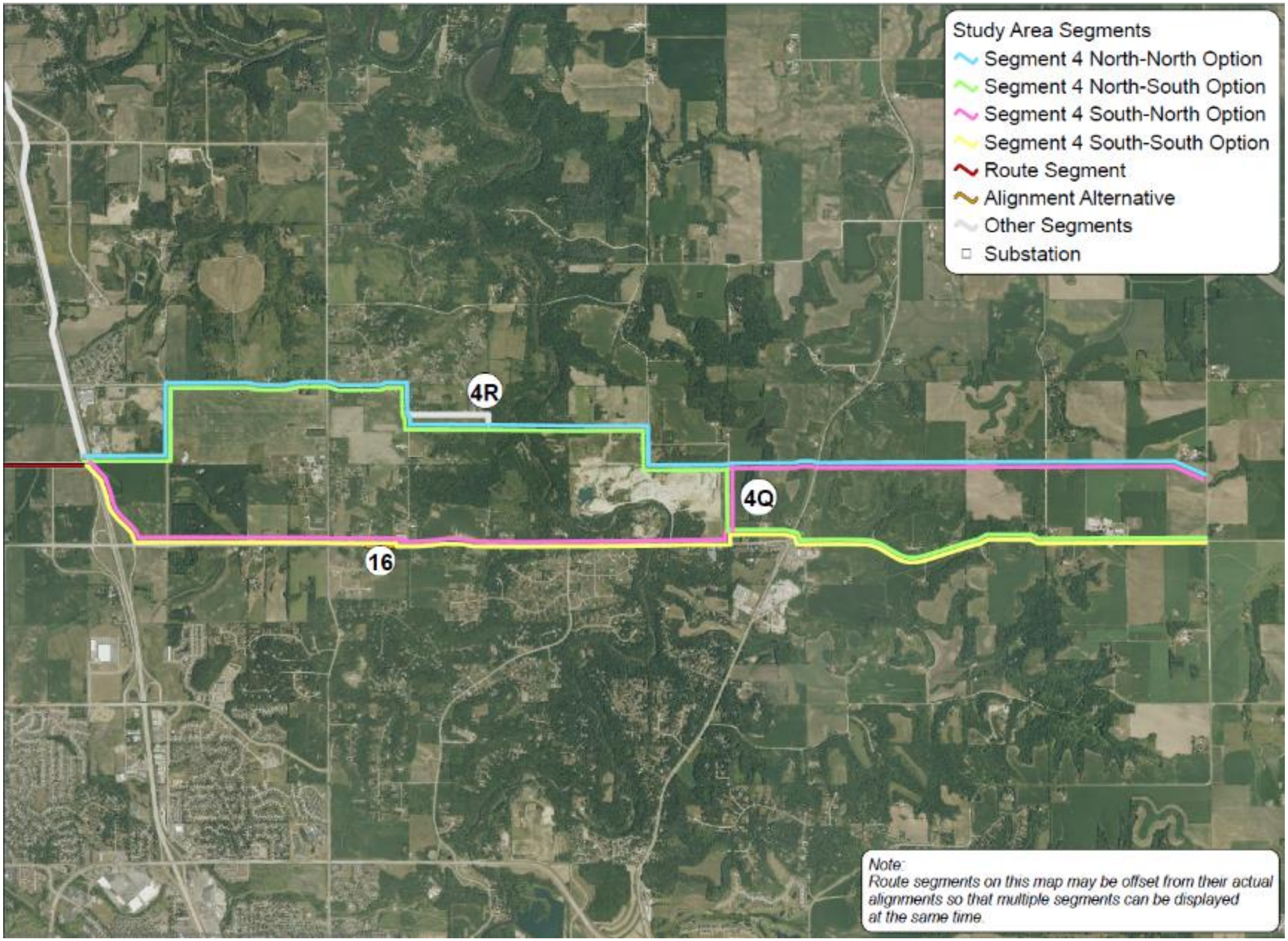


Table 10-38 Human and Environmental Impacts in Segment 4 Highway 52 to Existing 161 kV Line Study Area

Resource	Element	Segment 4 Highway 52 to Existing 161 kV Line Study Area				Notes
		North-North	South-South	North-South	South-North	
Length (miles)		7.9	7.4	8.4	7.8	
Opportunities for Double-Circuiting	Double-circuit with existing 69 kV line (miles, percent)	0	5.1 (69%)	2.6 (31%)	2.5 (32%)	The south-south option has the greatest opportunity for double-circuiting (69% of its length). The north-north option has no opportunity for double-circuiting.
	Total opportunity for double-circuiting (miles, percent)	0	5.1 (69%)	2.6 (31%)	2.5 (32%)	
ROW Sharing / Paralleling	Transmission line (miles, percent)	0	5.1 (69%)	2.6 (31%)	2.5 (32%)	The south-south option has the greatest opportunity for ROW sharing or paralleling with existing infrastructure (90% of its length). All four options have less than one mile that does not follow existing infrastructure or division lines.
	Roads (miles, percent)	3.1 (40%)	6.7 (90%)	6.2 (73%)	4.5 (58%)	
	Railroad (miles, percent)	0	0	0	0	
	Pipeline (miles, percent)	0	0	0	0	
	Total ROW sharing or paralleling (transmission line, road, railroad, and pipeline) (miles, percent)	3.1 (40%)	6.9 (94%)	6.2 (73%)	4.8 (62%)	
	Total ROW Paralleling (Parcel, section, and division lines) (miles, percent)	7.3 (92%)	6.9 (93%)	7.6 (90%)	7.5 (96%)	
	Total ROW Paralleling (all) (miles, percent)	7.3 (92%)	6.9 (93%)	7.6 (90%)	7.6 (97%	
	Total length following no infrastructure or division lines (miles, percent)	0.6 (8%)	0.5 (6%)	0.9 (10%)	0.2 (3%)	
Human Settlement	Residences within 0 - 50 feet, ROW (count)	0	1	0	1	The north-north option has the fewest residences at every distance. West of Connector 4Q, the south option has a residence within the ROW. All four options would have a non-residential structure in the ROW. Beyond that, the north-north option has the fewest non-residential structures at every distance.
	Residences within 50-250 feet	11	38	26	23	
	Residences within 250 – 500 feet, Route Width (count)	18	60	58	23	
	Residences within 500 – 1,600 feet (count)	17	30	23	58	
	Total Residences (count)	46	129	107	105	
	Non-residential structures within 0 - 50 feet (count)	1	1	1	1	
	Non-residential structures within 50 - 250 feet (count)	21	50	31	40	
	Non-residential structures within 250 - 500 feet (count)	26	87	75	46	
	Non-residential structures within 500 - 1,600 feet (count)	19	30	37	47	
	Total Non-residential structures (count)	67	168	144	134	
Conservation Easements	RIM (acres in route width)	0	0	0	0	The ROW does not contain any RIM or CREP easements.
	CREP (acres in route width)	0	0	0	0	
Land-Based Economies	Agricultural land (acres in ROW)	46	25	31	42	The study area is comprised predominantly of agricultural land. Impacts to agricultural operations could be mitigated by prudent routing; specifically, prudent routing could include selecting route alternatives that prioritize paralleling existing infrastructure to maximize potential opportunity for ROW sharing and minimize potential interruptions or impediments of the use of farm equipment. The south-south option would share or parallel the most existing infrastructure.
	Prime farmland (acres in ROW)	49	55	57	57	

Resource	Element	Segment 4 Highway 52 to Existing 161 kV Line Study Area				Notes
		North-North	South-South	North-South	South-North	
Archaeology and Historic Architecture	Archaeological sites in route width (count in route width)	1	0	1	0	West of Connector 4Q, the north option intersects a previously documented archaeological site. East of Connector 4Q the south option has five historic architectural resources within the route width.
	Historic architectural resources in route width (count in route width)	1	5	5	1	
	Historic cemeteries (count in route width)	0	1	1	0	
Water Resources	NHD stream crossings (count)	10	5	9	6	The south-south and south-north options have the fewest watercourse crossings. West and east of Connector 4Q, the south options cross all but one watercourse while double-circuiting, while the north options west and east of Connector 4Q would cross watercourses in areas without an existing crossing, including the Zumbro River.
	PWI stream crossings (count)	1	1	1	1	
	Impaired stream crossings (count)	1	1	1	1	
	Forested wetlands (acres in ROW)	1	<1	1	<1	
	Total wetlands (acres in ROW)	2	3	3	2	
Vegetation	Forested landcover in the ROW (acres)	15	5	11	10	The south-south option would impact the least acreage of mapped forested land cover. West of Connector 4Q, the north option would require fragmenting a densely forested area around the Zumbro River; no transmission line or road corridors are present in this area.
Wildlife	Wildlife Action Network Corridors (acres in ROW, acres in route width)	<1 8	<1 9	<1 8	<1 9	West of Connector 4Q, both the north and south options cross a Wildlife Action Network corridor; though the affected acreages are similar, the north option would cross it while creating a new corridor, while the south option would cross in an area where an existing transmission line is present.
Rare and Unique Natural Resources	State Threatened or Endangered Species (documented records in NHIS database; count in ROW, count in route width)	0 0	1 1	0 0	1 1	Only the south option west of Connector 4Q has a record of a state threatened or endangered species in the ROW. However, the species documented is a mussel and impacts are not anticipated. The north option west of Connector 4Q would intersect an SBS and associated native plant communities in a densely forested area around the Zumbro River. These sensitive ecological resources would be fragmented, as no existing transmission line or road corridors are present in this area.
	Sites of Biodiversity Significance (acres in ROW, acres in route width)	3 30	0 10	3 30	0 10	
	Native Plant Communities (acres in ROW, acres in route width)	2 21	0 7	2 21	0 7	

10.18 Segment 4 Route Options

This EIS has discussed potential impacts for Segments 1, 2, 3, and 4. Chapter 8 presented the relative merits for Segment 1 and 2, which, combined with Segment 3 (of which there are no alternatives as described in Chapter 9) would comprise the complete route for the proposed 345 kV transmission line.

The Commission must also select a complete route for the relocation of the existing 161 kV transmission line. As described in Section 3.1.5, Segment 4 (161 kV Relocation) would be a new 161 kV transmission line that would replace the portion of the existing North Rochester to Chester 161 kV transmission line that would be displaced by Segment 3. This section presents the relative merits for Segment 4.

The route options discussed in this chapter do not represent the only routing possibilities for Segment 4. Rather, they are examples—other routes could be developed by combining parts of the applicant-proposed routes and/or combining parts with alternatives. This section illustrates how various subparts could be selected to build a Segment 4 (161 kV Relocation) route. No option is meant to represent a "best-case scenario" or to be "least impactful overall."

The four Segment 4 route options discussed in this chapter include:

- Route Option A – Segment 4 West Modification option within the North Rochester to Highway 52 Study Area (Section 10.16) and then the south-south option within the Highway 52 to the Existing 161 kV Line Study Area (Section 10.17).
- Route Option B – Segment 4 West Modification option within the North Rochester to Highway 52 Study Area (Section 10.16) and then the south-north option in the Highway 52 to the Existing 161 kV Line Study Area (Section 10.17).
- Route Option C – Segment 4 East option within the North Rochester to Highway 52 Study Area (Section 10.16) and then the south-north option in the Highway 52 to the Existing 161 kV Line Study Area (Section 10.17).
- Route Option D – CapX Co-Locate Option (described in Section 3.1.5.6)

Of the four options, Route Option D is the only one that includes an alternative proposed during scoping; Route Option D is the same as the CapX Co-Locate Option discussed in Sections 10.3 through 10.12. Route Options A through C are not identical to any of the options summarized in Sections 10.3 through 10.12, they are comprised of applicant-proposed subparts of Segment 4 West, Segment 4 West Modification, and Segment 4 East.

The four Segment 4 route options are illustrated in Map 74. The potential impacts of the Segment 4 route options are summarized in Table 10-39.

Table 10-39 Human and Environmental Impacts of Segment 4 Route Options

Resource	Element	Route Options			
		Route Option A	Route Option B	Route Option C	Route Option D
Length (miles)		22.1	22.5	20.0	16.4
Opportunities for Double-Circuiting	Double-circuit with existing 69 kV line (miles, percent)	5.1 (23%)	2.5 (11%)	2.5 (13%)	0
	Double-circuit with existing 161 kV line (miles, percent)	11.3 (51%)	11.3 (50%)	0	0
	Total opportunity for double-circuiting (miles, percent)	16.4 (74%)	13.8 (61%)	2.5 (13%)	0
ROW Sharing / Paralleling	Transmission line (miles, percent)	16.4 (74%)	13.8 (61%)	4.0 (20%)	13.7 (84%)
	Roads (miles, percent)	9.5 (43%)	7.4 (33%)	12.2 (61%)	<.1 (0%)
	Railroad (miles, percent)	0	0	0	0
	Pipeline (miles, percent)	0	0	0	0
	Total ROW sharing or paralleling (transmission line, road, railroad, and pipeline) (miles, percent)	18.2 (82%)	16.1 (71%)	13.9 (70%)	13.7 (84%)
	Total ROW Paralleling (Parcel, section, and division lines) (miles, percent)	19.3 (87%)	20.0 (89%)	18.9 (95%)	7.8 (48%)
	Total ROW Paralleling (all) (miles, percent)	21.2 (96%)	21.8 (97%)	19.2 (96%)	14.7 (90%)
	Total length following no infrastructure or division lines (miles, percent)	1.0 (4%)	0.7 (3%)	0.8 (4%)	1.7 (10%)
Human Settlement	Residences within 0 - 50 feet, ROW (count)	1	1	1	0
	Residences within 50-250 feet	49	34	28	1
	Residences within 250 – 500 feet, Route Width (count)	82	45	75	21
	Residences within 500 – 1,600 feet, local vicinity (count)	64	92	130	18
	Total Residences (count)	196	172	234	40
	Non-residential structures within 0 - 50 feet (count)	3	3	2	0
	Non-residential structures within 50 - 250 feet (count)	72	62	65	2
	Non-residential structures within 250 - 500 feet (count)	123	82	116	48
	Non-residential structures within 500 - 1,600 feet (count)	71	88	139	42
	Total Non-residential structures (count)	269	235	322	92

Resource	Element	Route Options			
		Route Option A	Route Option B	Route Option C	Route Option D
Conservation Easements	RIM (acres in ROW)	0	0	0	0
	CREP (acres in ROW)	0	0	0	0
Land-Based Economies	Agricultural land (acres in ROW)	153	170	119	159
	Prime farmland (acres in ROW)	190	193	154	108
Archaeology and Historic Architecture	Archaeological sites in route width (count in ROW, count in route width)	3	3	5	2
	Historic architectural resources in route width (count in ROW, count in route width)	9	5	29	3
	Historic cemeteries (count in route width)	3	2	1	1
Water Resources	NHD stream crossings (count)	20	21	23	30
	PWI stream crossings (count)	5	5	3	1
	Impaired stream crossings (count)	3	3	3	0
	NHD lake crossings (count)	0	0	5	1
	PWI basin/wetland crossings (count)	0	0	5	1
	Forested wetlands (acres in ROW)	5	5	0	1
	Total wetlands (acres in ROW)	12	11	8	4
Vegetation	Forested landcover in the ROW (acres)	18	22	15	19
Wildlife	Grassland Bird Conservation Areas (acres in ROW, acres in route width)	33 328	33 328	0 0	0 0
	Wildlife Action Network Corridors (acres in ROW, acres in route width)	25 255	25 255	9 109	23 269
Rare and Unique Natural Resources	State Threatened or Endangered Species (documented records in NHIS database; count in ROW, count in route width)	4 7	4 7	3 4	1 1
	Sites of Biodiversity Significance (acres in ROW, acres in route width)	1 39	1 39	<1 30	9 110
	Native Plant Communities (acres in ROW, acres in route width)	1 33	1 33	0 8	3 28

The Segment 4 route options relative merits analysis uses graphics (Table 10-40) to provide a visual assessment of the relative merits for each route option. The graphic for a specific routing factor or element is not meant to be indicative of the best route option but is provided as a relative comparison to be evaluated together with all other routing factors. Table 10-41 summarizes the relative merits analysis of the four Segment 4 route options.

Table 10-40 Guide to Relative Merits Analysis

Consistency with Routing Factor or Anticipated Impacts	Symbol
Route option is consistent with the routing factor OR Impacts are anticipated to be negligible to minimal or the impact is positive	
Route option is consistent with routing factor but less so than the other options OR Impacts are anticipated to be minimal but the potential for impacts is greater than the other options or require special permit conditions OR Impacts are anticipated to be moderate	
Route is not consistent with routing factor or consistent only in part OR Impacts might be moderate but the potential for impacts is greater than the other options or might require special permit conditions OR Impacts are anticipated to be significant	

Table 10-41 Relative Merits of Segment 4 Route Options

Routing Factor / Resource	Route Option A	Route Option B	Route Option C	Route Option D	Summary
Factor A Human Settlement					
Aesthetics	◒	◒	◒	◒	Aesthetic impacts are anticipated to be moderate. Route Option D has less residences within the ROW, route width, and local vicinity, with a total of 40 residences within the local vicinity compared to Route Option A (196), Route Option B (172), and Route Option C (234). Route Option D also has less non-residential structures within the local vicinity. The route options would result in aesthetic impacts to areas used for recreational purposes. All four would introduce new crossings at the Zumbro River, a state water trail, where there is no existing infrastructure already present. Route Options A, B, and C would have the most Zumbro River crossings without existing transmission line infrastructure. Route Options A and B would intersect the Douglas State Trail near Rochester, where there is no existing transmission line infrastructure. Route Option A could be double-circuited with or paralleling existing transmission lines for 74% of its length and 82% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads). Route Option B could be double-circuited with or paralleling existing transmission lines for 61% of its length and 71% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads). Route Option C could be double-circuited with or paralleling existing transmission lines for 13% of its length and 70% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads). Route Option D could be double-circuited with or paralleling existing transmission lines for 0% of its length and 84% of its length would be parallel to existing infrastructure (transmission lines, roads, or railroads).
Displacement	◒	◒	◒	●	Route Option D does not contain any residences within the ROW. Route Options A, B, and C each have one resident that could be subject to displacement within ROW; however, the applicant has indicated no residences would be displaced. Route Option D does not contain any non-residential structures within ROW. Route Options A and B have three non-residential structures, and Route Option C has two non-residential structures, that could be subject to displacement within ROW.
Land Use and Zoning	●	●	●	●	Impacts to existing land use patterns, future land use planning, and local zoning are anticipated to be minimal within the counties crossed by Route Options A, B, C, and D.
Recreation	◒	◒	◒	●	Recreational resources within the route width subject to impact include a publicly accessible trail system, public watercourses (including a designated state water trail), and snowmobile trails. Intermittent impacts would occur during construction and long-term impacts would include aesthetic impacts. Approximately 8.1 miles of the Douglas State Trail is within the route width of Route Options A and B. Existing infrastructure, including roads and transmission lines, cross the trail in multiple locations. Impacts to the trail are anticipated to be minimal. Route Options A, B, and C cross the Zumbro River, a designated state water trail, in multiple locations, while the Route Option D route width only crosses once. There are existing transmission lines at most of the crossings, including the one crossing of Route Option D.
Factor C Land-Based Economies					
Agriculture	●	●	●	●	Most land within the route width is agricultural and impacts cannot be avoided but can be mitigated. Prudent routing (e.g., ROW sharing via double-circuiting or paralleling with existing infrastructure) could help minimize impacts. All four options share or parallel ROW with existing infrastructure for 70% or more of their respective lengths. Overall, impacts are anticipated to be minimal.
Forestry	●	●	●	●	No notable forestry resources were identified within Route Options A, B, C, or D's route width; therefore, no impacts to forestry are anticipated.

Routing Factor / Resource	Route Option A	Route Option B	Route Option C	Route Option D	Summary
Mining					Two gravel pits, a borrow pit, sand quarry, a prospect mine, and a bedrock quarry were identified within Route Option A and B's route widths. The gravel pits and sand quarry appear inactive based on a review of aerial imagery. The borrow pit, prospect mine, and bedrock quarry appear active based on a review of aerial imagery. The anticipated alignment of Route Option A and B do not cross any workspaces of active mining operations based on the aerial imagery. Three prospect mines, two bedrock quarries, and a sand quarry were identified within Route Option C's route width. The prospect mines and quarries appear to be inactive. No active gravel pits were identified within Route Option D's route width; therefore, impacts to mining are anticipated to be minimal.
Tourism					Known events and other opportunities for tourism are advertised in nearby incorporated towns and the activities are not located within the ROI. Recreational opportunities identified within the ROI include publicly accessible lands and waters used for outdoor activities. Impacts to the tourism-based economy are anticipated to be negligible to minimal.
Factor D Archaeological and Historic Resources					
Archaeological					Route Option C and Route Option D's route widths contain one (the same) NRHP-eligible archaeological site; route widths for Route Options A and B do not contain any NRHP-eligible sites. Route Options A and B have more unevaluated sites for the NRHP (4) compared to Route Option C (2), and Route Option D (1). Route Option A's route width contains more potential historic cemeteries (3), than Route Option B (2), Route Option C (1), and Route Option D (1). However, the exact locations of the cemeteries are unknown. Survey efforts would be completed by the applicant and would inform potential impacts; impacts could be avoided and/or mitigated.
Historic					There is one eligible historic architectural resource within the route width of Route Option C. The NRHP-eligible resource, OL-ORT-00013/ William-Rucker Farmstead, intersects the route width along U.S. Highway 52, south of Oronoco, along a portion of the segment that would not be double-circuited or parallel an existing transmission line. Survey efforts would be completed by the applicant and would inform potential impacts; impacts could be avoided and/or mitigated.
Factor E Natural Resources					
Public and Designated Lands					No locally-owned (city or county), state-owned, or federally-owned lands are present within the ROW for Route Options A, B, C, or D. No RIM land or CREP easements are located within the ROW for Route Options A, B, C, or D. No impacts to public or designated lands are anticipated.
Surface Water					Route Option D has the most stream crossings (30), while the other three options have between 20 and 23 crossings. Route Options A and B would have the most PWI watercourse crossings. Route Option C would have the most waterbody crossings, including PWI basins; Route Options A and B would not cross any waterbodies. Many of the watercourse crossings would occur in areas that would be double circuited with or paralleling existing transmission lines or highway ROW.
Vegetation					Route Option B has the most forested vegetation within the ROW (22 acres), and Route Option C has the least (15 acres). Given the proposed double-circuiting and/or paralleling of existing transmission line or road rights-of-way, fragmentation of forested areas has mostly already occurred where the rights-of-way intersect forested vegetation.
Wetlands					Route Options A and B have the most wetland acreage within the ROW (12 and 11 acres, respectively), 5 acres of which is forested wetland. Route Option D has the least wetland acreage in the ROW (4 acres). Route Option C has 8 acres of wetland within the ROW and is the only route option that does not have forested wetland within its ROW. Route Options A and B would cross a wetland wider than 700 feet, where existing transmission line is not present, and could therefore require pole placement within the wetlands.
Wildlife and Wildlife Habitat					The ROW of Route Options A and B intersect a GBCA, while the rights-of-way of Route Options C and D avoid the GBCA. However, impacts would be minimized because Route Options A and B would cross the GBCA in an existing transmission line corridor while double-circuiting a 161 kV line. The ROW of all four route options would intersect several Wildlife Action Network corridors, with Segment 4 East intersecting the least acreage. All route options would cross Wildlife Action Network corridors in an existing transmission line or road ROW; as such, these corridors are already fragmented.

Routing Factor / Resource	Route Option A	Route Option B	Route Option C	Route Option D	Summary
Rare and Unique Natural Resources	◒	◒	◒	◒	Route Options C and D have fewer NHIS records within the ROW and route width than Route Options A and B. Blanding's turtle, Blanchard's cricket frog, glade mallow, and a mussel species have been documented within the ROW of Route Options A and B. Tuberous Indian-plantain has been documented within the ROW of Route Options C and D; two mussel species have also been documented within the ROW of Route Option C. All four route options could impact terrestrial protected species should they be present in the ROW during construction. Watercourses would be spanned by all Route Options; as such impacts to protected mussel species are not anticipated. The ROW of Route Option D would intersect the most acres of SBS (9 acres) and native plant communities (3 acres), while the other three route options would intersect 1 acre or less of SBS and native plant communities.
Minnesota Statute § 216E.03 - subdivision 7 (15e) (transmission lines)					
Paralleling Existing Transmission Line	●	●	◒	●	Route Option A could be double-circuited for 16.4 miles which is 74% of its length. Route Option B could be double-circuited for 13.8 miles which is 61% of its length. Route Option C could be double-circuited for 4.0 miles which is 20% of its length. Route Option D could be double-circuited for 13.7 miles which is 84% of its length.
Minnesota Statute § 216E.03 - subdivision 7 (15e) (transmission lines)					
Paralleling Roads and Railroads	◒	◒	●	◒	Route Option A would parallel roads or railroads for 9.5 miles which is 43% of its length. Route Option B would parallel roads or railroads for 7.4 miles which is 33% of its length. Route Option C would parallel roads or railroads for 12.2 miles which is 61% of its length. Route Option D would parallel roads or railroads for <.1 miles which is 0% of its length.
Factor H Paralleling Division Lines					
Paralleling existing survey lines, natural division lines, and agricultural field boundaries	●	●	●	◒	Route Option A would follow existing division lines (field, parcel, and section lines) for 19.3 miles which is 87% of its length. Route Option B would follow existing division lines (field, parcel, and section lines) for 20.0 miles which is 89% of its length. Route Option C would follow existing division lines (field, parcel, and section lines) for 18.9 miles which is 95% of its length. Route Option D would follow existing division lines (field, parcel, and section lines) for 7.8 miles which is 48% of its length.
Factor J Paralleling Existing Infrastructure					
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.	●	●	●	●	Cumulatively, Route Option A parallels existing infrastructure (transmission lines, roads, or railroads) for 82% of its length. Cumulatively, Route Option B parallels existing infrastructure (transmission lines, roads, or railroads) for 71% of its length. Cumulatively, Route Option C parallels existing infrastructure (transmission lines, roads, or railroads) for 70% of its length. Cumulatively, Route Option D parallels existing infrastructure (transmission lines, roads, or railroads) for 84% of its length.
Factor L Costs					
Costs Dependent on Design and Route	◒	◒	●	●	The applicant's overall project costs, as presented in the joint certificate of need application and route permit application and discussed in Section 3.5, are based on high and low-cost estimates of the project as a whole, and do not distinguish between the individual route segments and alternatives. The application noted that the transmission line is expected to cost approximately $3.7 million per mile. Route Option D is the shortest (16.4 miles) followed by Route Option C (20 miles), Route Option A (22.1 miles) and Route Option B (22.5 miles).

11 Substations - Affected Environment, Potential Impacts and Mitigation

This chapter provides an overview of the human and environmental resources that could be affected by the project substations and associated mitigation measures. As described in Section 3.2.2, upgrades would be required to the Wilmarth Substation and North Rochester Substation and may be required for the Eastwood Substation. The existing Wilmarth Substation's fenced-in area would be expanded by approximately 0.8 acres; new equipment and a retaining wall on the northeast corner of the substation would be installed. The North Rochester Substation's fenced-in area would not require expansion, but new equipment would be installed. If Segment 1 South were to be selected by the Commission, new substation equipment and 500 feet of new 69 kV transmission line would be installed at the Eastwood Substation.

As described in Section 4.3.1, the project expands the route widths around the existing Wilmarth Substation and Eastwood Substation to accommodate the additional areas needed to complete the construction activities. The expanded route widths are shown on Map 13–1 for the Wilmarth Substation and Map 13–18 for the Eastwood Substation. An expanded route width around the Wilmarth Substation is not necessary to facilitate construction as shown on Map 53-1.

11.1 Potential Impacts and Mitigation

Construction activities at the existing substations, including grading, would result in temporary human and environmental impacts. Minimal impacts to aesthetics and property values would be anticipated given that the substations already exist and are in areas with largely developed human environments. Operational human and environmental impacts associated with the modifications and the continued operation of the substations would be incremental and blend with current operations.

Substation noise during operations would be localized to the area immediately surrounding the substation. Transformers and switchgear operation are the common noises associated with a substation. Noise emissions from this equipment have a tonal character that often sounds like a hum or a buzz that corresponds to the frequency of the alternating current (AC). Transformers produce a consistent humming sound, resulting from magnetic forces within the transformer core. This sound does not vary with transformer load. Switchgear produces short-term noises during activation of circuit breakers; these activations are infrequent. The applicant indicates that the substation modifications will be designed such that noise levels would be compliant with Minnesota noise standards at the substation boundary. Accordingly, substation noise levels are anticipated to be within Minnesota noise standards (that is, < 50 dBA and NAC-1) at the nearest receptor(s).

As with any project involving heavy equipment, there are safety issues to consider during construction. Human health and safety impacts related to the construction activities at the substations would be similar to those described for transmission line construction activities. During operations, substations have potential electrocution risks if there is unauthorized entry. Substations would not be accessible to the public. Appropriate signage would be posted that identifies the hazards associated with the substation. In the event of an emergency, local emergency services would be contacted. EMF associated with the project substations would be below Commission permit requirements and state and international guidelines.

Short-term impacts to roads during construction would be similar to the HVTL construction with increased use resulting in potential for traffic delays within the project area. Potential impacts associated with construction activities at the substations would be localized.

Substation projects have the potential to impact air quality and greenhouse gas emissions through temporary, construction-related and operational impacts. Potential impacts to air quality and greenhouse gas emissions would be similar to those described for transmission line construction activities.

Temporary impacts to soils would occur as a result of construction work within the substation sites which would include grading and installation of substructures and electrical equipment. New impervious surfaces would result in permanent impacts. Installation of concrete foundations and embedments for equipment would require the use of trenching machines, concrete trucks and pumpers, vibrators, forklifts, boom trucks, and large cranes. The limit of disturbance would be within the footprint of the substations for both the foundation equipment and the concrete delivery trucks. All topsoil from the substation footprints would be removed to a pre-established suitable location for storage. The storage area would be near the site where the soil was removed, accurately located (GPS boundary, soil depth), and graded to facilitate revegetation. Subsoil would also be removed, if necessary, to an acceptable pre-established and approved area for storage. The applicant would develop a SWPPP that complies with MPCA rules and guidelines; implementation of the protocols outlined in the SWPPP would minimize the potential for soil erosion during construction of the transmission line and substation modifications.

Modifications to the substations would not result in direct impacts to watercourses or waterbodies, but the expansion of the Wilmarth Substation would impact floodplains and wetlands. The applicant noted in the joint certificate of need application and route permit application that the expansion of the Wilmarth Substation would be located within portions of both 100-year (0.64 acre) and 500- year floodplains (0.14 acre) and would require filling approximately 0.53 acre of emergent wetlands. The applicant would be required to work with city and county governments during development in the floodplain and would follow all applicable local ordinances throughout project construction and operation. Wetland impacts, including the loss of wetland acreage and potentially function, would require permits from the USACE and WCA local government unit, depending upon the jurisdiction of the wetland to be impacted. The applicant would be required to establish mitigation measures at the time of the permitting process, this could include replacing the function of the wetlands through mitigation credits.

Ground-level vegetation would be disturbed or removed from the substation areas subject to modification/expansion. Vegetation would be re-established in accordance with the SWPPP and the applicant indicated that vegetation that is consistent with substation site operation, outside the fenced area, would be allowed to reestablish naturally at substation sites. The fenced portion of the substation sites would be kept free of vegetation and adequate drainage would be maintained during operations.

12 Irreversible and Unavoidable Impacts

This chapter describes unavoidable impacts and irreversible and irretrievable commitments of resources.

12.1 Unavoidable Impacts

Resource impacts are unavoidable when an impact cannot be avoided even with mitigation strategies.

Transmission lines are infrastructure projects that have unavoidable adverse human and environmental impacts. These potential impacts and the possible ways to mitigate against them were discussed in the previous chapters. However, even with mitigation strategies, certain impacts cannot be avoided.

Unavoidable adverse impacts associated with construction of the proposed project include:

- Possible traffic delays and fugitive dust on roadways
- Visual and noise disturbances
- Potential impacts to agricultural operations, such as crop losses
- Soil compaction and erosion
- Vegetative clearing; changes to forested wetland type and function
- Disturbance and temporary displacement of wildlife, as well as direct impacts to wildlife inadvertently struck or crushed during structure placement or other activities
- Minor amounts of habitat loss
- Converting the underlying land use
- GHG emissions

Unavoidable adverse impacts associated with the operation of the proposed project include:

- Visual impact of structures and conductors
- Loss of land use for other purposes, such as agriculture, where structures are placed
- Injury or death of avian species that collide with, or are electrocuted by, conductors
- Interference with AM radio signals
- Potential decrease to property values
- Continued maintenance of tall-growing vegetation
- GHG emissions
- Increased EMF on the landscape. Potential impacts from EMF are minimal and are not expected to impact human health.

12.2 Irreversible and Irretrievable Commitments of Resources

Resource commitments are irreversible when it is impossible or very difficult to redirect that resource to a different future use; an irretrievable commitment of resources means the resource is not recoverable for later use by future generations.

Irreversible impacts include the land required to construct the transmission line. While it is possible that the structures, conductors, and substations could be removed and the ROW restored to previous conditions, this is unlikely to happen in the reasonably foreseeable future (approximately 50 years). The loss of forested wetlands is considered irreversible, because replacing these wetlands would take a significant amount of time. Certain land uses within the ROW will no longer be able to occur.

An irretrievable commitment of resources means the resource is not recoverable for later use by future generations. These impacts are primarily related to project construction, including the use of water, aggregate, hydrocarbons, steel, concrete, wood, and other consumable resources. The commitment of labor and fiscal resources is also considered irretrievable.

13 Cumulative Potential Effects

13.1 Cumulative Potential Effects

Minnesota Rule 4410.0200 defines cumulative potential effects as impacts on the environment that result from:

> *The incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects actually planned or for which a basis of expectation has been laid, regardless of what person undertakes the other projects or what jurisdictions have authority over the projects* (Minnesota Rule 4410.0200).

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

The "environmentally relevant area" for which cumulative potential effects were analyzed includes locations where the potential effects of the project might coincide with the potential effects of other projects to impact the elements studied in this EIS. Generally, this area includes the ROI for the different resource elements.

To identify projects that are currently happening or are planned with construction schedules that overlap the project's, the websites of agencies/local governments were reviewed, and in some cases agencies/local governments were directly contacted to identify current and reasonably foreseeable future projects that are located within areas traversed by the project; these agencies included: the Minnesota Environmental Quality Board, Commission, Department, MnDOT, BWSR, MPCA, and DNR. In addition, the websites for Blue Earth, Le Sueur, Waseca, Rice, Steele, Dodge, Goodhue, Olmsted, and Wabasha counties and associated Soil and Water Conservation Districts for each county were reviewed; as well as larger municipalities in the area, including Mankato, Waterville, Faribault, Pine Island, and Oronoco.

Current and reasonably foreseeable future projects are summarized in Table 13-1 and shown on Figure 13-1. Most of the projects identified are transportation-related and generally include routine maintenance and repair activities. The MnDOT website was used to identify state-level projects (Districts 6 and 7) that intersect or are adjacent to route alternatives or associated facilities. Local transportation projects were identified by reaching out to the counties crossed by the project. While the entire extents of relevant MnDOT projects are shown on Figure 13-1, the locations of local transportation projects are identified at the point of the nearest proximity to this project. While these transportation-related projects would provide long-term benefits to the area, their potential for cumulative effects would generally be minimal and tied to short-term construction related effects. Continued coordination efforts with MnDOT would be required to confirm the status of planned MnDOT projects. For example,

Appendix F notes planned but currently unfunded trunk highway improvements, pending study completions, and planned trunk highway turn backs. Also as noted in Appendix F, there are numerous state ROW parcels that are planned for turn back to other road authorities in Blue Earth and Waseca Counties where operations, access, and maintenance responsibilities would change. This could result in the need to reach out to local jurisdictions closer to the time of construction to confirm potential for work to be occurring at the same time.

As noted in Table 13-1 and shown on Figure 13-1, the foreseeable projects are scattered across the project. Non-transportation projects that are planned to occur near the western end of the project include Xcel Energy's resource acquisition for up to 800 megawatts, a new forensic laboratory (Bureau of Criminal Apprehension Southern Minnesota Regional Office), and a residential development (Mesenbrink Residential Development).

In the city of Madison Lake, construction is scheduled to begin in 2026 on a planned Dollar Store General that will also include expansion of East Street in the city of Madison Lake (Madison Lake Dollar General Store Project) (Section 5.5.5).

The following non-transportation projects would also occur near Route Segment 17 (HWY 14 Option): a solar project (Byron Solar Project), a wind farm and associated transmission line (Dodge County Wind Farm), a residential subdivision (Gaiter Lake Land Development), and an expansion of warehousing and manufacturing (Con-Tech Manufacturing Inc.).

The only non-transportation foreseeable project planned near Segment 3 is a 161 kV transmission line relocation and construction of a substation (Wabasha 161 kV Relocation Project).

Only one non-transportation foreseeable project is planned near Segment 4, development of a mixed technology center (Project Skyway).

It is assumed that the construction-related impacts of these foreseeable projects are short-term, for example, construction impacts may cause local disturbances, such as increased noise levels, and traffic delays/and reroutes. Thus, the cumulative potential effects discussion for these projects is focused on their potential long-term impacts.

Table 13-1 Current and Reasonably Foreseeable Future Projects

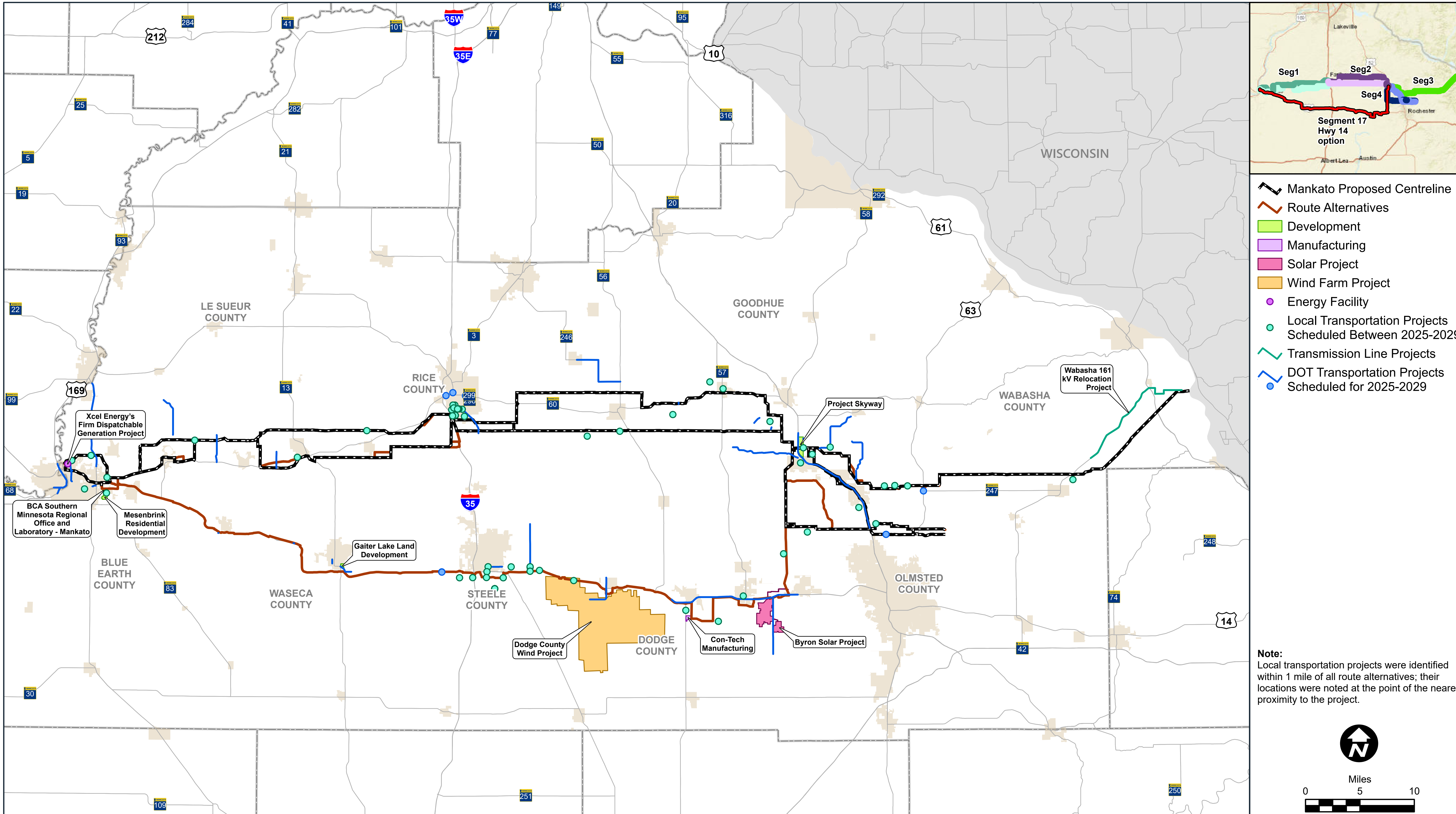
Project Name	Description	Location	Source
Xcel Energy Competitive Resource Acquisition Process for up to 800 Megawatts of Firm Dispatchable Generation: Mankato Energy Center Battery Energy Storage System	Xcel Energy seeks to acquire up to 800 MW of firm dispatchable generation through a competitive resource acquisition process. Proposals from Xcel Energy, DESRI Renewable Energy Development, Invenergy Renewables, National Grid Renewable Development, and Onward Energy Holdings are under consideration. Onward Energy proposes to extend an existing power purchase agreement with Xcel for the output of its existing 375 MW natural gas combined cycle generating Unit 1 at the Mankato Energy Center (MEC). The existing generating facility can operate on natural gas and liquid fuel and may also use a hydrogen-blended fuel, should that become available to the site. In addition to the existing MEC, the proposal would also install a 14 MW/56 MWh BESS at the site. Onward Energy anticipates that the BESS component of the proposal would begin operation in September 2028.	Segment 1, Route Segment 17 (Hwy 14 Option), in Mankato, Blue Earth County, MN	https://apps.commerce.state.mn.us/web/project/15647
Byron Solar Project	Byron Solar, LLC (a subsidiary of EDF Renewables) is proposing to construct and operate the 200 MW Byron Solar project on a site of approximately 1,800 acres in Mantorville and Canisteo townships in Dodge County. As proposed, the project would connect to the electric grid at the existing Byron Substation (west of Byron) via a transmission line of approximately three miles. The Commission issued site and route permits with conditions for the project in 2023.	Route Segment 17 (Hwy 14 Option), Dodge County, MN	https://apps.commerce.state.mn.us/web/project/14509
Dodge County Wind Project	Dodge County Wind, LLC (DCW), a subsidiary of NextEra Energy Resources, LLC, proposes to construct and operate a 259-MW wind farm in Dodge and Steele Counties and an associated 161 kV transmission line in Dodge and Mower counties. The Commission issued site and route permits for the project in 2024.	Route Segment 17 (Hwy 14 Option), Dodge County, MN	https://apps.commerce.state.mn.us/web/project/13333
Wabasha 161 kV Relocation Project	Dairyland Power Cooperative has submitted a joint Certificate of Need and Route Permit Application to the Minnesota Public Utilities Commission to relocate approximately 13.3 miles of 161-kV transmission line and construct a new substation in Wabasha County, Minnesota.	Segment 3, Wabasha County, MN	https://apps.commerce.state.mn.us/web/project/15450

Project Name	Description	Location	Source
Mesenbrink Residential Development	Mesenbrink Construction proposed the construction of a new mixed-use development consisting of retail space, apartment units and single family residential, located on approximately 105 acres in Blue Earth County (to be annexed into the City of Mankato).	Segment 1 and Route Segment 17 (Hwy 14 Option), Blue Earth County, MN	https://content.mankatomn.gov/files/Mesenbrink-EAW-FOFC-ROD-2023-04-20.pdf
Gaiter Lake Land Development	The City of Waseca proposed to develop a residential subdivision along the western shore of Gaiter Lake. Construction is anticipated to begin in Spring 2025 and be completed by 2031. The project would provide buildable lots for up to 67 units of market-rate residential housing across 33 single-home lots and 17 twin-home lots.	Route Segment 17 (Hwy 14 Option), Waseca County, MN	https://webapp.pca.state.mn.us/eqb-search/project-detail/261950?sIld=261950-PROJ0000000001
Project Skyway	Ryan Companies US, Inc. is preparing an Alternative Urban Areawide Review (AUAR) for an approximately 482-acre area in the City of Pine Island and Pine Island Township, Goodhue County, Minnesota. The AUAR area is bounded by 490th Street to the north, Trunk Highway 52 to the west and south, and 195th Avenue to the east. Development scenarios include a Mixed Technology Center/ Light Industrial Scenario (Scenario A) and Technology Center Scenario (Scenario B).	Segment 4, Goodhue County, MN	https://webapp.pca.state.mn.us/eqb-search/project-detail/262379?sIld=262379-PROJ0000000001
BCA Southern Minnesota Regional Office and Laboratory - Mankato	The Bureau of Criminal Apprehension Southern Minnesota Regional Office and Laboratory is proposing a project involving the construction of a two-story forensic laboratory and investigations facility in Mankato, MN, to support criminal investigations, forensic analysis, and law enforcement training. The new building will be constructed on a parcel owned by the State of Minnesota, directly north of the Blue Earth County Justice Center. The project includes site development, utility extensions, and infrastructure improvements to serve the southern region of Minnesota's law enforcement.	Segment 1 and Route Segment 17 (Hwy 14 Option), Blue Earth County, MN	https://webapp.pca.state.mn.us/eqb-search/project-detail/262824?sIld=262824-PROJ0000000001
Con-Tech Manufacturing, Inc	Con-Tech Manufacturing is proposing to expand current footprints of its warehousing and manufacturing buildings.	Route Segment 17 (Hwy 14 Option), Dodge County, MN	https://webapp.pca.state.mn.us/eqb-search/project-detail/149186?sIld=149186-PROJ0000000001
Hwy 63 and CR 112 — Olmsted County	MnDOT is planning to build a roundabout at the intersection of Hwy 63 (75th Street Northwest) and Olmsted Co. Rd. 112 to reduce crashes and improve driver safety in the area.	Segment 4, Olmsted County, MN	https://talk.dot.state.mn.us/hwy63-cr112

Project Name	Description	Location	Source
Hwy 52 — Pine Island to Oronoco construction	In 2028, Highway 52 will receive improvements from Highway 52 from near the Highway 60 interchange to north of Rochester. The work includes: - Resurface southbound Highway 52 - Construct a new frontage road to help with safety and access - Replace a culvert bridge north of Pine Island - Raise southbound Highway 52 to reduce the risk of flooding near the middle fork of the Zumbro River - Minor bridge repair work - 5th Street NW bridge over Highway 52 in Oronoco - 85th Street NW bridge over Highway 52 south of Oronoco	Segment 4, Olmstead County, MN	https://talk.dot.state.mn.us/hwy-52-pine-island-oronoco
Hwy 169 Revitalization	Building upon the Mankato/North Mankato Area Planning Organization Hwy 169 Corridor Study in 2021, MnDOT is developing a project for 2027 and 2028 construction that implements key elements to improve the pavement, safety and traffic flow of Hwy 169 through the cities of Mankato and North Mankato.	Segment 1, Route Segment 17 (Hwy 14 Option), Nicollet and Blue Earth County, MN	https://www.dot.state.mn.us/d7/projects/hwy169revitalization/index.html
Hwy 63 and CR 112 — Olmsted County	MnDOT is planning to build a roundabout at the intersection of Hwy 63 (75th Street Northwest) and Olmsted Co. Rd. 112 to reduce crashes and improve driver safety in the area.	Segment 4, Olmsted County, MN	https://talk.dot.state.mn.us/hwy63-cr112
Highways 63/247, Co. Rd. 12 roundabout	Construction of a roundabout is planned in 2027 at the intersection of Hwy 63, Hwy 247, and Olmsted Co. Rd. 12 in Olmsted County.	Segment 4, Olmsted County, MN	https://www.dot.state.mn.us/d6/projects/hwy63-247-roundabout/index.html
Highway 22 Mankato to St. Peter	Preliminary work (*minimal impacts to Hwy 22 traffic*) happened in 2024, with construction (*detour for Hwy 22 traffic*) occurring 2025-2026. Work includes: Reconstruct roadway from south of Blue Earth County Road 57 in Mankato to just south of the Minnesota River Bridge in St. Peter; add new turn lanes and passing lanes throughout the project area; construct a roundabout at Hill St. (Le Sueur County Road 21) in Kasota; design and grade for a future walking and biking trail to connect Mankato and St. Peter; improve lighting at intersections, repair and replace bridges, and install snow fence.	Segment 1, Blue Earth County, MN	https://www.dot.state.mn.us/d7/projects/hwy22mankato-stpeter/index.html

Project Name	Description	Location	Source
Highway 246 from Rice County Road 26 to Highway 56	Road resurfacing	Route Segment 17 (Hwy 14 Option), Goodhue County, MN	https://www.dot.state.mn.us/planning/10yearplan/district-chip.html
Highway 14 from east of Dodge County Road 9 to west of Olmsted County Road 5	Road resurfacing	Route Segment 17 (Hwy 14 Option), Goodhue County, MN	https://www.dot.state.mn.us/planning/10yearplan/district-chip.html
MnDOT US State Aid Road & Bridge Projects	Various road improvement projects including milling, paving, and overlays	Segment 1, Segment 2, Segment 3, Segment 4, Route Segment 17 (Hwy 14 Option), Blue Earth, Rice, Steele, Dodge, Waseca, Olmsted, Wabasha, Goodhue, and Le Sueur Counties, MN	https://mndot.maps.arcgis.com/apps/webappviewer/index.html?id=34f8913831b94d3c94b675298e6fa18d
Blue Earth County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays	Segment 1, Route Segment 17 (Hwy 14 Option), in Blue Earth County, MN	https://www.blueearthcountymn.gov/DocumentCenter/View/3418/Draft-5-Year-TIP-2024-2028
Le Sueur County Road Construction / Maintenance Projects	Various road improvement projects, including milling, paving, and overlays	Segment 1, Le Sueur County, MN	https://www.lesueurcounty.gov/DocumentCenter/View/5841/CIP-2024-2028?bidId=
Rice County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays	Segment 1, Segment 2, Rice County, MN	Data received from County officials

Project Name	Description	Location	Source
Goodhue County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays	Segment 2, Segment 3, Segment 4, Goodhue County, MN	https://experience.arcgis.com/experience/022bf3a83bcf44e0b5636078d70e0020
Wabasha County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays	Segment 3, Wabasha County, MN	Data received from County officials
Waseca County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays	Segment 1, Route Segment 17 (Hwy 14 Option), in Waseca County, MN	https://www.ci.waseca.mn.us/finance-human-resources/pages/capital-improvement-program-cip
Steele County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays	Route Segment 17 (Hwy 14 Option), Steele County, MN	Data received from County officials
Dodge County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays	Route Segment 17 (Hwy 14 Option), Dodge County, MN	https://cms4files.revize.com/dodgecountymn/2024%20CIP%20Summary.pdf
Olmsted County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays	Route Segment 17 (Hwy 14 Option), Segment 3, Segment 4, Olmsted County	Data received from County officials
Madison Lake Dollar General Store Project	The city of Madison Lake is working with Dollar General and MnDOT on construction of a Dollar General store. The plat for this site has been approved by the city, and Dollar General is working with MnDOT on lane configuration and access requirements.	Segment 1, Blue Earth County	Data received from MnDOT and Madison Lake City Administrator



CUMULATIVE EFFECTS
Mankato - Mississippi River Transmission Line Project

Figure 13-1

13.1.1 Human Settlement

This project, combined with the foreseeable projects identified in Table 13-1, could interact to result in minimal cumulative effects on aesthetics. The non-transportation projects identified in Table 13-1, such as the Dodge County Wind Project and Byron Solar Project, could interact with this project to result in cumulative effects on aesthetics; however, given the presence of existing transmission lines and highway infrastructure adjacent to these projects, the effects are anticipated to be minimal. The Mesenbrink Residential Development Project is a little over a mile south of Segment 1 and Route Segment 17 (HWY 14 Option); however, if Route Segment 1 were used as an alternative to Segment 1 South, this development would be located approximately 0.6 miles south. Given the limited tree cover, it is possible that Route Segment 1 would be visible from parts of the development, which would alter the currently open landscape of the planned development. The southern boundary of the Gaiter Lake Land Development Project is located approximately 0.25 miles north of Route Segment 17 (HWY 14 Option). The southern boundary of this development is bordered by a 69 kV line and HWY 14. This project is not anticipated to result in aesthetic impacts to this development given that Route Segment 17 is located on the southern side of HWY 14.

13.1.2 Public Health and Safety

This project, in combination with the current and reasonably future projects identified in Table 13-1, such as the Dodge County Wind Project and Byron Solar Project, could interact to result in minimal cumulative effects on public health and safety. This project, in combination with these two renewable energy projects, would add to background EMF levels in the area. Because the Commission imposes a maximum electric field limit of 8 kV/m for new transmission projects, this project as well as the Dodge County Wind Project and Byron Solar Project would have to meet this permit condition. Accordingly, potential public health impacts related to induced voltages are anticipated to be minimal. In general, it is anticipated that the foreseeable future projects in the area would have minimal impacts on human health and safety when operational.

13.1.3 Land-Based Economies

This project, combined with the foreseeable projects identified in Table 13-1, could interact to result in minimal to moderate cumulative effects on land-based economies. Cumulative effects on land-based economies may occur as a result of conversion of more agricultural land to developments, industrial sites, and/or energy infrastructure.

13.1.4 Archaeological and Historic Resources

This project, combined with the foreseeable projects identified in Table 13-1 could interact to result in minimal to moderate cumulative effects on archaeological and historic architectural resources. Any time new ground disturbance would occur as the result of a project, there is the potential to impact significant archaeological and historic architectural resources. However, survey and identification of these resources during project planning stages can help determine the presence of these resources.

Once identified, prudent routing and/or efforts to avoid or minimize impacts to these resources would reduce the potential for cumulative effects.

13.1.5 Natural Environment

This project, combined with the foreseeable projects identified in Table 13-1 could interact to result in minimal to moderate cumulative effects on the natural environment. The location where this project intersects foreseeable projects is largely agricultural, along roadways, or otherwise disturbed. Potential impacts would be minimized through project design, impact minimization measures, and permit conditions that would be incorporated into this project and the other projects.

This project and the other foreseeable projects identified in Table 13-1 would avoid or span surface waters to the extent practicable; as such, the potential for cumulative effects on surface waters are not anticipated to be notable. Conversion of natural upland and wetland vegetation would occur where this project and the other projects identified in Table 13-1 cross non-agricultural land. These projects could together result in an increase in vegetation type conversion and an increase in the spread of noxious weeds and other non-native species. Should this project be constructed simultaneously to other projects in Table 13-1, cumulative effects on soil disturbance and associated construction stormwater management could occur.

Cumulative potential effects to wildlife and associated habitat could occur as a result of vegetation clearing and associated habitat conversion; however, where this project intersects the foreseeable projects, the landscape is primarily agricultural and similar agricultural habitat is abundant in the region.

This project could interact with the Wabasha 161 kV Relocation Project and the transmission lines associated with the Byron Solar Project and the Dodge County Windfarm to result in increased potential for avian collisions with transmission line infrastructure. BMPs, such as bird flight diverters, would be used where necessary to reduce the potential for impacts.

This project, in combination with the foreseeable projects in Table 13-1 could interact to result in minimal cumulative potential effects to rare and unique natural resources, including federally and/or state protected species and sensitive ecological resources. To the extent practicable, this project and the foreseeable projects would avoid or span sensitive ecological resources, which may provide habitat for protected species. In addition, the setting where this project intersects foreseeable projects is primarily agricultural, with minimal native habitat.

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