Draft Environmental Impact Statement

The human and environmental impacts of constructing and operating the Minnesota Energy Connection 345 kV transmission line and associated substations

October 2024

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Xcel Energy proposes to construct a double-circuit 345 kilovolt high-voltage transmission line (HVTL) between a new substation in Lyon County near Garvin, Minnesota, and the existing Sherburne County Generating Station (Sherco) in the city of Becker, Minnesota. The project consists of two major components: new substations along with upgrades to existing substations and new 345 kilovolt HVTLs. Additional information is available on the Commission website at: https://mn.gov/puc/activities/energy-facilities/power-plants-transmission-lines/tranche-one/minnesota-energy-connection/

Document Availability

This environmental impact statement and other materials related to this project are available on the Department of Commerce project webpage: **https://eera.web.commerce.state.mn.us/web/project/15000**.

Scan QR code to view project webpage.

Data rates apply.

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

Sign up to receive notices about project milestones and opportunities to participate or change your mailing preference. Email eservice.admin@state.mn.us or call 651-201-2246 with the docket number (22-131 or 22-132), your name, mailing address, and email address.

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Abbreviations

ALJ	administrative law judge
applicant	Xcel Energy
BWSR	Board of Water and Soil Resources
CEQ	Council on Environmental Quality
Commission	Minnesota Public Utilities Commission
CREP	Conservation Reserve Enhancement Program
CVTs	continuously variable transmissions
Department	Department of Commerce
DNR	Department of Natural Resources
ECS	Ecological Classification System
EERA	Energy Environmental Review and Analysis
EIS	environmental impact statement
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
GPS	global positioning system
HVTL	high-voltage transmission line
iPaC	Information for Planning and Conservation
IRP	Integrated Resource Plan
kV	kilovolt
LGUs	local units of government
MDA	Minnesota Department of Agriculture
MISO	Midcontinent Independent System Operator
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MW	megawatts
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NHIS	Natural Heritage Information System
NHPA	National Historic Preservation Act
NPDES/SDS	National Pollutant Discharge Elimination System/Sanitary Disposal System
OAH	Office of Administrative Hearings
project	Minnesota Energy Connection Project
RIM	Reinvest in Minnesota
ROI	regions of influence
ROW	right-of-way
Sherco	existing Sherburne County Generating Station
STATCOM	static synchronous compensator
SWPPP	Stormwater Pollution Prevention Plan
SHPO	State Historic Preservation Office

USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VMP	Vegetation Management Plan
WCA	Wetland Conservation Act

Executive Summary

The Minnesota Department of Commerce (Department) prepared this environmental impact statement (EIS) for the Minnesota Energy Connection Project (project), a 345 kilovolt (kV) double-circuit transmission line proposed by 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” (Minn. Statute 116D.02).

Need for the Project

The project is a result of the applicant’s *2020-2034 Upper Midwest Integrated Resource Plan* (IRP) (Docket No. E002/RP-19-368). As explained by the applicant in their route permit application, the project “would deliver 1,996 megawatts (MW) of carbon-free energy generation to the Sherco Substation. The project will also enable the interconnection of more than 4,000 MW of carbon-free energy generation overall that will support the recently enacted ‘100 percent by 2040’ law that, generally, sets a standard for public utilities to generate or acquire 100 percent of the energy for retail sales from carbon-free resources.”

When defining the purpose of the project for this EIS, the Department, Energy Environmental Review and Analysis (EERA) unit staff referred to the Commission IRP Order. The purpose of the project is to construct a high-voltage transmission line (HVTL) to connect new energy sources to the MISO transmission grid at the location of the retiring Sherco coal-fired generator, that is, the Sherco Substation.

Overview of Project and Routing Alternatives

The applicant proposes to construct a double-circuit 345 kV HVTL between a new substation in Lyon County near Garvin, Minnesota (Garvin Substation), and the existing Sherburne County Generating Station (Sherco) in the city of Becker, Minnesota (Map ES.1).

The project consists of two major components: new substations along with upgrades to existing substations and new 345 kilovolt HVTLs. The applicant proposed two possible HVTL routes as required by Minnesota Rule 7850.1900. Neither of these routes is designated as “preferred” by the applicant.

Proposed substation work involves:

- A new substation to be located near Garvin in Lyon County referred to as the Garvin Substation.
- An intermediate substation to be located 20 miles north of the proposed Garvin Substation referred to as the intermediate substation.
- A voltage-support substation to be located 80 miles south of the Sherco Substation in either Meeker, Kandiyohi, or Renville County referred to as the Support Substation.
- Modifications to the existing Sherco Substation and Sherco Solar West Substation near Becker in Sherburne County.

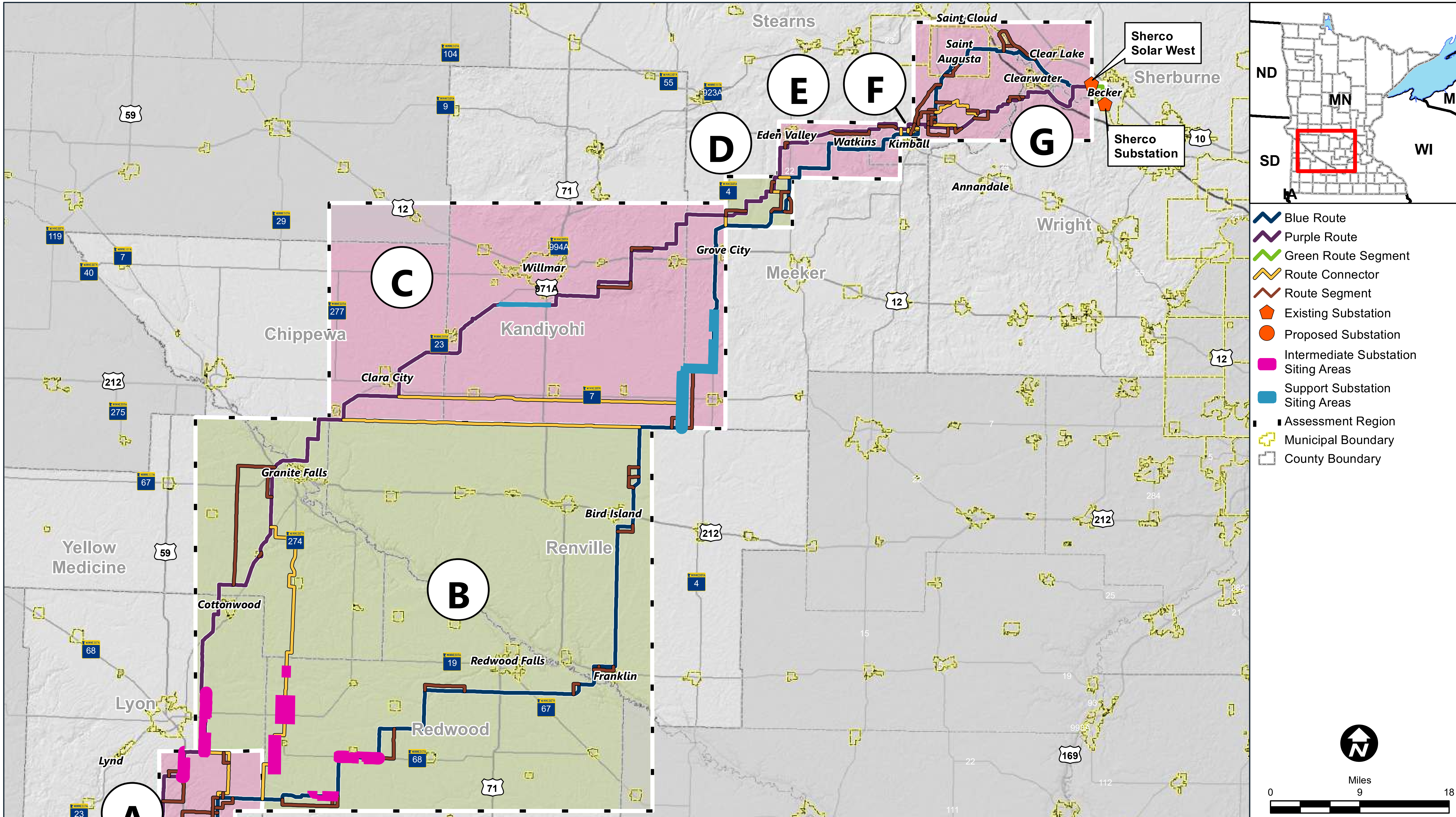
Proposed HVTL work involves:

- A new 345 kV double-circuit HVTL between the Garvin Substation and the existing Sherco Solar West Substation. The applicant's proposed routes are 171 and 174 miles in length and designated as the Purple Route and Blue Route, respectively.
- A new 3.1-mile single-circuit 345 kV transmission line between the existing Sherco Solar West Substation and the Sherco Substation referred to as the Green Route Segment. The Green Route Segment would be co-located with applicant's existing Line 5651, occupying the open position on the existing double-circuit-capable structures.

The applicant requested a route width of 1,000 feet and a final right-of-way (ROW) width of 150 feet with a few exceptions, including substations where a wider route width was requested.

The May 14, 2024, final scoping decision included 63 route alternatives (48 route segments, 11 route connectors, and four alignment alternatives). Route alternatives are studied in the EIS as either standalone route segments or refinements along the applicant-proposed routes within seven identified regions (Region A through Region G). Standalone route segments are named with a letter corresponding to the region they are in (for example – Route Segment A1) and are either a portion of the Purple or Blue Route or include at least one route segment or route connector identified during scoping.

A refinement is a route segment that was included in the scoping decision but is not included within a standalone route segment in any of the different regions. For purposes of analysis, refinements are compared against their Purple or Blue Route equivalents and retain their 200-number series names assigned in the scoping decision.



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 airing 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 ALJ (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(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:

- Construct an underground transmission line;
- Construct a new nuclear plant or natural gas plant at the retired Sherco coal-fired generator and interconnect into the existing Sherco Substation;
- Construct a new nuclear plant or natural gas plant closer to the Minneapolis—St. Paul metropolitan area and interconnect into the existing Sherco Substation; and
- Construct wind and solar generation closer to the Minneapolis—St. Paul metropolitan area and interconnect into the existing Sherco Substation.

The EIS excluded the following system alternatives because they would not meet the underlying need for or purpose of the project: demand side management, purchased power, and a different energy source and (this rule requirement relates to a generation facility). The EIS also excluded the following system alternatives because they would not be feasible or available: HVTL of a different type (underground), upgrading the retiring Sherco coal-fired generator, replacing coal-fired generation at

Sherco with additional solar and/or wind powered generation at Sherco, replacing the coal-fired generating plant at Sherco with nuclear generation.

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

- the no-build alternative;
- HVTL of a different size (a double circuit 500 kV transmission line);
- replacing coal-fired generation at Sherco with a new natural gas generation facility closer to Sherco and the Minneapolis—St. Paul metropolitan area, that interconnects to the Sherco Substation; and
- replacing coal-fired generation at Sherco with additional solar and wind powered generation closer to Sherco and the Minneapolis—St. Paul metropolitan area, that interconnects to the Sherco Substation.

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 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.

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 ten-county area as the ROI.

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

- Impacts on human settlements (factor A)— cultural values, environmental justice, noise, property values, socioeconomics, transportation, and public services.
- Impacts on land-based economies (factor C)— forestry and tourism.
- Impacts on the natural environment (factor E) – air quality, climate, geology and topography, floodplains, and groundwater.

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 route 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.

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 following existing infrastructure (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 paralleling existing transmission lines.

Impacts are largely assessed by reviewing the number of nearby residences and opportunities for ROW paralleling. Throughout the project, there is variability in the number of nearby residences and opportunities for 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 is limited opportunity for paralleling existing transmission lines project wide.

Overall, aesthetic impacts are anticipated to be moderate, with a few areas subject to more significant impacts. State water trails and scenic byways 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. Crossing state water trails is unavoidable, the Purple Route and Blue Route both cross the same state water trails. Additionally, in two select locations, some residents along Route Segments B1 (Purple Route), B2, and B3 would be subject to significant aesthetic impacts where the residence would be boxed in by the proposed HVTL and existing HVTLs.

Displacement

Displacement occurs when a residence or building is required to be removed within the ROW for construction of the project. No residential structures are present within the ROW and therefore no displacement of homes 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. There are 33 nonresidential structures (for example, agricultural outbuildings or animal production structures) within the ROW of the various route alternatives.

Displacement of nonresidential 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 negligible throughout the project with one exception. Potential impacts to a residential development in the city of Augusta would require further coordination and potential mitigation if Route Segment G1 (Blue Route) or Route Segment G2 are selected.

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 scenic byways) that are crossed by all route segments and cannot be avoided. These would be subject to aesthetic impacts.

Other recreational resources that are present include publicly accessible lands (Wildlife Management Areas, Waterfowl Production Areas, and state game refuges) and snowmobile trails. There is one potential localized impact to an access point of the Amiret Wildlife Management Area near Route Segment A4.

Human Health and Safety

The ROI for human health and safety is the ROW. Transmission line projects have the potential to negatively impact public health and safety during project construction and operation. Health concerns related to the operation of the project include impacts from EMF, stray voltage, induced voltage, and electrocution.

Potential impacts to human health and safety would be mitigated through conditions of the route permit (for example - mitigation related to grounding, electric field and electronic interference). Specifically, the applicant would be required to 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 would not exceed 8.0 kV/m rms. Applicable standards including National Electric Safety Code, Occupational Safety and Health Administration standards, and electrical performance standards would also be followed by the applicant.

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.

Most of the land within the project area is used for agricultural purposes. Implementation of the Agricultural Impact Mitigation Plan (AIMP)and prudent routing (paralleling existing infrastructure and paralleling division lines) could help minimize potential impacts. More localized impacts to agriculture would include disruption to airstrips used for agricultural purposes and center pivot irrigation systems. Route Segments C2, C3, and C4 (Blue Route) would impact regular use of the Lux Strip Airport airstrip, impacting an aerial spraying business. Impacts to the airstrip could be minimized by selecting Route Segment 223 as a refinement to Route Segment C2, C3, or C4 (Blue Route). The highest concentration of center pivot irrigation systems is on the northern end of the project. Potential impacts to center pivot irrigation systems that would be unavoidable are present within Route Segment C1 (Purple Route); Route Segments D4 (Blue Route), D5, D6, and D7; and Route Segment F4 (Blue Route).

The Reinvest in Minnesota (RIM)/Conservation Reserve Enhancement Program (CREP) program provides financial incentives to farmers to remove land from agricultural production. Most route alternatives avoid RIM/CREP easements but in some cases these easements are crossed. Route Segment A4 crosses a RIM easement and Route Segment B4 (Blue Route) has more CREP/RIM acres within its ROI compared to other route segments in its region. The RIM Reserve program compensates landowners for granting conservation easements. The applicant committed to working with the landowners if easements are present to avoid or minimize impacts. Impacts can be mitigated by compensating individual landowners through negotiated easement agreements. These agreements are outside the scope of this EIS.

Impacts to mining would be minimal. There are some gravel pit operations present within the route width but often times the final alignment is anticipated to be on the outer edge or across the road from the gravel pit. Route Segments F3 and F6 would be anticipated to interfere with the current gravel pit operations at MnDOT ASIS Number 73079. 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 impacts to forestry would occur except for potential impacts to a Christmas tree farm if Route Segment 244 (a refinement) were selected as part of the final route.

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 route alternatives. Archaeological resources are concentrated near watercourses and waterbodies in Regions A, B, C, and G. Some resources are unevaluated for listing on the National Register of Historic Places within the route widths. This includes at least two Native American mortuary sites, one of which intersects the ROW of Route Segments B1 (Purple Route), B2, and B3. Both sites might have been destroyed due to previous disturbance. Eligible historic architectural resources including railways and unevaluated historic architectural resources are also present within the route width. 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, the construction of new substations and access roads, temporary construction areas, and vehicle and equipment operation. Indirect 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 avoid or mitigate potential effects on resources identified during these surveys. Avoidance of resources could include adjustments to the project design and designation of sensitive areas to be left undisturbed or spanned by the project.

Natural Environment

Public and Designated Lands

Public and designated lands within the ROI (route width) 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, Waterfowl Production Areas, and state game refuges. The EIS summarizes potential impacts to these resources as a part of the wildlife and wildlife habitat assessment. No other public lands such as local parks, state forests, or national forests were identified. Designated lands with easements within the ROI include: CREP and RIM easements (reviewed as part of the land-based economies assessment for agriculture), one designated Water Bank in Region B, and one state Wild and Scenic Riverbank in Region G.

The applicant avoided areas with designated easements as practicable and in some areas requested additional route width to allow for flexibility to avoid conservation easements. If easements are crossed, the applicant would work with landowners to determine measures to avoid and minimize impacts to these resources and to avoid interfering with landowner participation in the CREP or RIM programs. Additionally, the applicant would continue to coordinate potential easement crossings with Minnesota Board of Water and Soil Resources (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 seven state endangered and eleven state threatened species within 1 mile of the project; two 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 route segments within the regions, including the state and federally endangered Poweshiek skipperling (*Oarisma Poweshiek*; Region A); state endangered king rail (*Rallus elegans*; Region B), the three state threatened mussel species: mucket (*Actinonaias ligamentina*; Region B), spike (*Eurynia dilatate*; Region B), and fluted-shell (*Lasmigona costata*; Region B); and the state threatened Blanding's turtle (*Emydoidea blandingii*) (Regions F and G).

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 scattered throughout the project, including Sites of Biodiversity Significance, native plant communities, railroad rights-of-way prairies, prairie bank easements, and Lakes of Biological Significance. Some of these sensitive ecological resources intersect the ROW or are crossed by the anticipated alignments of various route segments, including Sites of Biodiversity Significance (Regions A, B, C, E, and G), native plant communities (Regions A, B, and C), railroad rights-of-way prairies (Regions B and C), prairie bank easements (Regions A and B), and Lakes of Biological Significance (Region B).

Soils

Impacts to soils within the ROI (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 a 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, if required, 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. All watercourses and waterbodies would be spanned and no in-water work would occur as a result of the project.

Several major watercourses intersect the project, including Meadow Creek, the Cottonwood River, the Redwood River, the Yellow Medicine River, the Crow River, the Clearwater River, the Minnesota River, and the Mississippi River. Of these, the Mississippi River, which intersects Region G, and the Minnesota River, which intersects Region B, are designated Section 10 waters, which means they are navigable waters regulated under Section 10 of the Rivers and Harbors Act. Numerous jurisdictional watercourses and county ditches traverse the ROI, many of which are listed on the Public Waters Inventory (PWI) or are designated impaired waters. Two trout streams intersect Region G (Johnson Creek and Fairhaven Creek). In addition, three Outstanding Resource Value Waters, the Minnesota River, Crow River, and Mississippi River, intersect Regions B, D, and G, respectively. Watercourses designated as either state water trails or wild and scenic rivers including the Redwood River (Region B), Crow River (Region D), and Mississippi River (Region G) are also present.

With the exception of Region F, route segments in all regions would cross perennial, intermittent, and/or ephemeral watercourses. An ephemeral watercourse only flows briefly after it rains. However, the majority of crossings include intermittent or ephemeral watercourses. In some regions, particular route segments have more watercourse crossings than others, while in other regions route segments have a similar amount of watercourse crossings.

Waterbodies are sparsely scattered throughout the ROI, with the larger waterbodies including Belle Lake, Locke Lake, Lynden Lake, Wilcox Lake, Long Lake, and Sather Lake. The anticipated alignments for most route segments would not cross a waterbody, while some route segments would cross up to three waterbodies.

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 of the regions consists of herbaceous agricultural vegetation. Forested vegetation is limited, with most route segments having 1 acre or less within their ROW. Forested vegetation is most abundant in Region G, where route segments could impact up to 44 acres of forested vegetation within the ROW.

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 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 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 USFWS National Wetlands Inventory (NWI), as updated by the DNR, identifies numerous wetland complexes and small isolated wetlands throughout the ROI. In general, wetlands are more prevalent in the northeast portion of the project compared to the southwest portion. All route segments would intersect wetlands, with some route segments intersecting less than 1 acre and others intersecting up to 53 acres. Forested wetlands are not abundant in the area and the ROW of many route segments would not intersect forested wetlands or would intersect only a few acres; however, the ROW of some route segments in Region G would intersect up to 11 acres of forested wetland. Some of the regions have route segments that would require crossing a wetland wider than 1,000 feet; these crossings occur in every region except Regions D and F.

Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except that potential impacts to birds are evaluated at the local vicinity (1,600 feet). Potential short-term, localized impacts could occur from displacement during construction or maintenance activities. Potential long-term impacts could occur as a result to 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 residential development. Watercourses and waterbodies and areas of natural vegetation, such as forest, wetlands, 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, including DNR Wildlife Management Areas, DNR state game refuges, lakes that are part of DNR Shallow Lakes Program, USFWS Grassland Bird Conservation Areas, USFWS Waterfowl Production Areas, and National Audubon Society Important Bird Areas. Some of these areas are located within the ROW of various route segments within the regions, including state game refuges (Regions F and G), shallow wildlife lakes (Regions A, B, C, E, F, and G), Grassland Bird Conservation Areas (all regions), and Important Bird Areas (Region B).

Route Options

Chapters 6 through 13 discusses the relative merits of the different route segments based on the routing factors outlined in Minnesota statute and rule. For each region, route segments are compared against one another and summarized in a relative merits table. Graphics are used to represent the magnitude of anticipated difference between potential impacts or consistency with the routing factor. 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. In this way, the EIS includes significant discussion of potential impacts by region.

If the Commission elects to issue a route permit for the project, it must select a complete route from the Garvin Substation to the Sherco Substation. Given the number of routing options, Chapter 17 of the EIS discusses four example complete routes that run from the Garvin Substation to the Sherco Solar West Substation. These complete routes are comprised of the route segments and route connectors across the seven regions discussed in Chapters 6 through 12. The Green Route Segment travels from the Sherco Solar West Substation to the Sherco Substation. This segment, discussed in Chapter 13, is common to all alternatives; therefore, its discussion is not repeated in Chapter 17.

Four route options are discussed in Chapter 17. These route options are not the only possible complete routes. These routes are not meant to represent a “best-case scenario” or to be “least impactful overall.” The four route options presented could be further improved with the refinements. The applicant-proposed routes are included as two options: Route Option A (the Purple Route) and Route Option B (the Blue Route). The other two route options were compiled by selecting route segments and route connectors that could be feasibly connected to each other to create a route between the new Garvin Substation and the existing Sherco Solar West Substation.

1 Introduction

The Department of Commerce (Department) prepared this environmental impact statement (EIS) on behalf of the Minnesota Public Utilities Commission (Commission) for the Minnesota Energy Connection Project (project). The project is proposed by Xcel Energy (applicant). 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 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 What does the applicant propose to construct?

The applicant proposes to construct a double-circuit 345 kilovolt (kV) high-voltage transmission line (HVTL) between a new substation in Lyon County near Garvin, Minnesota (Garvin Substation), and the existing Sherburne County Generating Station (Sherco) in the city of Becker, Minnesota. The project also involves a new intermediate substation, a support substation, modifications to the existing Sherco Substation and Sherco Solar West Substation, and a new single-circuit 3.1-mile 345 kV transmission line between the existing Sherco Solar West Substation and the Sherco Substation.

The project consists of two major components: new substations and upgrades to existing substations, and a new double-circuit 345 kV HVTL (Map 1). The applicant proposed two possible HVTL routes as required by Minnesota Rules 7850.1900 (Map 1). The applicant has identified both routes as feasible and has not indicated preference for a particular route.

Proposed substation work involves:

- A new substation near Garvin in Lyon County, referred to as the Garvin Substation.
- A new intermediate substation approximately 20 miles north of the proposed Garvin Substation, referred to as the intermediate substation.
- A new voltage-support substation approximately 80 miles south of the Sherco Substation in either Meeker, Kandiyohi, or Renville County, referred to as the support substation.
- Modifications to the existing Sherco Substation and Sherco Solar West Substation near Becker in Sherburne County.

Proposed HVTL work involves:

- A new double-circuit 345 kV HVTL between the Garvin Substation in Lyon County and the existing Sherco Solar West Substation. The applicant-proposed routes are 171 and 174 miles in length and designated as the Purple Route and Blue Route, respectively.
- A new single-circuit 3.1-mile 345 kV transmission line between the existing Sherco Solar West Substation and the Sherco Substation referred to as the Green Route Segment. The Green Route Segment would be co-located with applicant's existing Line 5651, occupying the open position on the existing double-circuit-capable structures.

The applicant has generally requested a route width of 1,000 feet and a final right-of-way (ROW) width of 150 feet (Section 3.3.1). Exceptions to the 1,000-foot route width include areas near certain conservation easements and proposed substations where route widths ranging from 0.3 to 1.25 miles are requested to enable flexibility in routing (Section 3.3.1).

The applicant anticipates that construction will begin in the third quarter of 2025, and that the project will be complete by the third quarter of 2031.

1.2 What is the project's purpose?

The project is a result of the applicant's *2020-2034 Upper Midwest Integrated Resource Plan* (IRP) (Docket No. E002/RP-19-368) (reference (1)). The IRP was approved by the Commission on April 15, 2022, in its *Order Approving Plan with Modifications and Establishing Requirements for Future Filings* and is referred to throughout this EIS as the "IRP Order" (reference (2)). As part of the IRP Order, the applicant "will seek a certificate of need from the Commission to build . . . [an HVTL] from the retiring . . . Sherco facilities to connect to the regional grid operated by the Midcontinent Independent System Operator [(MISO)" (reference (1)). This HVTL must be designed to "permit new energy resources to connect to the transmission grid" (reference (2)).

As explained by the applicant in their route permit application, the project "would deliver 1,996 megawatts (MW) of carbon-free energy generation to the Sherco Substation. The project will also enable the interconnection of more than 4,000 MW of carbon-free energy generation overall that will support the recently enacted '100 percent by 2040' law that, generally, sets a standard for public utilities to generate or acquire 100 percent of the energy for retail sales from carbon-free resources" (reference (3)).

When defining the purpose of the project for this EIS, the Department, Energy Environmental Review and Analysis (EERA) unit staff referred to the Commission IRP Order. The purpose of the project is to construct a HVTL to connect new energy sources to the MISO transmission grid at the location of the retiring Sherco coal-fired generator, that is, the Sherco Substation.

1.3 What is the public's role?

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

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.

1.4 What is the state of Minnesota's role?

The Commission will make permit decisions that are informed by this EIS as well as public meetings, hearings, and comment periods.

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 applicant filed a certificate of need application for the project in March 2023 (Section 2.1) and a route permit application in October 2023 (Section 2.2). The Commission directed joint proceedings be held on the certificate of need application and the route permit application on August 10, 2023 reference (4).

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 when making decisions. For this project this process requires: (1) the development of an EIS and (2) hearings before an ALJ (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.

1.5 How is this document organized?

This EIS is based on the applicant's certificate of need and route permit applications, public comments received during the scoping period for this EIS, and input from the Commission. The project has been divided into regions for discussion and analysis purposes. The regions are shown on Map 2. These regions and the applicant-proposed routes are described in more detail in Chapter 3.

This EIS addresses the matters identified in the scoping decision for this project (Appendix A) and is organized as follows:

Executive Summary		Provided a summary of the project – its potential impacts and possible mitigation measures.
Chapter 1	Introduction	Provides a brief overview of the project, the public's role, the state of Minnesota's role, and discusses the organization of the document.
Chapter 2	Overview of Project and Routing Alternatives	Describes the regulatory framework associated with the project, including the state of Minnesota's certificate of need and route permitting processes, the environmental review process, and other permits and approvals that would be required for the project.
Chapter 3	Regulatory Framework	Describes the project and regions, including route segment and alignment alternatives. Chapter 3 also describes the engineering, design, and construction of the project.
Chapter 4	Alternatives to the Project	Discusses the feasibility, availability, and potential impacts of system alternatives—that is, alternatives other than a double-circuit 345 kV transmission line, that could meet the stated need for the project.
Chapter 5	Affected Environment, Potential Impacts and Mitigation Overview	Discusses the existing resources in the project area, the general potential human and environmental impacts of the project, and identifies measures that could be implemented to avoid or mitigate potential impacts. Chapter 5 discusses those impacts and mitigation measures that are common to all of the route segment and alignment alternatives studied in the EIS.
Chapters 6, through 12	Impacts and Mitigation Measures by Region	Analyzes the location-specific potential human and environmental impacts of routing alternatives by region and possible mitigation measures. Also discusses the merits of the alternatives relative to the routing factors of Minnesota Rules 7850.4100.

Chapter 13	Green Route Segment	Summarizes the potential human and environmental impacts of routing alternatives and possible mitigation measures specific to the Green Route Segment.
Chapter 14	Substations	Analyzes the potential human and environmental impacts of routing alternatives for the Garvin Substation, intermediate substation, and support substation.
Chapter 16	Cumulative Potential Effects	Includes a discussion of the potential cumulative effects of the project.
Chapter 15	Irreversible and Unavoidable Impacts	Includes a discussion of the potential irreversible and unavoidable effects of the project.
Chapter 17	Route Options Relative Merits	Discusses the merits of the applicant-proposed routes, and other end-to-end routes, relative to the routing factors of Minnesota Rules 7850.4100.

1.6 What's next?

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 public 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 recommendations for the Commission to consider. The Commission will then review the record and decide whether to grant a routing permit.

Now that the draft EIS is complete and has been 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 B. EERA staff will respond to substantive comments received and incorporate your input on the draft EIS into the final EIS consistent with the scoping decision.

Following 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 their 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 spring 2025.

1.7 What sources of information were used to inform this document?

The primary sources of information for this EIS are the certificate of need and route permit application submitted by the applicants. 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 June 28, 2024.

1.8 Where do I get more information?

For additional information, don't hesitate to contact Commission or Department staff. If you would like more information or if you have questions, please contact the Commission public advisor: Jacques Harvieux (publicadvisor.puc@state.mn.us), (651) 201-2233 or Department staff: Andrew Levi (andrew.levi@state.mn.us), (651) 539-1840.

Project documents, including the certificate of need and route permit applications, can be found on eDockets at https://www.edockets.state.mn.us/EFiling/search.jsp by searching "22" for year and "131" or "132" for number. Information is also available on the Department webpage: https://apps.commerce.state.mn.us/web/project/15000.

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 double-circuit 345 kV transmission line with a proposed length of over 100 miles, meets the definition of a large energy facility and requires a certificate of need.

The applicant filed a certificate of need application for the project on March 9, 2023 (reference (5)). The Commission accepted the certificate of need application as complete and authorized use of informal proceedings for developing the record on May 2, 2023 (reference (5)). The Commission later directed joint proceedings be held on the certificate of need application and the route permit application on August 10, 2023 (reference (6)).

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 their 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,” see Section 4.2).

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, a 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 a HVTL requires a route permit from the Commission (Minnesota Statute § 216E.03). The project, which includes a double-circuit 345-kV HVTL and a single-circuit 345-kV HVTL, meets this definition and therefore requires a route permit from the Commission. The applicant filed a route permit application on October 30, 2023 (reference (3)). The Commission accepted the application as complete on January 16, 2023.

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) 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 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 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

Once 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 applications before the Commission for a single transmission line project—a certificate of need and a route permit application—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 developed 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 proposed project.

During scoping, Commission and Department staff gathered input on the scope of the EIS through eight public scoping meetings and an associated comment period. Seven of the meetings were in-person; one meeting was virtual. The scoping meetings occurred on:

- January 24, 2024, in Granite Falls and Marshall
- January 25, 2024, in Olivia and Redwood Falls
- January 30, 2024, in Litchfield
- January 31, 2024, in Monticello and Kimball
- February 1, 2024 (virtual)

Approximately 865 people in total attended the scoping meetings. As some individuals commented more than once, 88 people provided 108 verbal comments during the in-person and virtual meetings (reference (7)).[1]

A 44-day comment period, which closed on February 21, 2024, provided an opportunity to submit written comments to EERA staff on potential impacts and mitigation measures for consideration in the scope of the EIS. During the comment period, citizens provided approximately 443 written comments. Additionally, two agencies and 11 local units of government provided comments.[1] Scoping comments directly informed development of project alternatives.

[1] 20243-204510-01, 20243-204510-02, 20243-204510-03, 20243-204510-04, 20243-204510-05, 20243-204510-06, 20243-204510-07, 20243-204510-08, 20243-204510-09, 20243-204510-10, 20243-204514-01, 20243-204514-02, 20243-204514-03, 20243-204514-04, 20243-204514-05

Department staff provided a summary of the scoping process to the Commission and an opportunity for Commission 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 Department issued a scoping decision for the EIS on May 14, 2024 (Appendix A). The scoping decision identifies the routes, route segments, route connectors, and alternative alignments evaluated in this EIS and those alternatives that were not carried forward for evaluation. EERA staff provided notice of the scoping decision to those persons on the project mailing list and to landowners along alternatives newly proposed during the scoping process. Based on the scoping decision, EERA staff prepared this EIS.

EERA staff issued this draft EIS on October 8, 2024. The EIS is issued in draft form so that it can be improved through public comment. Members of the public can provide comment 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 responses to the comments and appropriate revisions to the draft EIS. The draft and final EIS will be entered in the records for these proceedings so they can be used by the Commission in making decisions about the project.

2.5 Public Hearing

After close of the comment period on the draft EIS, hearings, presided over by an ALJ from the OAH, will be 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 or against the granting of a certificate of need; they can also advocate for what they believe is the most appropriate route for the project and for any conditions to include in a route permit. 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 facts, 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 grant 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 spring 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 construction and operation of the project. All permits subsequent to the issuance of a route permit and necessary for the project must be obtained by the applicant. The information in this EIS may be used by the subsequent permitting agencies as part of their environmental resource impact evaluation.

2.7.1 Tribal Coordination

As noted in the route permit application, the applicant has notified and engaged with multiple tribes and met with various leaders and members of the Lower Sioux Indian Community between 2022 and 2024.

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 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 pursuant to Section 7 of the Endangered Species Act (ESA) regarding potential impacts to 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 Minnesota Energy Connection 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 Harbor Act	Protects water quality through authorized crossings of navigable waters
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 avoid, minimize, and mitigate impacts to federally listed species
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 due to structures taller than 200 feet

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) use of best management practices (BMPs), (2) a stormwater pollution prevention plan, and (3) adequate stormwater treatment capacity once the project is constructed. The NPDES/SDS permit 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.

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

The Minnesota BWSR oversees implementation of Minnesota's Wetland Conservation Act (WCA). The WCA is implemented by local units of government (LGUs). For linear projects that cross multiple LGUs, BWSR typically coordinates the review of potential wetland impacts among the affected LGUs. The WCA requires 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 Minnesota Energy Connection Project

Unit of Government	Type of Application	Purpose
Minnesota Department of Natural Resources (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
Minnesota Pollution Control Agency (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
Minnesota State Historic Preservation Office (SHPO)	Minnesota Statute § 138 (Minnesota Field Archaeology Act and Minnesota Historic Sites Act)	Oversees adequate consideration of impacts on significant cultural resources
Minnesota Department of Agriculture (MDA)	Agricultural Impact Mitigation Plan	Establishes measures for protection of agricultural resources
Minnesota Department of Transportation (MnDOT)	Utility Permit	Authorizes accommodation of utilities within highway rights-of-way
MnDOT	Driveway Access	Authorizes access to driveways along highways
MnDOT	Oversize/Overweight Permit	Authorizes the use of roads for oversize or overweight vehicles
Minnesota Board of Water and Soil Resources (BWSR)	Wetland Conservation Act, 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

2.7.4 Local and Other 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 a railway. The need for such approvals will 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 Minnesota Energy Connection 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 Reinvest in Minnesota (RIM) and Conservation Reserve Enhancement Program (CREP. The applicant indicates that it will work with landowners, local governmental entities administering such programs, and sponsoring federal agencies on a site-specific basis to coordinate the approvals necessary for placing the project on these lands.

2.7.6 Electric Safety and Reliability Costs

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

This chapter explains how the route alternatives (including the applicant-proposed routes) will be studied and compared spatially. It also describes how the project will be designed, constructed, operated, and maintained. Unless otherwise noted, the source of information for this chapter is the route permit application and supplemental information provided by the applicant.

The following terminology is used in this chapter and throughout the EIS to describe the project and assess the potential impacts:

- **Applicant-proposed routes** is a term used to refer collectively to what the applicant proposed in their route permit application and includes the following.
    - **Routes** extend most of the length of the project and connect the proposed Garvin Substation and the existing Sherco Solar West Substation. The applicant proposed the Purple Route and Blue Route.
    - Four **route connectors**.
    - The **Green Route Segment** connects the existing Sherco Solar West Substation and the Sherco Substation (Section 3.1.1).
- **Route alternatives** is a term used to refer collectively to the applicant-proposed routes and all route segments, route connector, and alternative alignment alternatives (defined below) identified in the scoping decision.
    - **Route segments** (indicated with a number in the 200 series in the scoping decision) generally leave and return to the same route or route connector they originate from. For example, a route segment initiating from the Purple Route returns to the Purple Route. In limited cases, a route segment might not return to its original route. For example, it might start on a route connector and return to the same route connector. There are 48 route segments studied in this EIS, which are numbered 201 to 248 in the scoping decision.
    - **Route connectors** are segments that can be used to transition from the Purple Route to the Blue Route, or vice versa. There are 15 unique route connectors studied in this EIS: four proposed by the applicant and 11 identified through scoping) that are numbered 101 to 115 in the scoping decision. For purposes of analysis, route connectors are either:
        - incorporated into route segments and almost always travel in one direction, or
        - can be used to connect the Purple and Blue Route.
    - **Alternative alignments** are alignments proposed during scoping that deviate from the anticipated alignment (referred to in the route permit application as the proposed centerline) but fall within the originally proposed route width proposed by the applicant-provided Blue and Purple Routes or route connector. Unique identifications were given to alternative alignments starting with Alternative Alignment 1 and ending with Alternative Alignment 4 in the scoping decision.

3.1 Regions and Route Alternatives

Route alternatives are studied within seven geographical regions moving south to north along the applicant-proposed routes.

The applicant proposed the Purple Route (Section 3.1.1), the Blue Route (Section 3.1.2), four route connectors, and the Green Route Segment (Section 3.1.10). During scoping, the Commission decided that 48 route segments, 11 route connectors, and four alignment alternatives would be studied in the EIS. Route alternatives studied in the EIS are shown on Map 3.

Route alternatives are studied as either standalone route segments or refinements along the applicant-proposed routes within the seven identified regions (Region A through Region G). These segments are named with a letter corresponding to region they are in and are either a portion of the Purple or Blue Route or include at least one route segment or route connector identified during scoping. Regional maps are shown in Map 4-2; and further described in Sections 3.1.3 through 3.1.9. A refinement is a route segment that was included in the scoping decision but is not included within a standalone route segment in any of the different regions. For purposes of analysis, refinements are compared against their Purple or Blue Route equivalents and retain their 200-number series names.

Appendix D summarizes the 48 route segments and 11 route connectors identified in the scoping decision and indicates whether each is a part of a route segment by region or considered a refinement.

3.1.1 Purple Route

The Purple Route is the westernmost route proposed by the applicant and is approximately 171 miles long, crossing Sherburne, Wright, Stearns, Meeker, Kandiyohi, Chippewa, Renville, Yellow Medicine, and Lyon counties. The Purple Route predominantly follows property lines, agricultural field lines, and roads where practicable. The Purple Route also follows existing transmission lines where it crosses the Mississippi and Minnesota Rivers.

3.1.2 Blue Route

The Blue Route is the easternmost route proposed by the applicant and is approximately 174 miles in length, crossing Sherburne, Stearns, Meeker, Kandiyohi, Renville, Redwood, and Lyon counties. The Blue Route predominantly follows property lines, agricultural field lines, and roads where practicable. The Blue Route also follows an existing transmission line where it crosses the Minnesota River.

3.1.3 Region A

Region A is the southernmost region at the beginning of the project. It includes the Garvin Substation (Section 3.2.4.1) and one of the options for siting the intermediate substation (Section 3.2.4.2). Region A is in Lyon County, Minnesota and includes the townships summarized in Table 3-1.

Table 3-1 Region A Township Summary

County	Township(s)
Lyon County	Custer, Monroe, Sodus, Amiret, Lake Marshall, and Clifton

For purposes of analysis, Region A includes seven route segments by region, summarized in Table 3-2, that are evaluated in further detail in Chapter 6.

Table 3-2 Region A Route Segments Summary

Route Segment Name	Association to Applicant-Proposed Routes [1]	Total Length (miles)
Route Segment A1	applicant-proposed Purple Route	17.5
Route Segment A2	Purple variation	17.6
Route Segment A3	applicant-proposed Blue Route	14.6
Route Segment A4	Blue variation [2]	18.1
Route Segment A5	Blue variation	15.1
Route Segment A6	Blue variation	14.5
Route Segment A7	Blue variation	14.6

[1] This column indicates whether the route segment by region is either a subpart of the Purple Route or Blue Route as proposed by the applicant, is a variation of one the applicant-proposed routes, or includes components of both of the applicant-proposed routes.
[2] This variation includes Route Connector 101 which was proposed by the applicant as Connector D. It connects to the Purple Route at the conclusion of this region.

Region A also includes the potential refinements summarized in Table 3-3; these potential refinements are assessed in Section 6.8.

Table 3-3 Region A Potential Refinements Summary

Route Segments	Association to Applicant-Proposed Routes [1]	Total Length (miles)
Route Segment 204	Purple	1.5
Route Segment 206	Purple	2.0
Route Segment 207	route segment starting and ending on Route Connector 101	1.0
Route Segment 208	route segment starting and ending on Route Connector 101	1.5

[1] This column indicates whether the route segment leaves and returns to the Purple Route, the Blue Route, or Route Connector 101.

3.1.4 Region B

Region B includes options for siting the intermediate substation (Section 3.2.4.2) and the support substation (Section 3.2.4.3). It is in Lyon, Yellow Medicine, Chippewa, Redwood, and Renville counties, Minnesota and includes the townships summarized in Table 3-4. This region also includes the towns of Franklin, Hanley Falls, and Wood Lake.

Table 3-4 Region B Township Summary

County	Township(s)
Lyon County	Amiret, Lake Marshall, Clifton, Stanley, Fairview, and Lucas
Yellow Medicine	Sandnes, Hazel Run, Posen, Wood Lake, Minnesota Falls, and Stony Run
Chippewa	Granite Falls, Leenthrop, and Stoneham
Redwood	Gales, Johnsonville, Westline, Granite Rock, Underwood, Vail, Sheridan, Redwood Falls, Paxton, and Sherman
Renville	Birch Cooley, Norfolk, Bird Island, Melville, and Osceola

For purposes of analysis, Region B includes four route segments by region that are evaluated in further detail in Chapter 7. Route segments studied at the regional scale within this region are summarized in Table 3-5.

Table 3-5 Region B Route Segments Summary

Route Segment Name	Association to Applicant-Proposed Routes [1]	Total Length (miles)
Route Segment B1	applicant-proposed Purple Route	45.4
Route Segment B2	Blue to purple variation [2]	51.0
Route Segment B3	Purple variation	46.9
Route Segment B4	applicant-proposed Blue Route	75.3

[1] This column indicates whether the route segment by region is either a subpart of the Purple Route or Blue Route as proposed by the applicant, is a variation of one the applicant-proposed routes, or includes components of both of the applicant-proposed routes.
[2] This variation includes Route Connector 102, which was proposed as a route alternative during scoping and includes a portion of the Purple Route.

Region B also includes the potential refinements summarized in Table 3-6; these potential refinements are assessed in Section 7.9.

Table 3-6 Region B Potential Refinements Summary

Route Segments	Association to Applicant-Proposed Routes [1]	Total Length (miles)
Route Segment 210	Purple	0.5
Route Segment 221	Purple	3.2
Route Segment 211	Blue	7.0
Route Segment 219	Blue	7.1
Route Segment 212	Blue	4.5
Route Segment 213	Blue	5.0
Route Segment 214	Blue	2.2
Route Segment 220	Blue	2.3
Route Segment 215	Blue	2.4
Route Segment 216	Blue	2.2
Route Segment 217	Blue	3.5
Route Segment 218	Blue	3.5

[1] This column indicates whether the route segment leaves and returns to the Purple Route or leaves and returns to the Blue Route.

Region B includes two alternative alignments, Alternative Alignment 1 and Alternative Alignment 4, which are further discussed in Section 7.10.

3.1.5 Region C

Region C includes the potential location of the support substation (Section 3.2.4.3). It is in Chippewa, Kandiyohi, Renville, and Meeker counties, Minnesota and includes the townships summarized in Table 3-7. This region also includes the city of Prinsburg.

Table 3-7 Region C Township Summary

County	Township(s)
Chippewa	Stoneham, Rheiderland, and Lone Tree
Kandiyohi	Edwards, Saint Johns, Willmar, Whitefield, Kandiyohi, Gennessee, Harrison, Holland, Roseland, Lake Lilian, and East Lake Lilian
Renville	Wang, Eriscon, Crooks, Winfield, Kingman, and Osceola
Meeker	Cosmos, Danielson, Acton, and Swede Grove

For purposes of analysis, Region C includes four route segments by region that are evaluated in further detail in Chapter 8. Route segments studied at the regional scale within this region are summarized in Table 3-8.

Table 3-8 Region C Route Segments Summary

Route Segment Name	Association to Applicant-Proposed Routes [1]	Total Length (miles)
Route Segment C1	applicant-proposed Purple Route	56.0
Route Segment C2	Purple to blue variation [2]	58.5
Route Segment C3	Purple to blue variation [3]	57.9
Route Segment C4	applicant-proposed Blue Route	28.6

[1] This column indicates whether the route segment by region is either a subpart of the Purple Route or Blue Route as proposed by the applicant, is a variation of one the applicant-proposed routes, or includes components of both of the applicant-proposed routes.
[2] This variation starts at the Purple Route, includes Route Connector 103 which was proposed as a route alternative during scoping, and includes a portion of the Blue Route.
[3] This variation starts at the Purple Route, includes Route Connector 104 which was proposed by the applicant as Connector C, and includes a portion of the Blue Route.

Region C also includes the potential refinements summarized in Table 3-9; these potential refinements are assessed in Section 8.9.

Table 3-9 Region C Potential Refinements Summary

Route Segments	Association to Applicant-Proposed Routes [1]	Total Length (miles)
Route Segment 224	Purple	3.8
Route Segment 225	Purple	2.2
Route Segment 222	Blue	8.0
Route Segment 223	Blue	8.0

[1] This column indicates whether the route segment leaves and returns to the Purple Route or leaves and returns to the Blue Route.

Region C includes one alternative alignment, Alternative Alignment 2, which is further discussed in Section 8.10.

3.1.6 Region D

Region D is in Meeker County, Minnesota and includes the townships summarized in Table 3-10.

Table 3-10 Region D Township Summary

County	Township(s)
Meeker	Swede Grove, Harvey, and Manannah

For purposes of analysis, Region D includes seven route segments by region that are evaluated in further detail in Chapter 9. It also includes one route connector (that is not incorporated into route segments by region and can be used to connect the Purple and Blue Route) as further described in Section 9.9.

Route segments studied at the regional scale and the route connector within this region are summarized in Table 3-11.

Table 3-11 Region D Route Segments Summary

Route Segment Name	Association to Applicant-Proposed Routes [1]	Total Length (miles)
Route Segment D1	applicant-proposed Purple Route	9.1
Route Segment D2	Purple variation	9.2
Route Segment D3	Purple to blue variation	10.1
Route Segment D4	applicant-proposed Blue Route	10.8
Route Segment D5	Blue variation [2]	10.9
Route Segment D6	Blue variation	11.4
Route Segment D7	Blue variation [3]	12.8
Route Connector 105	Can connect Purple Route and Blue Route in either direction	1.0

[1] This column indicates whether the route segment by region is either a subpart of the Purple Route or Blue Route as proposed by the applicant, is a variation of one the applicant-proposed routes, or includes components of both of the applicant-proposed routes.
[2] Includes a portion of Route Connector 106, which was proposed by the applicant as Connector A.
[3] This variation includes a portion of the Blue Route, Route Connector 106 which was proposed by the applicant as Connector A, and a portion of the Purple Route.
[4] Route Connector 105 was proposed by the applicant as Connector B.

Region D also includes one potential refinement. Route Segment 229 is associated to the Purple Route and is 1.2 miles long. This potential refinement is assessed in Section 9.9.

3.1.7 Region E

Region E is in Meeker and Stearns Counties, Minnesota, and includes the townships summarized in Table 3-12.

Table 3-12 Region E Township Summary

County	Township(s)
Meeker	Manannah, Forest Prairie
Stearns	Luxembourg, Maine Prairie

For purposes of analysis, Region E includes two route segments by region that are evaluated in further detail in Chapter 10. It also includes and one route connector (that is not incorporated into route segments by region and can be used to connect the Purple and Blue Route) as further described in Section 10.9. Route segments studied at the regional scale and the route connector within this region are summarized in Table 3-13.

Table 3-13 Region E Route Segments Summary

Route Segment Name	Association to Applicant-Proposed Routes [1]	Total Length (miles)
Route Segment E1	applicant-proposed Purple Route	17.7
Route Segment E2	applicant-proposed Blue Route	16.6
Route Connector 107	Can connect Purple Route and Blue Route in either direction	1.0

[1] This column indicates whether the route segment by region is either a subpart of the Purple Route or Blue Route as proposed by the applicant, is a variation of one the applicant-proposed routes, or includes components of both of the applicant-proposed routes.

Region E also includes the potential refinements summarized in Table 3-14; these potential refinements are assessed in Section 10.9.

Table 3-14 Region E Potential Refinements Summary

Route Segments	Association to Applicant-Proposed Routes [1]	Total Length (miles)
Route Segment 230	Purple	0.7
Route Segment 231	Purple	4.2
Route Segment 232	Purple	1.8

[1] This column indicates whether the route segment leaves and returns to the Purple Route, or leaves and returns to the Blue Route.

3.1.8 Region F

Region F is in Stearns County, Minnesota and includes the Maine Prairie Township.

For purposes of analysis, Region F includes six route segments by region that are evaluated in further detail in Chapter 11. It also includes one route connector (that is not incorporated into route segments by region and can be used to connect the Purple and Blue Route) further described in Section 11.7. Route segments studied at the regional scale and the route connector within this region are summarized in Table 3-15.

Table 3-15 Region F Route Segments Summary

Route Segment Name	Association to Applicant-Proposed Routes [1]	Total Length (miles)
Route Segment F1	applicant-proposed Purple Route	2.2
Route Segment F2	Purple to blue variation [2]	2.3
Route Segment F3	Purple to blue variation [3]	2.7
Route Segment F4	applicant-proposed Blue Route	2.7
Route Segment F5	Blue to purple variation [4]	2.4
Route Segment F6	Blue variation	2.7
Route Segment F7	Purple variation	2.1
Route Segment F8	Blue to purple variation [5]	2.7
Route Connector 108	Can connect Purple Route and Blue Route in either direction	0.5

[1] This column indicates whether the route segment by region is either a subpart of the Purple Route or Blue Route as proposed by the applicant, is a variation of one the applicant-proposed routes, or includes components of both of the applicant-proposed routes.
[2] This variation starts at the Purple Route, includes Route Connector 104 which was proposed as a route alternative during scoping, and includes a portion of the Blue Route.
[3] This variation includes a portion of the Purple Route, Route Connector 109 which was proposed by the DNR during scoping, and a portion of the Blue Route.
[4] This variation includes a portion of the Blue Route, a portion of a route segment which was proposed as a route alternative during scoping, and ends at the Purple Route.
[5] This variation includes a portion of the Blue Route, a portion of a route connector and a route segment which were proposed as a route alternative during scoping, and a portion of the Purple Route.

Region F does not include additional potential refinements.

3.1.9 Region G

Region G ends at the Sherco Solar West Station (Section 3.2.4.4) and is the northernmost region. It is in Stearns, Sherburne, and Wright Counties, Minnesota and includes the townships summarized in Table 3-16. This region also includes the cities of St. Augusta and St. Cloud.

Table 3-16 Region G Township Summary

County	Township(s)
Stearns	Maine Prairie, Fair Haven, Lynden
Sherburne	Haven, Clear Lake
Wright	Clearwater, Silver Creek

For purposes of analysis, Region G includes six route segments by region that are evaluated in further detail in Chapter 12. Route segments studied at the regional scale within this region are summarized in Table 3-17.

Table 3-17 Region G Route Segments Summary

Route Segment Name	Association to Applicant-Proposed Routes [1]	Total Length (miles)
Route Segment G1	applicant-proposed Blue Route	25.4
Route Segment G2	Blue variation	24.6
Route Segment G3	applicant-proposed Purple Route	22.7
Route Segment G4	Blue to purple variation [2]	25.0
Route Segment G5	Purple variation	24.3
Route Segment G6	Blue to purple variation [3]	22.7

[1] This column indicates whether the route segment by region is either a subpart of the Purple Route or Blue Route as proposed by the applicant, or is a variation of one the applicant-proposed routes, or includes components of both of the applicant-proposed routes.
[2] This variation includes a portion of the Blue Route, Route Connector 115 which was proposed by the DNR during scoping, and ends at the Purple Route.
[3] This variation includes a portion of the Blue Route, Route Connector 111 which was proposed as a route alternative during scoping DNR during scoping, and ends at the Purple Route.

Region G also includes the potential refinements summarized in Table 3-18; these potential refinements are assessed in Section 12.7.

Table 3-18 Region G Potential Refinements Summary

Route Segments	Association to Applicant-Proposed Routes [1]	Total Length (miles)
Route Segment 235	Blue	3.2
Route Segment 236	Blue	3.4
Route Segment 237	Blue	3.3
Route Segment 238	Blue	3.2
Route Segment 239	Blue	3.2
Route Segment 240	Blue	3.2
Route Connector 249	Can connect Purple Route and Blue Route	2.5
Route Segment 244	Blue	2.1
Route Segment 245	Blue	4.2
Route Segment 246	Blue	6.9
Route Segment 242	Purple	1.1
Route Segment 250	Can connect Purple Route and Blue Route	1.3
Route Segment 243	Purple	2.1
Route Segment 247	Purple	2.0
Route Segment 248	Purple	2.3

[1] This column indicates whether the route segment leaves and returns to the Purple Route, or leaves and returns to the Blue Route.

Region G includes one alternative alignment, Alternative Alignment 3, which is further discussed in Section 12.10.

3.1.10 Green Route Segment

The Green Route Segment is a 3.1-mile, single-circuit 345 kV transmission line that connects the Sherco Solar West Station (Section 3.2.4.4) and the Sherco Substation (Section 3.2.4.5) at the end of the project

(Map 1). It is in Sherburne County, Minnesota and includes Becker Township. This region also includes the city of Becker.

The Green Route Segment is assessed in Chapter 13.

3.2 Engineering and Design

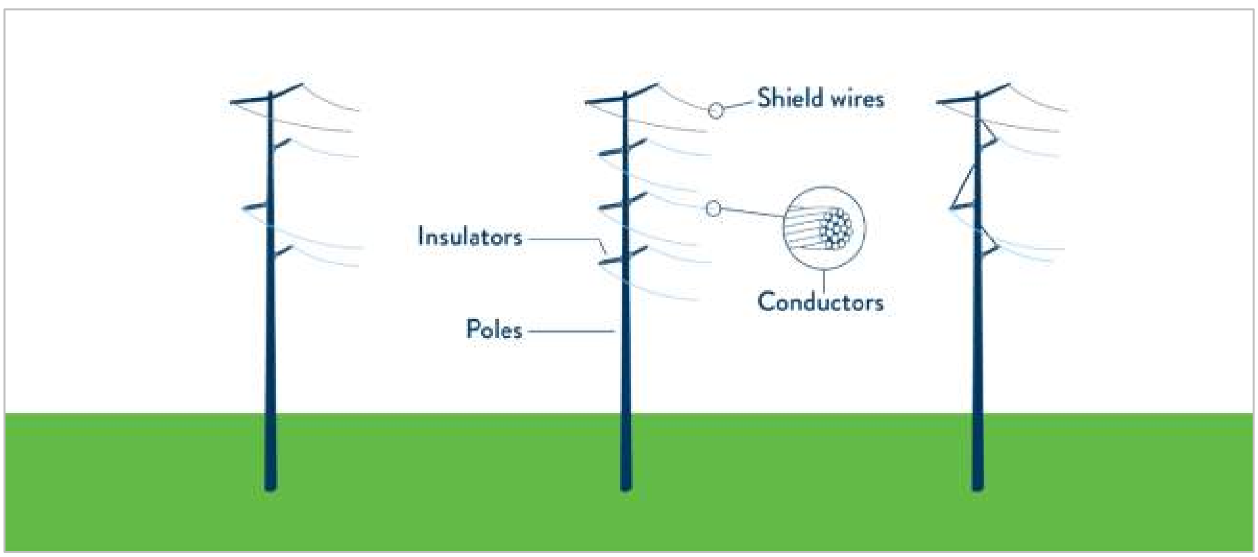
3.2.1 Transmission Lines

3.2.1.1 Double-circuit 345 kV HVTL

Transmission line circuits consist of three phases, each phase at the end of a separate insulator and physically supported by a structure that holds it above ground (Figure 3-1). A phase consists of one or more conductors: single, double, or bundled. A typical conductor is a cable consisting of aluminum wires stranded around a core of steel wires. There might also be shield wires strung above the phases to prevent damage from lightning strikes. The shield wire could also include a fiber optic cable that allows substation protection equipment to communicate with other terminals on the line.

Transmission lines are usually either single-circuit (carrying one three-phase conductor set) or double-circuit (carrying two three-phase conductor sets). There are three conductors per circuit because power plants generate electricity such that each of the three conductors operates at a different phase. The project would primarily involve construction of double-circuit transmission line.

Figure 3-1 Typical Double-Circuit Transmission Line



Source: Barr Engineering Co.

3.2.1.2 Green Route Segment

The Green Route Segment would serve as an interconnection between the Sherco Substation and the Sherco Solar West Substation; as such, it would be common to both the Purple and Blue Routes. To accommodate the second 345 kV circuit on the Green Route Segment, davit arms would be installed on the applicant's existing Line 5651, and eight new structures would be installed adjacent to the existing dead-end structures. The existing 345 kV line is the applicant's Line 5651 and was constructed as a double circuit capable line. The project would occupy the open position on existing structures. The Green Route Segment would not require additional ROW because the existing 150-foot ROW is sufficient for adding a second circuit to the Applicant's existing Line 5651.

3.2.2 Structures

The new double circuit 345 kV transmission line would be constructed primarily of single (monopole) steel pole structures. For angles and dead-end structures, a multiple pole design would be used. The transmission structures would be a double-circuit 345 kV/ 345 kV design and are proposed to be weatherizing steel. Other specialty structures might be used depending on site-specific conditions.

Figure 3-2 provides photos of typical double-circuit structures that the applicant proposes to use for this project.

Figure 3-2 Typical 345-kV Structures

Typical Double-Circuit Structures

Typical Dead-End Structures

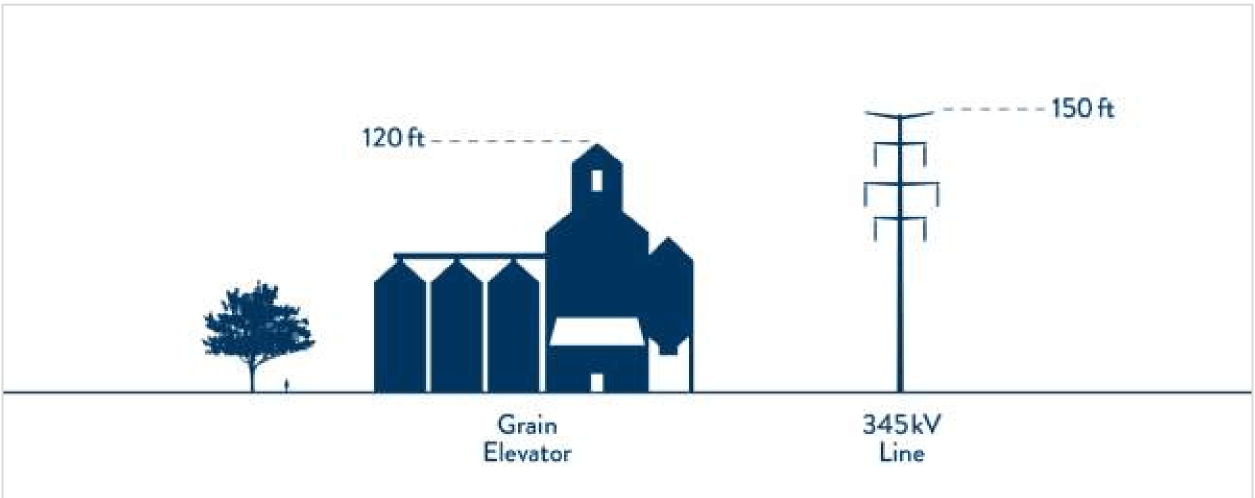
The proposed structures would typically range in height from approximately 90 to 160 feet tall; however, where existing transmission lines are crossed, structure heights could be up to 195 feet tall. Figure 3-3 illustrates how the height of a transmission line could compare to a grain elevator. The typical spans between structures would be about 1,000 feet. The structures would typically be installed on a drilled pier concrete foundation usually approximately 30 to 40 feet deep. Specialty foundations could be required due to geotechnical (or soil) conditions. Foundation depth would be based on site-specific conditions and detailed engineering design and could be up to 60 to 70 feet deep. Table 3-19 summarizes the typical structure designs for the transmission line.

Table 3-19 Typical Structure Design Summary

Line Type	Structure Type	Structure Material	Structure Height (feet)	Foundation Diameter (feet)	Typical Span Between Structures (feet)
345 kV Double-circuit Tangent, Small and Medium Angles	Monopole with Davit Arms	Weathering Steel	90 to 160	7 to 10	1,000
345 kV Double-circuit Large Angle and Dead-end	Two poles with Davit Arms			Up to 12	

Structure sizes could change based on site conditions and further analysis.

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



3.2.3 Conductors

A single circuit transmission line carries three phases (conductors) and separate shield wire(s). A double circuit transmission line carries six phases (conductors) and two separate shield wires. Each 345 kV line would utilize bundled (twisted pair) 2x636 kcmil Aluminum Conductor Steel Reinforced or similar performance conductor. These double bundled conductors would have a capacity equal to or greater than 3,000 amps. This type of conductor is the preferred conductor in areas of icing with wind that can lead to galloping. Galloping is where conductors oscillate in large vertical motion due to wind or ice loading and can result in outages or damage to insulators causing mechanical failures. If the galloping action is significant, it can cause phase-to-phase and phase-to-ground faults. The design of two twisted pair conductors in a bundled configuration reduces aeolian vibration due to its changing cross-section.

The project would be designed to meet or surpass relevant local and state codes including NESC and the applicant’s standards. Applicable standards would be met for construction and installation, and applicable safety would be followed during design, construction, and after installation.

3.2.4 Associated Facilities

Associated facilities for the proposed project include:

- the new Garvin Substation,
- the new intermediate substation,
- the new support substation,
- modifications to the existing Sherco Solar West Substation, and
- modifications to the existing Sherco Substation.

The precise locations of the intermediate substation and support substation would be chosen by the Commission if a permit is issued. The applicant requested additional route width (Section 3.3.1) in the general areas where the substations would be needed. The applicant would seek agreements with willing landowners for the location of the new substations. This acquisition process is ongoing. The applicant has indicated that the locations of the facilities would avoid environmentally sensitive areas including but not limited to, wetlands, public lands, native plant communities, and historic sites. Resources within the substation potential siting areas are summarized in Chapter 14.

3.2.4.1 Garvin Substation

The Garvin Substation would be the southern endpoint of the transmission line in Lyon County, Minnesota. This substation would be located approximately 1 mile north of the town of Garvin, south/southeast of the intersection of U.S. Highway 14 and U.S. Highway 59. The Garvin Substation would facilitate the interconnection of renewable resources to that substation.

The Garvin Substation would be approximately 40 acres in size and include the installation of two 116/-58 megavolt amp of reactive power (MVAR) synchronous condensers, shunt reactors, breakers, switches, continuously variable transmissions (CVTs), arresters, and bus work. A control building and road access would also be constructed at the site. The applicant secured purchase options with two landowners for a total of 160 acres that could be used for selecting the final 40–acre substation site to provide siting flexibility and setbacks from residences and to accommodate interconnections from future wind generation in the area.

3.2.4.2 Intermediate Substation

The intermediate substation would be approximately 20 miles north of the Garvin Substation. The intermediate substation would occupy an approximately 20-acre footprint and facilitate the interconnection of renewable resources to that substation. A control building and road access would also be constructed at the site. The applicant would seek to purchase property that is approximately 40 to 80 acres in size to accommodate the substation footprint and additional acreage that might be needed for future line connections, including connections for new generators.

3.2.4.3 Support Substation

The support substation would be a new 345 kV voltage substation approximately 80 miles south of the Sherco Solar West Substation, near the approximate midpoint of the transmission line. For this substation, the applicant-proposed to include a Series Capacitor and one 150 MVAR static synchronous compensator (STATCOM) system per line. Selection of voltage support equipment would be dependent on the technologies available at the time of construction and the resources selected to interconnect to the line. A control building and road access would also be constructed at the site. The support substation footprint would be approximately 30 acres in size. The applicant would seek to purchase property that is approximately 40 to 80 acres in size to accommodate the substation footprint and additional acreage that might be needed for transmission line connections.

3.2.4.4 Sherco Solar West Substation

The Sherco Solar West Substation, owned by the applicant, is the northern endpoint of the proposed double circuit 345 kV transmission line. This substation is located just outside the city of Becker, adjacent to the applicant's Sherco Solar West solar facility and interconnects the solar facility with the Sherco Substation via the Sherco Solar West 345 kV transmission line (Line 5651).

To accommodate this project, the Sherco Solar West Substation would require expansion entirely on applicant property and installation of new substation equipment such as: breakers, switches, CVTs, arresters, and bus work. The project would connect the Sherco Solar West Substation and the Sherco Substation via the proposed Green Route Segment, which is proposed to be a new second circuit to be added to existing Line 5651. This interconnection is accounted for within the requested route width (Section 3.3.1).

3.2.4.5 Sherco Substation

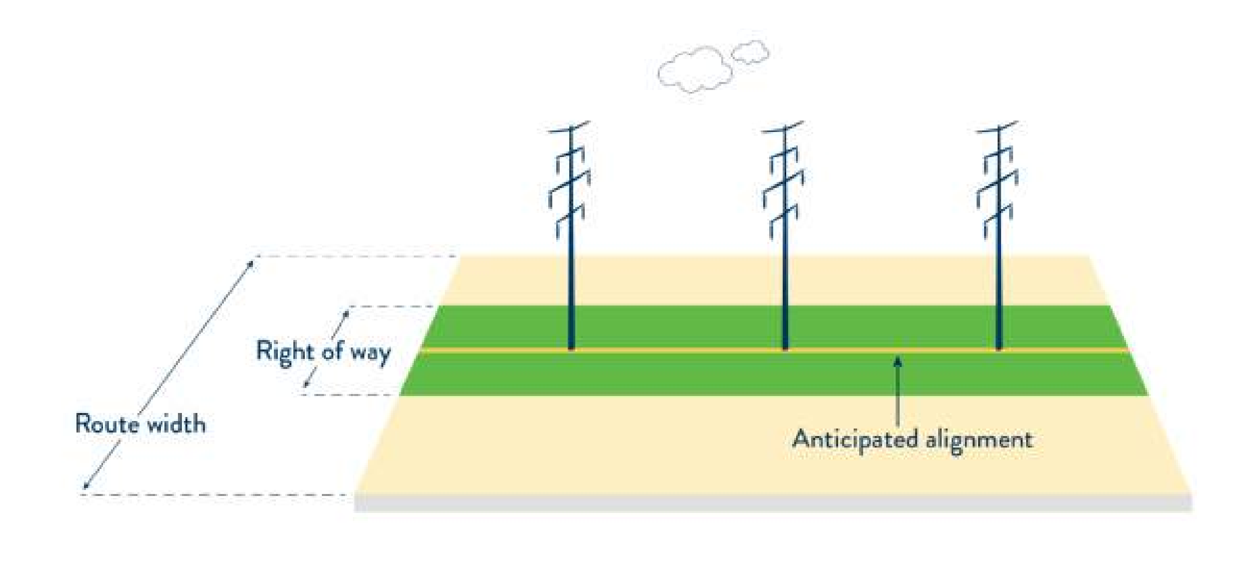
Modifications at the Sherco Substation would also be necessary to accommodate termination of the second circuit between Sherco and Sherco Solar West Substations as part of this project. However, no expansion would be required as all additional equipment would be installed within the existing fence line of the Sherco Substation.

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 3-4. The route width, in combination with the anticipated alignment, is intended to balance flexibility and predictability.

Figure 3-4 Route Width, Right-of-Way, and 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 of such 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 address engineering issues that could arise after a permit is issued. A route should be wide enough to provide flexibility for the permittee to work with landowners to address concerns and to address engineering issues that could arise after a route permit is issued.

For this project, except as otherwise noted below, the applicant generally requested a route width of 1,000 feet for the Purple and Blue Routes and the route connectors. Additional route widths were requested as summarized below.

- **Garvin Substation, intermediate substation, and support substation**. The applicant requested an additional route width between 0.5 mile and up to 1.25 miles surrounding the locations of the new substations to provide flexibility in substation location and routing the lines in and out of the substations. In other words, these wider route widths correspond to the approximate locations where the new substations would be sited.
- **Conservation Easements and Natural Resources.** To allow for greater flexibility to avoid known conservation easements and their associated natural resources features during final design, the applicant requested an additional route width between 0.32 mile and up to 1.25 miles in two locations with state conservation easements present.
    - Route Segment B4 is a subpart of the Blue Route and is one of the areas that the applicant requested additional route width to allow for flexibility around a conservation easement.

- Route Segment C1 is a subpart of the Purple Route and is the second area that the applicant requested additional route width to allow for flexibility around a conservation easement.

- For the **Green Route Segment**, the applicant requested a route width of 150 feet, which corresponds to the 150-foot ROW of its existing transmission line (Line 5651).

Map 4 illustrates where the route width deviates from the 1,000-foot-wide requested route width, and Table 3-20 summarizes the variations in the widths requested as part of the route permit application. For the new substations, resources within the additional route width are summarized in Chapter 14. Where additional route width was requested to accommodate avoiding conservation easements, resources are considered as part of the route widths in Chapter 7 (Region B) and Chapter 8 (Region C).

Table 3-20 Summary of Route Width Variations

Explanation for Additional Route Width	Route Width (miles) [1]	EIS discussion
Garvin Substation siting area	0.48	Section **14.2**
Intermediate substation siting areas Options A and B (Purple Route) [2] Options C through E (Route Segment B2) Option F (Blue Route) [4] Option G (Blue Route) [5]	 1.25 .09 – 1.3 [3] 1.01 1.25	Section 14.4
Support substation siting area Option A (Purple Route) [6] Option B (Blue Route) [7]	 0.50 1.25	Section 14.5
Conservation Easement (Route Segment B4 Area One) [8]	1.25	Chapter **7**
Conservation Easement (Route Segment B4 Area Two) [9]	0.80	Chapter **7**
Conservation Easement (Route Segment C1) [10]	0.32	Chapter **8**

[1] Measured from the widest point of the requested route width.
[2] In the route permit application, the applicant referred to intermediate substation siting areas Options A and B as Purple 4 and Purple 3, respectively.
[3] The route width for Option C is .09 miles wide, Option D is 2 miles wide, and Option E is 1.3 miles wide.
[4] In the route permit application, the applicant referred to the intermediate substation siting area Option F as Blue 4.
[5] In the route permit application, the applicant referred to the intermediate substation siting area Option G as Blue 3.
[6] In the route permit application, the applicant referred to support substation siting area Option A as Purple 1.
[7] In the route permit application, the applicant referred to support substation siting area Option B as Blue 1.
[8] In the route permit application, the applicant referred to this area as Blue 5.
[9] In the route permit application, the applicant referred to this area as Blue 2.
[10] In the route permit application, the applicant referred to this area as Purple 2.

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 3.3.2.1.

The applicant indicated that the new double circuit 345 kV transmission line facilities would require a 150-foot-wide ROW. When paralleling existing road rights-of-way, the applicant-proposed to place structures on adjacent private property, at approximately a 10-foot offset from the existing road ROW, subject to easements with landowners, as well as road authority design requirements that could affect the offset distance. In areas where a 10-foot offset is not feasible, structures could be placed inside road rights-of-way subject to the road authority's utility accommodation policy. These structure placements allow the transmission line ROW to share existing road rights-of-way to the greatest extent feasible and could reduce the overall size of the easement required from a private landowner. Structure placement and offset distances could vary in areas such as highway interchanges due to county or state design requirements and in areas of planned future road expansion. Data pertaining to ROW paralleling is presented in Section 5.7.

The Green Route Segment would not require any additional ROW. The applicant indicated that it does not currently anticipate that any construction or relocation would be necessary on any existing transmission lines crossed by the new double circuit 345 kV transmission line. At the time of final design of the project, the applicant might determine that short segments of existing transmission lines crossed by the new transmission line or at substations might need to be relocated or reconstructed to maintain NESC and applicant design criteria and clearances. If such lines are not owned by the applicant, the company will coordinate with the transmission line owner. Likewise, the applicant will coordinate with any distribution line owners regarding relocation, as applicable.

3.3.2.1 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. The rights would consist primarily of permanent electric transmission easements, providing a 150-foot-wide easement area. In addition, there would be ancillary rights, including access (temporary and permanent) and construction workspace, as necessary to support construction and ongoing operation and maintenance.

Prior to contacting these landowners, the applicant would conduct a title search to identify persons and entities that have a recorded interest in the affected real estate. Once ownership has been determined, a ROW agent would contact each landowner. The applicant and its agent would identify the owners of lands from which rights are needed and then engage with the individual owners, or their representative, about the project, the specific rights that are to be acquired, and other issues related to the project's design, construction, operation, or maintenance. These initial contacts with landowners could also involve requests from applicant or its agent to enter the owner's property to conduct survey activities beneficial to the design, routing, and/or permitting processes. The applicant would also discuss with the landowner where the structure(s) would be located on the property, as well as the boundaries of the easement. The location of the proposed transmission line could be staked with the permission of the landowner.

The ROW agent would collect area land value data to determine the amount of compensation to be paid for the rights to construct, operate, and maintain the transmission line in the easement. Based on this data, a fair market value offer would be developed, necessary documents to acquire the easement would be prepared, and an offer made to the landowner. In most cases, the applicant and owners reach voluntary easement (or other) agreements. Sometimes, however, despite good faith efforts at resolution, the applicant and owners are unable to reach a voluntary agreement. If a negotiated settlement could not be reached with a landowner, the applicant may acquire an easement through the exercise of the power of eminent domain pursuant to Minnesota Statute § 117. The process of exercising the power of eminent domain is called condemnation.

Before commencing condemnation, the applicant would provide the landowner with a copy of each appraisal it had obtained for the property interests to be acquired. To begin 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 of the property. Owners of interests in the lands identified in the petition are provided with service of the applicant's filings and notice of the hearings that the district court will conduct to determine whether to grant the petition and other relief sought by the applicant.

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 to a jury that will 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; this statute would likely apply to the project. 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.

In addition, owners who make Buy-the-Farm elections that are accepted as valid by the applicant or ruled valid by the district court may receive other rights or benefits applicable under Minnesota Statute § 117.

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.

The applicant developed a likely alignment for the Purple Route and the Blue Route and referred to it as the "anticipated alignment" throughout the route permit application. Similarly, the route alternatives proposed during scoping also include assumed anticipated alignments.

After coordinating with landowners and completing detailed engineering plans, the applicant would establish the final alignment for the project and designate structure 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 project construction.

3.4 Construction and Maintenance Procedures

Project construction would not begin until all necessary federal, state, and local approvals have been obtained, easements have been acquired for rights-of-way, and final plans and profiles have been approved by the Commission. 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 will follow standard maintenance procedures.

3.4.1 Construction Staging Areas/Laydown Yards

Construction staging areas/laydown yards are usually established for transmission projects. For the project, the applicant could establish new staging areas/laydown yards and/or might use existing staging areas/laydown yards. Staging areas/laydown yards are typically 20 to 30 acres in size and located near major roads. Construction of the project would likely include two to five existing or new staging areas. Staging involves delivering the equipment and materials necessary to construct the new transmission line facilities. Structures are delivered to staging areas and materials are 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 corridor. 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

Construction crews would begin preparing the ROW by clearing vegetation to comply with NESC standards (that is, trees and other tall-growing vegetation would be removed), to allow for safe, debris-free access to the construction site.

The applicant indicated they would design the transmission line structures for installation at existing grades, meaning soil grading for installing structures would be minimal. In certain areas (typically on slopes exceeding 10 percent), working areas could be graded or leveled with fill to create a safe working area around the structure location. If acceptable to the landowner, the applicant proposes to leave the graded/leveled areas after construction to allow access for future maintenance activities. If not acceptable to the landowner, 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 exist near the permitted route. In most cases, the applicant anticipates that construction activities can be limited to the easement area. In certain circumstances, additional off-easement access could be required. Permission would be obtained from landowners prior to using off-easement access.

Improvements to existing access or construction of new access could be required to accommodate construction equipment. Field approaches and roads could 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. The applicant would be required to comply with requirements of its Stormwater Pollution Prevention Plan (SWPPP) and Vegetation Management Plan (VMP), as provided in the applicant's route permit application, to prevent the spread of invasive species.

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 set on wheeled or track-driven vehicles. Construction crews would attempt to use equipment, when opportunities are available, that minimize impacts to lands.

3.4.4.1 Foundation and Pole Installation

After ROW clearing and access preparation has been completed, existing facilities would be located and structure and foundation installation would begin. Most project structures would require a drilled pier, concrete foundation. Drilled pier foundations, which consist of large diameter concrete cylinders and reinforced steel, are typically between seven to ten feet in diameter and are typically 20 to 60 feet deep depending on soil conditions. An angle or dead-end structure could 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 would be 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 installed and bolted to the foundation.

Sections of transmission structures would be moved from staging areas and delivered to the foundation and assembled on site. Using a crane, the structure is lifted and placed then insulators and other hardware are attached.

For the substations, installation of concrete foundations and embedments for equipment would require the use of 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. 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 (global positioning system [GPS] boundary, soil depth) and graded to facilitate stabilization by revegetation. Subsoil would be removed, if necessary, to an acceptable pre-established and approved area for storage.

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 structures in the sensitive areas by spanning the feature. When it is not feasible to avoid traversing sensitive areas, BMPs such as use of construction matting to minimize equipment rutting, working in frozen ground conditions, and installing sediment and erosion control devices would be implemented in consultation with the appropriate agencies. Examples of erosion control devices which could be used are silt fence, straw bales, bio logs, and mulch.

3.4.4.2 Conductor Stringing

Conductor stringing is the last major component of transmission line construction. Stringing setup areas are typically located at two- to three-mile intervals. These sites are located within the ROW, when possible, or on temporary construction easements. Stringing operations require brief access to each structure to secure the conductor wire to the insulator hardware and the shield wire to clamps once final conductor sag, compliant with the applicant's procedures and minimum code clearances, is established. Stringing could be conducted by crane or by helicopter.

Where the transmission line crosses streets, roads, highways, or other energized conductors or obstructions, temporary guard or clearance structures might be installed before conductor stringing. The temporary guard or clearance structures precent conductors from obstructing traffic or contacting existing energized conductors or other cables during stringing operations and also protects the conductors from damage.

The electrical conductors would be strung on support structures using a pulley system or a tensioner mounted on the back of a digger/derrick truck. At road crossings, roads or lands might be temporarily closed for safety purposes when stringing electrical conductors between support structures. These closures could range in duration from minutes to hours based on the width of the road and the complexity of the crossing. Once an aerial crossing is completed, the road would be reopened to allow normal traffic flow.

3.4.4.3 Aerial Marker Installation

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

3.4.5 Restoration and Cleanup Procedures

The applicant indicates that 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 and in accordance with the VMP as provided in the applicant's route permit application. 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 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.

The applicant would compensate farmers for crops damaged during construction. The damaged area would be measured, yield determined in consultation with the farmer, and paid at current market rates.

Ground-level vegetation that is disturbed or removed from the ROW during project construction would be allowed to naturally reestablish to pre-construction conditions. Vegetation that is consistent with substation site operation outside the fenced area would be allowed to reestablish naturally at substation sites. Areas with significant soil compaction or other disturbance from construction activities would require additional assistance in reestablishing the ground-level vegetation 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 restore township, city, and county roads used for purposes of access during construction to their prior condition. The applicant would coordinate with township road supervisors, city road personnel, or county highway departments to document existing road conditions and 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

The applicant would be responsible for the operation and maintenance of this project. The applicant would perform annual aerial inspections of the 345 kV transmission lines and would inspect the lines from the ground approximately every four years. Typically, one to two workers are required to perform aerial inspections with drones, and three workers are required to perform the ground inspections; ground inspections are performed by both driving and walking. Any defects identified during these inspections would be assessed and corrected. The applicant would also perform necessary vegetation management for the line either through mechanical clearing or herbicide use, in accordance with the VMP as provided in the applicant's route permit application. Vegetation maintenance generally occurs every four years.

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 would be kept free of vegetation, and adequate drainage would be maintained.

The applicant indicated an approximately 60-year service life for the project and associated transmission assets. However, the applicant also noted that high voltage transmission lines are seldom completely retired.

3.4.6.1 Outages and Emergency Response

Transmission infrastructure has few mechanical elements and is built to withstand weather extremes that are normally encountered. With the exception of outages due to severe weather such as tornadoes and heavy ice storms, transmission lines rarely fail.

Transmission lines are automatically taken out of service by the operation of protective relaying equipment when a fault is sensed on the system. Such interruptions are usually only momentary. Scheduled maintenance outages are also infrequent. As a result, the average annual availability of transmission infrastructure is in excess of 99 percent.

However, unplanned outages of transmission facilities can happen for a variety of reasons. Unplanned outages can occur due to mechanical failures or severe weather like heavy ice, wind, and lightning. In the event an unplanned outage along the project occurs, the applicant would be responsible for returning the line to service. The applicant has indicated that it has the staff, equipment, and supplies to assess outages and return transmission lines to service with minimal downtime.

3.5 Project Costs

The applicant developed route-specific costs based on the estimates developed for the certificate of need application for a 160- to 180-mile-long route.

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 permitting and design; (4) transmission line and substation ROW acquisition; and (5) substation materials, permitting, design, and construction. Each of these components also includes a risk contingency and financing expenses

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 the Huntley-Wilmarth 345 kV Project, the construction of which was completed in October 2021. The applicant updated this data based on current market conditions and included a contingency factor. The estimate values are based on long straight alignments. The introduction of many corner structures and/or an alignment that jumps across features would increase costs. ROW cost estimates for the transmission line and substations were based on a 150-foot ROW for the transmission line and a needed space of 40 to 80 acres for each substation. The applicant considered actual costs from prior project acquisitions and approximated the number of easements required 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 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 certificate of need application, the applicant estimated that construction of the project, along with substation construction and all substation equipment, including STATCOMs and series compensation, at $1.14 billion. This estimate cost represents the sum of the expenditures over the life of the project and includes all transmission line areas, three new substations and modifications at Sherco Substation and Sherco Solar West Substation. Project costs include materials, construction, permitting and design costs, risk contingencies, finance costs, and ROW/land acquisition costs.

The transmission line is expected to cost approximately $3.8 million per mile (including land acquisition). Applying this per-line cost, the project costs as presented in the route permit application are as shown in Table 3-21.

Table 3-21 Overall Project Cost Estimates

Route Options	Purple Route / Green Route Segment Estimated Cost	Blue Route / Green Route Segment Estimated Cost
HVTL	$657 million	$668 million
Garvin Substation	$164 million	$164 million
intermediate substation	$24 million	$24 million
support substation	$255 million	$255 million
Sherco Substation Modifications	$12.2 million	$12.2 million
Sherco Solar West Substation Modifications	$9 million	$9 million
Green Route Segment	$6.6 million	$6.6 million
Total	**$1.128 billion**	**$1.139 billion**

Cost estimates for the connector segments identified by the applicant are shown in Table 3-22. These costs are the total costs for these connector segments. The applicant has not estimated the total route cost for a route using these connector segments. Using a similar cost-per-mile basis ($3.8 million per mile) for the transmission line and ROW cost noted above, the connector segments are estimated below:

Table 3-22 Route Connector Segment Costs

Connector Segment	Segment Length (miles)	Total Segment Cost
Connector A Route Connector 106	1.5	$5.7 million
Connector B Route Connector 105	1.0	$3.8 million
Connector C Route Connector 104	28.7	$109.1 million
Connector D Route Connector 101	8.1	$30.4 million

The applicant indicated that the annual inspections are the principal operating and maintenance cost. The aerial inspections cost approximately $35 to $55 per mile, and the 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.

3.6 Project Schedule

It is anticipated that the Commission will make decisions on the applicant's certificate of need and route permit applications in spring 2025. The applicant plans to complete permitting by the end of the second quarter of 2025, including all federal, state, and local agency permits. ROW clearing would begin in the third quarter of 2025, with construction also expected to begin at that time. The HVTL is anticipated to be operational in the third quarter of 2027, and the full project, including the support substation, is anticipated to be operational in the third quarter of 2031.

4 Alternatives to the Project

As described in Chapter 2, the Commission must determine whether the proposed project is needed or if another project or no project would be more appropriate. Other projects that could meet the purpose of this project are known as system alternatives.

4.1 Need for the Project

The project is a result of the applicant's approved 2020-2034 Upper Midwest Integrated Resource Plan (IRP) (Docket No. E002/RP-19-368). As part of the IRP, the applicant "will seek a certificate of need from the Commission to build . . . [an HVTL] from the retiring . . . Sherco facilities to connect to the regional grid operated by the Midcontinent Independent System Operator [(MISO)] (reference (8))." This HVTL must be designed to "permit new energy resources to connect to the transmission grid. (reference (2))

As explained by the applicant in their route permit application, the project "would deliver 1,996 megawatts (MW) of carbon-free energy generation to the Sherco Substation. The project will also enable the interconnection of more than 4,000 MW of carbon-free energy generation overall that will support the recently enacted '100 percent by 2040' law that, generally, sets a standard for public utilities to generate or acquire 100 percent of the energy for retail sales from carbon-free resources."

EERA staff refers to the Commission IRP Order (reference (2)) when defining the purpose of the project. The purpose of the project is to construct an HVTL to connect new energy sources to the MISO transmission grid at the location of the retiring Sherco coal-fired generator, that is, the Sherco Substation.

4.2 Feasibility of System Alternatives

The Commission issued a final scoping decision that includes the system alternatives to be studied in this EIS (Appendix A). The scoping decision was based on public comment. 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). Furthermore, Minnesota Rules 4410.2300(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."

Minnesota Rules 7849.1500 requires that the following system alternatives be considered for a proposed new HVTL:

- 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;
- Upgrading existing facilities;
- Generation rather than transmission; and
- Use of renewable energy sources.

Within these alternatives, the following specific system alternatives were identified during scoping and included by the Commission in its scoping decision:

- Construct an underground transmission line;
- Construct a new nuclear plant or natural gas plant at the retired Sherco coal-fired generator and interconnect into the existing Sherco Substation;
- Construct a new nuclear plant or natural gas plant closer to the Minneapolis—St. Paul metropolitan area and interconnect into the existing Sherco Substation; and
- Construct wind and solar generation closer to the Minneapolis—St. Paul metropolitan area and interconnect into the existing Sherco Substation.

4.2.1 No-build

Under the no-build alternative, the project would not be constructed. The no-build alternative is feasible and available; however, it does not address the need for the project. While other alternatives may help alleviate this gap, this option assumes no action, meaning no action of any type would be implemented. If the no-build alternative occurs, there would not be an alternate source of power to replace that which will be lost with retirement of the Sherco facilities. This would not allow for connection of new energy sources to the MISO grid, which could have adverse electrical reliability effects. The no-build alternative would avoid the potential impacts of the project as described in this EIS (Chapters 5 through 13).

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. Demand-side management is not feasible or available. Demand-side management would not connect new energy sources to the MISO transmission grid at the location of the Sherco Substation, as such it 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 instead purchase power to meet the purpose of the project. EERA staff believes this alternative is available. However, without the project, EERA staff is unaware of how the purchased power would reach the Sherco Substation. As such, this alternative would not meet the purpose of the project and is therefore unfeasible.

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 applicant's stated need to connect new energy sources to the MISO transmission grid at the location of the Sherco Substation in time to interconnect more than 4,000 MW of renewable energy generation in support of the recently enacted '100 percent by 2040' law. Should later timing still support the "100 percent by 2040" law, the potential impacts in Chapter 5 would still occur. However, given the later date, greater human and agricultural impacts could occur with increased development and costs would be expected to increase.

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

The project could be replaced with a 230 kV transmission line. Staff understands that because a 230 kV transmission line would operate at thermal operating limits line losses would be more than double a comparable 345kV option. This would cause system instability due to the line impedance. Thus, a 230 kV alternative is not feasible. The project could also be replaced with a double circuit 500 kV transmission line. This option would cost more but would be feasible and available.

4.2.4.2 HVTL of a Different Type

The proposed aboveground HVTL could be replaced with a new underground transmission line that interconnects to the Sherco Substation. This alternative is not feasible or available for the reasons discussed below. 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 proposed project.

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 are also 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.

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.

4.2.5 Upgrading Existing Facilities

In its most recent Integrated Resource Plan, and as noted in the route permit application, the applicant "proposed retirement dates for its remaining Sherburne County Generation Station (Sherco) coal units in the IRP proceeding. The Commission generally agreed, directing the applicant to retire Sherco Unit 3 by 2030. Previously, in connection with the applicant's 2016-2030 IRP, the Commission approved the applicant's plan to retire Sherco Units 1 and 2 in 2026 and 2023, respectively" (footnotes omitted). Therefore, upgrading the existing facility is neither feasible nor available given the planned closing of the coal-fired facility.

4.2.6 Generation rather than Transmission

Scoping commenters suggested replacing the coal-fired generation at Sherco with either nuclear or natural gas-fired generation either at the existing applicant-owned Sherco property or closer to the Minneapolis—St. Paul metropolitan area.

4.2.6.1 Modified Generation at Sherco

4.2.6.1.1 Nuclear

Several commenters suggested replacing the coal-fired generating plant at Sherco with nuclear generation. The applicant already operates two nuclear generating plants in Minnesota – the Monticello and Prairie Island plants. However, this alternative is not feasible or available. Minnesota has had a moratorium on the construction of new nuclear power facilities since 1994. Minnesota Statute 216B.243, subdivision 3b provides that the Commission "may not issue a certificate for the construction of a new nuclear-powered electric generating plant." A new nuclear plant would require legislative changes to the existing moratorium.

4.2.6.1.2 Natural Gas

Commenters suggested replacing coal-fired generation at Sherco with natural gas generation that would interconnect to the Sherco Substation. A change in generation would require construction of an entirely new facility. The applicant indicates that it is required by the IRP order to acquire 600 MW of solar and 2,150 MW of wind generation and that natural gas is not a replacement for that generation type. EERA staff does not disagree; however, given the purpose of the project as stated in the scoping decision (Appendix A), this system alternative meets the purpose of the project to interconnect new generation sources to the Sherco Substation.

4.2.6.2 Generation Closer to Minneapolis—St. Paul

4.2.6.2.1 Nuclear

Several commenters suggested constructing a nuclear-powered generating plant near the Minneapolis—St. Paul metropolitan area and interconnecting that new power plant to the Sherco Substation with a new transmission line. As discussed above, this alternative is not feasible or available. Minnesota has had a moratorium on the construction of new nuclear power facilities since 1994. A new nuclear plant would require legislative changes to the existing moratorium.

4.2.6.2.2 Natural Gas

Replacing coal-fired generation at Sherco with a new natural gas generation facility closer to Sherco and the Minneapolis—St. Paul metropolitan area, that interconnects to the Sherco Substation, is another alternative. This alternative is both feasible and available.

The applicant indicates that it is required by the IRP order to acquire 600 MW of solar and 2,150 MW of wind generation and that natural gas is not a replacement for that generation type. EERA staff does not disagree; however, given the purpose of the project as stated in the scoping decision (Appendix A), this system alternative meets the purpose of the project to interconnect new generation sources to the Sherco Substation.

4.2.7 Use of Renewable Energy Sources

4.2.7.1 Generation at Sherco

Replacing coal-fired generation at Sherco with additional solar and/or wind powered generation at Sherco is an alternative. This alternative is neither feasible nor available.

A change in generation would require construction of an entirely new facility. The applicant is already developing solar projects at Sherco to maximize renewable generation in close proximity the substation. Construction of the 460 MW Sherco Solar project is underway, serving as a renewable replacement for most of the capacity of the first coal unit retired at the nearby Sherco plant. Construction of the 250 MW Sherco Solar 3 Project near Sherco is scheduled to begin in the third quarter of 2024. The combined projects' 710 MW capacity is projected to replace the capacity of the Sherco plant's first retired coal unit.

The applicant indicates that it is required by the IRP order to acquire 600 MW of solar and 2,150 MW of wind generation. Siting approximately 600 MW of solar and/or 2,150 MW of wind at Sherco is not feasible due to space and resource limitations. Available land for renewable development at Sherco has already been permitted for solar generation.

4.2.7.2 Generation Closer to Minneapolis—St. Paul

Replacing coal-fired generation at Sherco with additional solar and wind powered generation closer to Sherco and the Minneapolis—St. Paul metropolitan area, that interconnects to the Sherco Substation, is an alternative. This alternative is feasible and available.

To site the full amount of renewable generation that will interconnect to Sherco in an area closer to Sherco and the Minneapolis—St. Paul metropolitan area is challenging due to existing development, natural resource constraints, suitable contiguous land acreage, and the quality of the wind resource.

Siting wind generation close to Sherco and the Minneapolis—St. Paul metropolitan area is difficult due to existing land use constraints and the relatively low-quality wind resource in the area. Thus, much of this alternative would need to be solar generation.

Solar generation could be constructed, and the technologies analyzed have been constructed in Minnesota. Utilities and independent generation developers can successfully construct and operate such facilities.

4.3 Potential Human and Environmental Impacts of System Alternatives

4.3.1 No-build

Under the no-build alternative, the applicant would not be able to reuse its existing interconnection rights at Sherco, deliver 1,996 MW of renewable energy generation to the Sherco Substation, or interconnect more than 4,000 MW of renewable energy generation in support of the recently enacted '100 percent by 2040' law. Overall congestion on the electrical transmission grid as described by the applicant would continue, and additional renewable generation would be adversely affected. The no-build alternative would avoid the potential impacts of the project as described in this EIS (Chapters 5 through 13).

4.3.1.1 Human Settlement Impacts

There would be no direct human impacts as a result of this alternative. The no-build alternative would avoid the potential impacts of the project For example, the existing landscape would remain unchanged avoiding aesthetic impacts and associated recreational and property value impacts. Existing land use and the agricultural land-based economy would remain unchanged. The local economies would also not be subject to increased expenditures from workers leveraging local businesses during construction. Human health and safety impacts would be avoided, and noise levels would remain the same.

4.3.1.2 Archaeological and Historic Resources

Archaeological and historic resources would not be subject to impacts.

4.3.1.3 Environmental Impacts

Likewise, there would be no direct environmental impacts as a result of this alternative as the no-build alternative would avoid potential impacts of the project. Vegetation, surface waters, wetlands, wildlife habitat, and wildlife would not be subject to impacts.

4.3.2 Transmission Line of a Different Size

Construction of a 500 kV transmission line would require larger structures and a wider ROW, resulting in greater human and environmental impacts than those associated with the project. In addition to the potential impacts identified in Chapter 5, a larger transmission line and wider ROW could have the following additional impacts.

4.3.2.1 Human Settlement Impacts

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

- Aesthetics: Aesthetic impacts are subjective and difficult to measure. However, the taller structures and wider ROW associated with constructing a 500 kV transmission line would presumably be more visible on the landscape. In addition, the larger space needed could limit opportunities for ROW paralleling and/or sharing, which can minimize aesthetic impacts.
- Displacement: The wider ROW associated with constructing a 500 kV transmission line 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 500 kV transmission line could potentially affect more acreage of agricultural lands and be more disruptive to center pivot irrigation systems or aerial spraying. In addition, the larger space needed could limit opportunities for ROW paralleling and/or sharing, which could introduce further constraints on farming 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 500 kV 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 500 kV transmission line are anticipated to be short-term, with increased expenditures from workers leveraging local businesses during construction.

4.3.2.2 Archaeological and Historic Resources

The wider ROW associated with constructing a 500 kV transmission line could potentially affect more archaeological and historic resources due to a larger area of potential effect.

4.3.2.3 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 500 kV transmission line 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 500 kV transmission line 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 500 kV transmission line 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 500 kV transmission line 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 500 kV transmission line 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 500 kV transmission line 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.

4.3.3 Generation rather than Transmission – Natural Gas

In the applicant’s 2019 IRP, the Commission determined that the applicant needed to acquire 600 MW of solar and 2,150 MW of wind, thus natural gas generation is not an alternative to renewable generation, but rather a means to facilitate the ongoing transition to clean energy.

4.3.3.1 Human Settlement Impacts

The following factors of the human environment have the potential to be affected by considering natural gas generation rather than transmission:

- Aesthetics: Aesthetic impacts are subjective and difficult to measure. However, construction of a natural gas generation facility would introduce a new visual intrusion on the landscape. Aesthetic impacts would be less and more localized compared to a 170-mile HVTL.
- Displacement: A natural gas generation facility and shorter HVTL to connect to Sherco would have less potential for displacement compared to a long, linear feature.
- Human health and safety: A natural gas generation facility and shorter HVTL to connect to Sherco would introduce less EMF into the landscape or over a lesser area when compared to a 170-mile HVTL.
- Land-based economies, agriculture: The more localized impacts of a natural gas generation facility and shorter HVTL to connect to Sherco would be of a lesser intensity compared to a 170-mile HVTL. A smaller acreage facility would also decrease the potential for disruption to center pivot irrigation systems or aerial spraying.
- Land use and zoning: The more localized impacts of a natural gas generation facility and shorter HVTL to connect to Sherco would be of a lesser intensity compared to a 170-mile HVTL.
- 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 natural gas generation facility is expected to meet state noise standards. Noise impacts would more localized compared to a 170-mile HVTL.
- Property values: Impacts to property values would be more localized for a natural gas generation facility compared to a 170-mile HVTL.
- Recreation: Impacts to recreational resources would be more localized for a natural gas generation facility compared to a 170-mile HVTL.
- Socioeconomics: The socioeconomic factors related to constructing a natural gas generation facility are anticipated to be both short- and long-term. Short-term effects include increased expenditures from workers leveraging local businesses during construction. Long-term effects include a potential economic boost from local jobs created to staff operation and maintenance of a new natural gas generation facility. Construction of a 170-mile HVTL would bring socioeconomic benefits to more communities compared to a more localized natural gas generation facility.

4.3.3.2 Archaeological and Historic Resources

Potential impacts to archaeological and historic resources would be more localized for a natural gas generation facility compared to a 170-mile HVTL.

4.3.3.3 Environmental Impacts

The following factors of the natural environment have the potential to be affected by considering natural gas generation rather than transmission. It is anticipated that a natural gas generation facility could be sited to avoid impacts to many types of sensitive and/or protected environmental resources.

- Air Quality: An operational natural gas generation facility would be expected to implement design criteria to abide by Minnesota state air quality standards and obtain the appropriate permits. An HVTL and its substations would not require an air permit.
- Greenhouse Gasses: Greenhouse gas emissions associated with construction of a natural gas generation facility are anticipated to be similar to those discussed in Section 5.6.4.2.
- Public and Designated Lands: Impacts to public and designated lands would be more likely to be avoided compared to a 170-mile HVTL.
- Rare and Unique Natural Resources: Impacts to rare and unique natural resources would be more likely to be avoided compared to a 170-mile HVTL.
- Surface Water: Construction of a natural gas generation facility could introduce large areas of impervious surfaces into the landscape. Introduction of impervious surfaces generally yields higher volumes and faster rates of stormwater runoff, which can compromise water quality of surface waters. Construction of such a facility would require compliance with state NPDES requirements to minimize impacts to surface waters and would be anticipated to be similar to the new substations proposed as part of the project.
- Vegetation: Impacts to vegetation would be of a lesser intensity compared to a 170-mile HVTL.
- Wetlands: Impacts to wetlands would be more likely to be avoided compared to a 170-mile HVTL.
- Wildlife and Wildlife Habitat: Impacts to wildlife and wildlife habitat would be of a lesser intensity compared to a 170-mile HVTL.

4.3.4 Renewable Generation Closer to Minneapolis—St. Paul

In the applicant's 2019 IRP, the Commission determined that the applicant needed to acquire 600 MW of solar and 2,150 MW of wind. This alternative would not provide for the addition of 2,150 MW of wind generation, although some wind generation might occur. Siting wind generation close to Sherco and the Minneapolis—St. Paul metropolitan area is difficult due to existing land use constraints and the relatively low-quality wind resource in the area. Thus, much of this alternative would need to be solar generation.

4.3.4.1 Human Settlement Impacts

The following factors of the human environment have the potential to be affected by considering construction of renewable generation (such as a combination of solar or wind farms) with a shorter HVTL to connect to Sherco closer to Minneapolis—St. Paul:

- Aesthetics: Aesthetic impacts are subjective and difficult to measure. However, constructing a wind farm results in alteration of the visual landscape by introducing potentially hundreds of turbines across a large geography. Constructing a solar farm would have visual impacts over an expansive area; however, impacts would be limited to the immediate area of the solar farm as solar panels are not as tall as wind turbines or transmission lines. Aesthetic impacts from transmission lines used to interconnect these projects to the Sherco Substation would occur.
- Displacement: A solar or wind generation facility closer to Minneapolis-St. Paul with a shorter HVTL to connect to Sherco would have less potential for displacement compared to a long, linear

feature. However, transmission lines would be needed to interconnect these projects; therefore, potential impacts could be greater given the proposed project does not displace any residences.

- Human health and safety: A solar or wind generation facility closer to Minneapolis-St. Paul with a shorter HVTL to connect to Sherco could introduce less EMF into the landscape or over a lesser area when compared to a 170-mile HVTL. However, transmission lines would be needed to interconnect these projects; therefore, total impacts could be similar for both options.
- Land-based economies, agriculture: Multiple facilities would be needed that could impacts agricultural production, future development, etc. Facilities near Minneapolis—St. Paul would be more heavily solar focused impacting more land and taken out of agricultural production for 30 years whereas in southern Minnesota these facilities would be more heavily wind focused impacting less land. Transmission lines would be needed to interconnect these projects; therefore, total impacts could be similar for both options.
- Land Use and Zoning: Construction of a solar or wind generation facility closer to Minneapolis-St. Paul with multiple shorter HVTLs to connect to the Sherco Substation would require commitment of large parcels of land, which might not be available in sufficient size in proximity to Minneapolis—St. Paul.
- 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. Operation of wind and solar facilities is expected to generate noise and would require implementation of design criteria to comply with state noise standards. Noise impacts would more localized compared to a 170-mile HVTL. Both wind and solar facilities would be anticipated to comply with state noise standards thus total impacts would be similar for both options.
- Property values: Impacts to property values from wind and solar generation facilities could occur. Shorter, and perhaps, smaller HVTLs to interconnect these facilities might impact less parcels than a 170-mile HVTL.
- Recreation: Impacts to recreational resources would be more localized for a solar or wind generation facility closer to Minneapolis-St. Paul with a shorter HVTL to connect to Sherco compared to a 170-mile HVTL. Impacts would be highly dependent on recreational resources near solar or wind facilities. Traffic related impacts during construction could be greater for solar and wind generation facilities given a higher density of traffic concentrated in a localized area compared to a 170-mile HVTL.
- Socioeconomics: The socioeconomic factors related to constructing solar or wind generation facility closer to Minneapolis-St. Paul with a shorter HVTL to connect to Sherco are anticipated to be both short- and long-term. Short-term effects include increased expenditures from workers leveraging local businesses during construction. Long-term effects include a potential economic boost from local jobs created to staff operation and maintenance of a new natural gas generation facility. Construction of a 170-mile HVTL would bring socioeconomic benefits to more communities compared to a more localized natural gas generation facility. Construction of the solar and wind

generation facilities could bring socioeconomic benefits toto the region and away from southern Minnesota.

4.3.4.2 Archaeological and Historic Resources

Potential impacts to archaeological and historic resources would be more localized for wind and solar facilitiesy closer to Minneapolis-St. Paul with potentially a shorter total length of HVTL to connect to the Sherco Substation compared to the 170-mile project. In both scenarios, resources would be anticipated to be largely avoided.

4.3.4.3 Environmental Impacts

The following factors of the natural environment have the potential to be affected by considering constructing renewable generation closer with a shorter HVTL to connect to Sherco to Minneapolis—St. Paul. It is anticipated that such a facility could be sited to avoid impacts to many types of sensitive and/or protected environmental resources.

- Air Quality: Impacts associated with constructing wind and solar facilities closer to Minneapolis-St. Paul with potentially shorter HVTLs to connect to the Sherco Substation are anticipated to be similar to those discussed in Section 5.6.1.2 during construction. Operations would be expected to implement design criteria to abide by Minnesota state air quality standards.
- Greenhouse Gasses: Greenhouse gas emissions associated with constructing wind and solar facilities closer to Minneapolis-St. Paul with potentially shorter HVTLs to connect to the Sherco Substation are anticipated to be similar to those discussed in Section 5.6.4.2.
- Public and Designated Lands: Impacts associated with constructing wind and facilities closer to Minneapolis-St. Paul with potentially shorter HVTLs to connect to the Sherco Substation are anticipated to be similarto the proposed 170-mile project as designated lands could potentially be avoided.
- Rare and Unique Natural Resources: Impacts associated with constructing wind and solar facilities closer to Minneapolis-St. Paul with potentially shorter HVTLs to connect to the Sherco Substation are anticipated to be similar or less as these resources would be more likely to be avoided compared to the 170-mile project.
- Surface Water: Impacts associated with constructing wind and solar facilities closer to Minneapolis-St. Paul with potentially shorter HVTLs to connect to the Sherco Substation are anticipated to be similar or less than the proposed 170-mile project as proposers would seek to limit potential impacts to surface waters.
- Vegetation: Impacts associated with constructing wind and solar facilities closer to Minneapolis-St. Paul with potentially shorter HVTLs to connect to the Sherco Substation are anticipated to be similar to the proposed 170-mile project as all projects would be revegetated. Solar projects could be revegetated with native vegetation.

- Wetlands: Impacts associated with constructing wind and solar facilities closer to Minneapolis-St. Paul with potentially shorter HVTLs to connect to the Sherco Substation are anticipated to be similar to the proposed 170-mile project as proposers would seek to avoid wetland areas.
- Wildlife and Wildlife Habitat: Impacts associated with constructing wind and solar facilities closer to Minneapolis-St. Paul with potentially shorter HVTLs to connect to the Sherco Substation are anticipated to be similar or less than the proposed 170-mile project as wildlife habitat near the metropolitan area is likely of lower quality than more rural locations. Impacts would be more localized.

5 Affected Environment, Potential Impacts and Mitigation Overview

This chapter provides an overview of the human and environmental resources that could be affected by the project. It discusses, in a general way, 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.

This chapter has two purposes. First, it provides the reader with a general understanding of the resources in the project area and the specific ways in which these resources could be impacted by the project. Second, it prepares the reader for Chapters 6 through 13 which discuss potential impacts relative to the route alternatives for the project. Detailed tables summarizing the data used for impact analyses discussed in Chapters 6 through 12 are included in Appendix E.

As indicated in Chapter 3, the project area was broken up into regions for analysis purposes (Chapters 6 through 12). Chapter 13 summarizes potential impacts for the Green Route Segment. Chapter 14 summarizes potential impacts relative to the substations.

5.1 Describing Potential Impacts and Mitigation

Potential impacts are measured on a qualitative scale based on an expected impact intensity level; the impact intensity level takes mitigation into account.

A potential impact is the anticipated change to an existing condition caused either directly or indirectly by the construction and operation of a proposed project. Potential impacts can be positive or negative and short- or long-term. Impacts vary in duration and size, by resource, and across locations. In certain circumstances, potential impacts can accumulate incrementally, meaning that impacts from the project would be in addition to on-the-ground impacts already occurring.

Direct impacts are caused by the proposed action and occur at the same time and place. An indirect impact is caused by the proposed action but is further removed in distance or occurs later in time. This EIS considers direct and indirect impacts that are reasonably foreseeable, which means a reasonable person would anticipate or predict the impact. Cumulative potential effects (Chapter 15) are the result of the incremental impacts of the proposed action in addition to other projects in the environmentally relevant area.

5.1.1 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 describes quantitatively, for example, the number of impacted acre 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.

5.1.2 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 is 150-feet-wide (75 feet on each side of the anticipated alignment) and is described in Section 3.3.2.
- **Route Width –** the route width is generally 1,000-feet wide (500 feet on each side of the anticipated alignment). The route width of the anticipated alignment varies (Section 3.3.1) for the substations, to accommodate conservation easements, and for the Green Route Segment (Section 3.3.1).
    - The additional route width requested by the applicant to accommodate conservation easements is reflected in the analysis for the route alternatives.
    - The additional route width to accommodate the work to occur at substations is reflected in the summary of potential impacts for the substations in Chapter **13**.
    - The route width requested by the applicant (150-feet-wide) for the Green Route Segment is reflected in the analysis specific to the Green Route Segment (Chapter **14**).
- **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)

- **Ten-county area** – term used to collectively describe the ten counties in which the route alternatives are located (including Lyon, Redwood, Yellow Medicine, Renville, Chippewa, Kandiyohi, Meeker, Stearns, Wright, and Sherburne counties).

Table 5-1 Regions of Influence

Resource Type	Resource Element	Region of Influence
Human settlement	Aesthetics	Local vicinity
	Cultural values	Ten-county area
	Displacement	ROW
	Environmental justice	Route width
	Land use and zoning	ROW
	Noise	Local vicinity
	Property values	Local vicinity
	Recreation	Route width
	Socioeconomics	Ten-county area
	Transportation and Public Services	Roadways and rail – local vicinity Public utilities – ROW Emergency services – ten-county area Airports – project area
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	Ten-county area
	Geology and topography	ROW
	Greenhouse Gases	ROW
	Groundwater	ROW
	Public and designated lands	Route width
	Rare and unique natural resources	Protected species - project area Sensitive ecological resources – route width
	Soils	ROW
	Surface water	Route Width
	Vegetation	ROW
	Wetlands	Route width
	Wildlife (except birds)	Route width
	Wildlife (birds)	Local vicinity
	Wildlife habitat	Route width

5.2 Human Settlement

Transmission lines have the potential to negatively impact human settlements through a variety of means. Transmission line structures and conductors could change the aesthetics of an area, displace homes or businesses, introduce new noise sources, lower property values, be incompatible with local zoning, and/or interfere with electronic communications.

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 route 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.

5.2.1 Aesthetics

The ROI for aesthetics is the local vicinity. 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 ROW paralleling.

5.2.1.1 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. 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.

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 corridors, road, railways, pipelines).

Throughout the project area the topography is generally flat, with areas of rolling plains. The vegetation is primarily uniformly low, which could cause some areas to be more susceptible to visual disruptions. There are watercourses (streams and rivers) in the project area that create some diversity in landscape. Rural residences and farmsteads are scattered across the project's viewshed and along rural county roads.

There are several municipalities that are near (within five miles) the route alternatives (Map 2); outside of this, the project primarily consists of open space that is mostly used for agricultural purposes. Viewsheds in the agricultural areas are generally broad and uninterrupted except for existing infrastructure (for example – roads).

Horizontal elements, such as highways and county roads, are consistent with the long and open viewsheds along most of the open spaces within the project area. Vertical elements such as HVTLs and wind turbines are visible from considerable distances and are the tallest and most dominant visual feature on the landscape where present. Wind turbines and solar panels are also at times visible from the anticipated alignments, including the Sherco Solar Project near the northern portion of the project and the Palmer's Creek Wind Farm near Granite Falls along the Purple Route.

Scenic byways are public roadways in areas of regionally significant scenic, natural, recreational, cultural, historic, or archaeological resources (reference (10)). The route alternatives cross two scenic byways, the Great River Road National Scenic Byway and the Minnesota River Valley Scenic Byway (Map 5). The Great River Road National Scenic Byway follows the Mississippi River and spans 565 miles across 20 counties (reference (11)). The Minnesota River Valley Scenic Byway follows the Minnesota River through central Minnesota between Big Stone Lake and Belle Plaine (reference (12)). Potential aesthetic impacts to these two scenic byways are discussed in Section 7.2.1 (Region B) and Section 12.2.1 (Region G).

5.2.1.2 Potential Impacts

The project's HVTL structures and conductors would create aesthetic impacts. The degree of these impacts depends on the below-listed factors.

- Proximity to homes, schools, churches, etc., where relatively more observers are present to experience aesthetic impacts.
- The types of structures and structure designs used for the project.
- Paralleling and/or sharing ROW with existing transmission lines would minimize impacts relative to existing human modifications to the landscape. In other words, putting like with like.
- Paralleling and/or sharing other types of existing ROW where the project would have an incremental impact relative to existing horizontal elements, such as highways and county roads.

5.2.1.3 Mitigation

5.2.1.3.1 Commission Sample Routing Permit

The sample routing permit (Appendix D, 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."

5.2.1.3.2 Other Proposed Mitigation

The primary strategy for minimizing aesthetic impacts is prudent routing—that is, choosing routes where a HVTL is most harmonious with the landscape. Other minimization and mitigation measures 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.
- 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.
- Using construction methods that minimize damage to vegetation near the transmission line.
- 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.

5.2.2 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.

The assessment was completed for the project as a whole because existing conditions are better understood at a broader scale than the regional level. Impacts to cultural values are independent of the route selected.

5.2.2.1 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 over the course of the three treaty areas that the project intersects: the 1837, 1851 and 1858 treaties. Existing conditions are discussed below for both the pre-contact period (prior to European settlement of the project area) and the post-contact period.

5.2.2.1.1 Tribal and Indigenous Peoples History within ROI

The 1837 Land Cession Treaties with the Ojibwe & Dakota were the first major land cession by the Dakota and Ojibwe people. The treaty areas span over portions of present-day Minnesota and Wisconsin. At this time the fur trading industry was collapsing, leading settler fur traders to support treaties with the Dakota and Ojibwe that included substantial debt payments to several specific settler fur traders. The treaty has also been called the "White Pine Treaty," as millions of acres of timber were transferred to the U.S. and subsequently led to abuses of Ojibwe timber rights for a century (reference (13)). The Treaty of 1837 was not property upheld for decades, causing many members of tribes that had signed the treaty to be prosecuted for violation of state conservation laws. Beginning in 1990, the Mille Lacs Band of Ojibwe began legal and negotiation processes with the state of Minnesota. In 1999, the U.S. Supreme Court upheld the Treaty of 1837 and the rights of the Mille Lacs Band and other tribal members to hunt, fish, and gather on the ceded land under tribal regulations. Enforcement is coordinated by tribal officials, the Great Lakes Indian Fish and Wildlife Commission, and conservation officers from the Minnesota Department of Natural Resources (reference (14)).

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 (15)). 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 tribals members (reference (16)). 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 (17)). 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 (15)).

After the Treaty of Traverse de Sioux was signed by the upper bands of the Dakota, the treaty delegation travelled 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 (18)). 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 (16)).

The 1858 Land Cession Treaties with the Mdewakanton, Wahpekute, Sisseton and Wahpeton Dakota bands happened one month after Minnesota became the 32nd state in the union. Dakota leaders were summoned to Washington, DC, and then “they were detained until they signed another treaty relinquishing all land north and east of the Minnesota River to the United States (reference (17)).” The ceded land was to be sold to settlers, as they had encroached on the land and planned to stay. The remaining land in the reservation was to be allotted to individual Dakota families (reference (19)).

5.2.2.1.2 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 cedar, sage, sweetgrass, and tobacco, are considered sacred and used for ceremonial purposes and their healing properties (reference (20)).

According to the United States Department of Housing and Urban development Tribal Directory Assessment Tool (reference (21)), Tribes with historic cultural interest or ancestral ties in the project area include the following:

- Apache Tribe of Oklahoma
- Bad River Band of the Lake Superior Tribe of Chippewa Indians of the Bad River Reservation, Wisconsin
- Cheyenne and Arapaho Tribes, Oklahoma
- Flandreau Santee Sioux Tribe of South Dakota
- Fond du Lac Band of the Minnesota Chippewa Tribe
- Menominee Indian Tribe of Wisconsin
- Mille Lacs Band of Ojibwe
- Minnesota Chippewa Tribe
- Prairie Island Indian Community in the state of Minnesota
- Red Cliff Band of Lake Superior Chippewa Indians of Wisconsin
- Santee Sioux Nation, Nebraska
- Sokaogon Chippewa Community, Wisconsin
- Upper Sioux Community, 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
- Keweenaw Bay Indian Community, Michigan
- Lac du Flambeau Tribe, Lac du Flambeau Band of Lake Superior Chippewa Indians
- Lac Vieux Desert Band of Lake Superior Chippewa Indians of Michigan
- Leech Lake Band of the Minnesota Chippewa Tribe
- Lower Sioux Indian Community in the state of Minnesota
- Sisseton-Wahpeton Oyate of the Lake Traverse Reservation, South Dakota
- Spirit Lake Tribe, North Dakota
- White Earth Band of Minnesota Chippewa

While there are no federally recognized tribes in the project area, the nearby Minnesota River Valley is an area of cultural significance for the Upper Sioux Community Pezihutazizi Oyate and Lower Sioux Indian Community, as well as other Tribal Nations whose ancestors previously inhabited the project area. The Dakota originated in Minnesota and four bands have lived along the Minnesota River: the Mdewakanton and Wahpekute (the “lower bands”), and the Sisseton and Wahpeton (the “upper bands”). The name “Lower Sioux” was placed on the Mdewakanton band and their homeland after the 1851 Dakota land cession treaties (reference (22)).

The Upper Sioux Community Pezihutazizi Oyate is a federally recognized Indian tribe in Yellow Medicine County, approximately six miles southwest of the city of Granite Falls. There are around 547 enrolled members (reference (23)). The Upper Sioux Community Pezihutazizi Oyate refers to the area surrounding the Minnesota River as Pezihutazizi Kapi (the Place where they dig for yellow medicine). The Upper Sioux Community Pezihutazizi Oyate holds a traditional Wacipi (that is, powwow) annually in Granite Falls on the first weekend in August. Wacipi is a cultural tradition that brings generations together to dance, sing, and celebrate their heritage. The Upper Sioux Community Pezihutazizi Oyate also has Native American Heritage nights, where for example community members can bus together to a Timberwolves game (reference (24)).

The Lower Sioux Indian Community is a federally recognized Indian tribe in Redwood County, approximately two miles south of the city of Morton. There are around 930 enrolled members, and over half reside on Tribal lands. The Lower Sioux Indian Community manages the Lower Sioux Agency Historic Site in Morton, which is the site where the U.S. Dakota War started in 1862. The Lower Sioux Indian Community government website lists many community-focused events throughout the year. The Lower Sioux Indian Community holds an annual Wacipi in the Land of Memories Park in Mankato during the third weekend in September, and also coordinates the Cansa'yapi Food Pantry, Little Crow Spiritual Run, Valentines Day UNITY Bake Sale, 3-Man scramble golf tournament, learning events, and other holiday events. (reference (25)).

5.2.2.1.3 County Conditions within ROI

Today, the project area is predominantly in a rural setting with agriculture-based economies. Corn and soybean crop production, livestock operations, and associated industries drive the local agricultural economy. Protection of the land and ability to continue to farm are strong values in farming and agricultural communities.

Sherburne, Stearns, and Wright counties are in the central region of Minnesota. Central Minnesota is known for its waterbodies, rivers, streams and wooded hills (reference (26)). Several global manufacturing firms operate in this region, and the area is known for food processing, printing, furniture manufacturing, appliances and heavy equipment manufacturing (reference (27)).

Sherburne County is home to numerous parks and recreational areas, such as the Sherburne National Wildlife Refuge and Sand Dunes State Forest. The Sherburne History Center has exhibits showcasing the county's history and hosts many community events and groups (reference (28)). The primary ancestry in Sherburne County is German and Norwegian descent. Both Sherburne County and Wright County share a border with the Mississippi River. Wright County is known by the Mississippi and Crow Rivers, its farmland, and lakes. The Wright County Fair is a large summer attraction that takes place in Howard Lake (reference (29)).

Chippewa, Kandiyohi, Lyon, Meeker, Redwood, Renville, and Yellow Medicine counties are a part of the southwest region of Minnesota. Southwest Minnesota is known for its vast prairie landscapes (reference (30)). It is a national leader in agricultural production and renewable energy (reference (31)).

Chippewa County lies within the western part of Minnesota. The county's heritage is largely European, primarily German and Norwegian. (reference (32)). Much of the land now in the project area is agricultural. Outdoor recreation is common in Chippewa County including recreational opportunities within the Lac Qui Parle State Park. Chippewa County also hosts an annual fair (reference (33)).

Kandiyohi County is largely agricultural land, and the community celebrates this with traditions of farmers markets and agricultural fairs. Kandiyohi County offers a variety of community events throughout the year including the county fair in August, Spicer Winterfest in January, Minnesota's largest indoor craft and vendor show in November, water skiing shows throughout the summer, and various concerts in the county park (reference (34)). Kandiyohi County is in central Minnesota, and the heritage of its residents is largely European, primarily German and Norwegian (reference (35)). Sibley State Park and Monson Lake State Park are both in Kandiyohi County.

Lyon County has numerous community events, including Balaton Fun Fest, Box Car Days, Belgian American Days, Boxelder Bug Days, Coming Home Days, Lyon County Fair, and more. The County has several art galleries, theaters and museums, including the Wheels Across the Prairie Museum showcasing historical wheels from all types of vehicles and machinery (reference (30)). Lyon County heritage is largely European, from primarily German and Belgian descent (reference (36)). The city of Marshall includes the Marshall Area Fine Arts Council and the Southwest Minnesota Arts Council, as well as Southwest Minnesota State University. Lyon County is also home to the Schwan's Center for Performing Art and the Marshall Area Stage Company.

The Minnesota river borders Redwood County to the north, providing outdoor recreational activities. Redwood County has numerous community events, including Fall Festival, Fire & Ice Festival, the Laura Ingalls Wilder Pageant, Loose Gravel Music Festival, the Lower Sioux Indian Community Wacipi/Powwow, and more (reference (30)). The heritage is largely European, primarily German and Norwegian (reference (37)).

Meeker County has a strong agricultural background, and farming is a prominent component of its economy. Meeker County recreational opportunities include hiking, bird watching, and Greenleaf Lake State Recreation Area. The county offers events to the community such as the county fair in August, Litchfield Summer festivals, the Cokato Corn Festival in August, Annual Santa Day in December, and more (reference (38)). Meeker County heritage is largely European, with nearly half of German descent (reference (39)).

In Renville County the biggest seasonal event is Catfish Derby Days, and the city of Franklin in Renville County is known as Minnesota's "Catfish Capital." The heritage is largely European, primarily of German and Norwegian descent (reference (40)). The Bechyn Czech Festival is held in the town of Bechyn with food, dancing, genealogy information, and other activities. The Renville County Fair occurs in August and has ATV barrel racing, an All-American Lumberjack show, a demolition derby, exhibits, 4-H participation, concerts, and more. 4-H is for kids and teens, offering school and community club programs focusing on health, science, agriculture and civic engagement. Other examples of regional cultural events include the Classic Car Roll In, Christmas Caroling, and the Renville County Market (reference (41)).

The Minnesota River cuts through the eastern boundary of Yellow Medicine County creating waterfalls, hills, and streams. The county offers community events throughout the year including summer festivals, the annual county fair, Prairie's Edge Powwow, Scandinavian cultural events, fishing tournaments, and more (reference (42)). The area is largely devoted to agriculture. The heritage is largely European, many of German and Norwegian descent (reference (43)).

There are numerous natural amenities, including lakes, rivers, and public lands, that attract local and regional recreational users within and nearby the project area (discussed further in 5.2.8 and 5.6). 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.

5.2.2.2 Potential Impacts

Lands within the local vicinity of the project were ceded to the U.S. government over the course of the 1837, 1851, and 1858 treaties. The 1837 treaty gave its members usufructuary rights to hunt, fish, and father on the ceded land in the treaty. Rice Lake is within the ROW of the project in Wright County, around six miles southwest from the city of Becker, which has historically shown wild rice growth (references (44); (45)). The project is designed to span waterbodies such that no impacts to the bed and bank would occur. 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 be dependent on the individual. For those residents that 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.

5.2.2.3 Mitigation

5.2.2.3.1 Commission Sample Routing Permit

There are no conditions included in the sample permit that directly mitigate impacts to cultural values, sense of place, or community unity.

5.2.2.3.2 Other Proposed Mitigation

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

5.2.3 Displacement

The ROI for displacement is the anticipated ROW. 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.

5.2.3.1 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 residences or nursing homes within the ROW of the route alternatives. There are 33 nonresidential structures (for example, agricultural outbuildings or animal production structures) within the ROW of various route alternatives.

5.2.3.2 Potential Impacts

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.

5.2.3.3 Mitigation

5.2.3.3.1 Commission Sample Routing Permit

The sample routing permit (Section 5.3.7 of Appendix D) 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."

5.2.3.3.2 Other Proposed Mitigation

Displacement of residential and nonresidential buildings 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.

5.2.4 Environmental Justice

The ROI for environmental justice (EJ) includes the census tracts that intersect the route width of each route alternatives. 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 from be disproportionally affected due to additional exposure to pollutants. The project would not further increase burden indicators in the EJ areas of concern and would not result in disproportionate adverse impacts to the EJ areas of concern within the ROI. Therefore, impacts are anticipated to be minimal.

5.2.4.1 Existing Conditions

EJ populations within the ROI were identified using three separate data analyses. These are the MPCA EJ Proximity Analysis Tool, the Council of Environmental Qualities guidance on using U.S. Census data for identifying low-income and minority population analysis, and the Council on Environmental Quality's (CEQ's) Climate and Economic Justice Screening Tool.

5.2.4.2 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 census tracts where additional consideration or effort is warranted to ensure meaningful community engagement and to evaluate the potential for disproportionate adverse impacts" (reference (46)). 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; or
4. The area is located within Indian country, as defined in United State Code, title 18, section 1151.

Using the above criteria, Census Tract 9504 (Figure 5-1) in Chippewa County was identified as an EJ area of concern within the ROI because around 36 percent of the population has a reported income that is less than 200 percent of the federal poverty level. Census Tract 9504 is crossed by Route Segments C1 (Purple Route), C2, and C3. There are several census tracts with federally recognized Tribal lands within them, however, none of the route widths of the route alternatives intersect these boundaries.

Figure 5-1 Census Tract 9504 - Environmental Justice Are of Concern

5.2.4.3 Council of Environmental Quality Low Income and Minority Analysis

A demographic assessment of the census tracts in the ROI was conducted using U.S. Census Bureau data. Analysis was done by using the EJ guidance under NEPA document from the Council of Environmental Quality (CEQ) (reference (47))to identify where persons in poverty and minority populations are located throughout the project area. The following guidelines were used in the comparison:

- A census tract is determined to have a significant low-income and/or minority population when that population exceeded 50 percent of the county population or was “meaningfully greater” than the general population of the county.
  - “Meaningfully greater” is defined as when the percentage of persons in poverty or minority population is at least 10 percentage points or higher than the respective county.
- Minority population percentages were calculated by excluding those who self-reported as white (and no other race) and not Hispanic or Latino. Which means, the minority population includes those who self-reported as Black or African American, American Indian or Alaska Native, Asian, Native Hawaiian or Pacific Islander, some other race, being two or more races, or being Hispanic or Latino.

As shown in Table 5-2, there is one meaningfully greater low-income or minority population, Census tract 7501 in Redwood County (Figure 5-2), within the ROI for any of the route alternatives. Census tract 7501 is crossed by Route Segment B4 (Blue Route), Route Segment 214 (a refinement) and Alternative Alignment 1. Table 5-2 shows that when compared to the population of Redwood County, the self-identified minority population was 13.8 percentage points higher than Redwood County's minority population. In this census tract, 15.2 percent of people identified as American Indian or Alaska Native alone, and 8.4 percent of people identified as Hispanic or Latino.

Figure 5-2 Census Tract 7501 - Environmental Justice Area of Concern

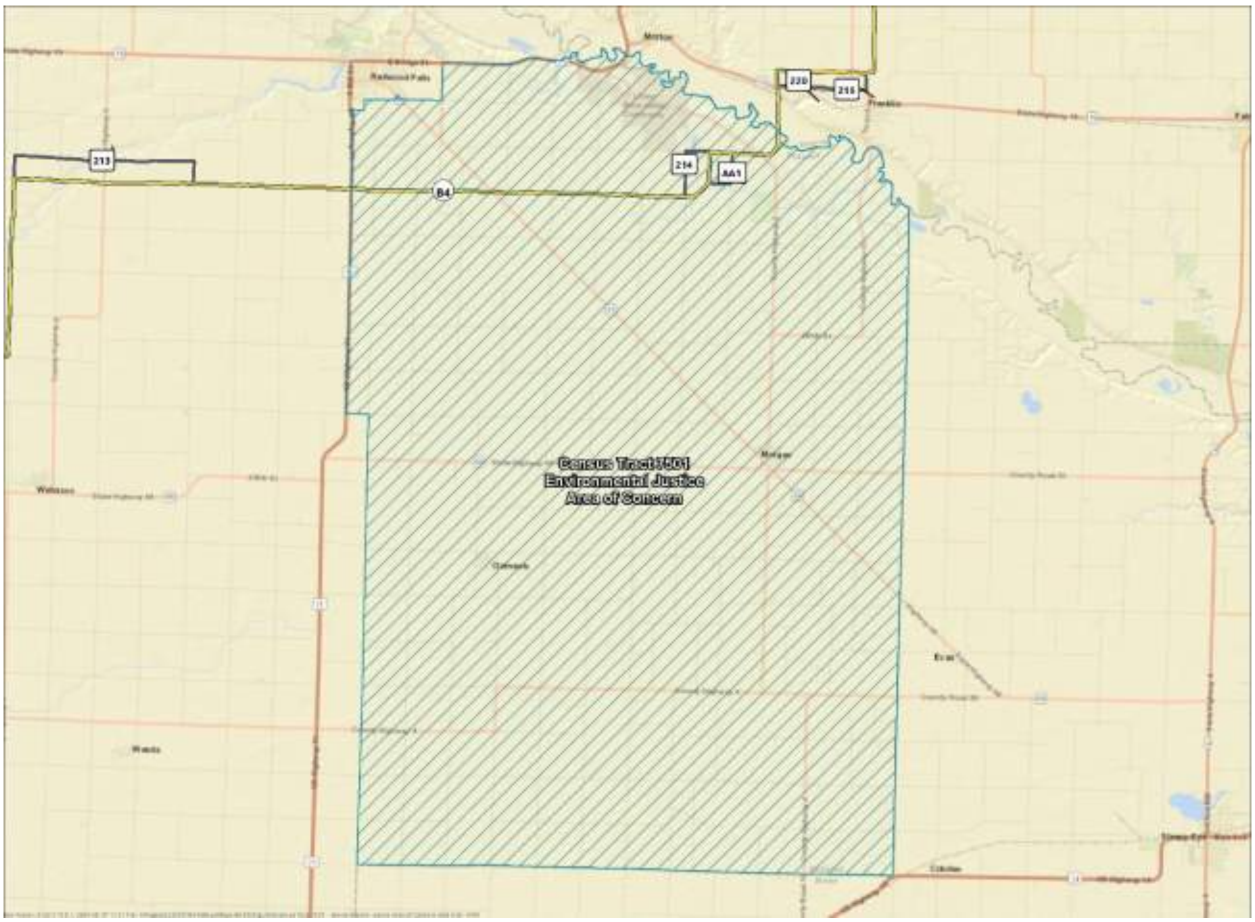


Table 5-2 EJ areas as determined by Council on Environmental Quality

State, County, Census Tract[1]	Population	Total Minority Population (%)	Persons in Poverty (%)
Minnesota	5,706,494	21.7	9.2
Lyon County	25,269	17.4	12.3
Census Tract 3601	3,538	5.9	7.1
Census Tract 3602	3,206	11.7	5.7
Census Tract 3606	2,773	4.7	6.6
Redwood County	15,425	13.8	9.8
Census Tract 7501 [1]	2,830 [1]	27.6 [1]	7.3 [1]
Census Tract 7504	2,829	6.2	8
Census Tract 7505	2,676	17.8	10.4
Yellow Medicine County	9,528	11	9.9
Census Tract 9701	2,999	14.2	11.5
Census Tract 9704	1,865	15.7	10.2
Renville County	14,723	13.4	9.7
Census Tract 7901	2,614	12.7	7.7
Census Tract 7902	1,821	2.9	6.2
Census Tract 7903	1,823	4.1	7.4
Census Tract 7904	2,642	16.9	11.8
Census Tract 7906	2,737	19.1	10.5
Chippewa County	12,598	14.1	11.3
Census Tract 9503	2,047	10.8	11.7
Census Tract 9504	2,344	10.6	7.1
Kandiyohi County	43,732	21.9	11
Census Tract 7801	2,639	2.4	3.5
Census Tract 7804	3,654	6.8	5.5
Census Tract 7806	5,238	12.1	7.8
Census Tract 7811	2,691	7.5	6.5
Census Tract 7812	2,907	8.3	8.5
Meeker County	23,400	6.6	7.7
Census Tract 5602	5,164	7	4.6
Census Tract 5605	3,214	4	6.2
Census Tract 5606	2,973	8.9	15.1

State, County, Census Tract[1]	Population	Total Minority Population (%)	Persons in Poverty (%)
Stearns County	158,292	16	12.8
Census Tract 112.01	3,192	1.5	4.1
Census Tract 112.02	3,220	1.9	9.5
Census Tract 114	5,034	15.2	10.4
Wright County	141,337	9	4.9
Census Tract 1003	5,849	5.1	4.8
Sherburne County	97,183	11.1	5
Census Tract 303.02	3,227	3.2	3.8
Census Tract 304.07	4,366	7.9	6.4
Census Tract 304.08	5,581	1.3	1

[1] Census tract 750 1 is the only tract with minority or low-income populations exceeding the established thresholds.

5.2.4.4 Council of Environmental Quality's Climate and Economic Justice Screening Tool

The CEQ's Climate and Economic Justice Screening Tool identifies census tracts as disadvantaged if they meet the threshold for at least one of the tool's categories of burden, or if they are on land within the boundaries of Federally Recognized Tribes. Burdens are organized into categories. A community is highlighted as disadvantaged if it is in a census tract that is (1) at or above the threshold for one or more environmental, climate, or other burdens, and (2) at or above the threshold for an associated socioeconomic burden (reference (48)). There were three census tracts identified as disadvantaged communities (reference (49)).

Census tract 9701 was identified as partially disadvantaged, due to a Federally Recognized Tribe, the Upper Sioux, covering one percent of this tract's land. Census tract 7501 was identified as partially disadvantaged, due to a Federally Recognized Tribe, the Lower Sioux, covering one percent of this tract's land. Census tract 3605 was identified as a disadvantaged community. The burden threshold is poverty (households where income is at or below 100 percent of the federal poverty level) and the socioeconomic threshold is high school education (percent of people ages 25 years or older whose high school education is less than a high school diploma).

5.2.4.5 Community Engagement in Identified EJ Ares of Concern

As described in Chapter 1, several public meetings have been held in the counties the project crosses. There are upcoming meetings scheduled to occur throughout the process. A number of notices have been sent and meetings held with potentially affected Tribes. Additionally, as noted in the route permit application, the applicant has met with various leaders and members of the Lower Sioux Indian Community between 2022 and 2024.

Meetings that were held near the EJ areas of concern included a scoping meeting held in Granite Falls which is within 9 miles of Census tract 9504 and in Redwood Falls which is within two miles of Census tract 7501.

5.2.4.6 Potential Impacts

For the analysis of this project, EJ populations within the ROI were identified using the MPCA EJ Proximity Analysis Tool, CEQ guidance on using U.S. Census data for identifying low-income and minority populations, and the CEQ's Climate and Economic Screening Tool. These three analysis tools each have a different approach to calculating what is considered an area of increased concern for EJ. They each had one census tract that meet the criteria thresholds for their unique analysis. One census tract (9504) meets the criteria for an MPCA EJ area of concern for a low-income population. One census tract (7501), using the U.S. Census data and analysis of census tract populations to their respective counties, was identified as having a meaningfully greater minority population, and thus is an EJ area. Using the CEQ's Climate and Economic Screening Tool there was one census tract (3605) that exceeded thresholds and was identified as a disadvantaged community.

According to the U.S. Environmental Protection Agency (EPA), environmental justice means the "just treatment and meaningful involvement of all people regardless of race, color, national origin, Tribal affiliation, or disability in agency decision-making and other Federal activities that affect human health and the environment…" (reference (50). The guidelines set by the EPA are designed to protect people from disproportionate and adverse human health and environmental effects and hazards and give equitable access to opportunities to participate in decisions that might affect a person's environment or health.

The EPA's EJ Screening and Mapping Tool is an interactive tool that provides a nationally consistent dataset and approach for combining EJ environmental and socioeconomic indicators (reference (51)). A full EJScreen Report was done for census tracts 7501, 9504, and 3605 (Appendix K).

For census tract 7501, there are several environmental indicators below the state average. The ozone state average is 37.2 parts per billion (ppb) and the census tract value is 39 ppb. The lead paint (percentage of pre-1960s housing) state average is 0.32 percent, whereas the census tract value is 0.46 percent. The Risk Management Plan (RMP for chemical accidents) Facility Proximity (facility count/km distance) state average is 0.66, whereas the census tract value is 2.1. All of the health indicators are above the state average, aside from people with disabilities. These include low life expectancy, heart disease, asthma, and cancer. Climate indicators show that the flood risk is above the state average of eight percent, at 15 percent.

For census tract 9504, several environmental burden indicators are below the state average. The ozone census tract value is 38.8 ppb and the lead paint (percentage of pre-1960s housing) census tract value is 0.59. All of the health indicators are above the state average. These include low life expectancy, heart disease, asthma, cancer and persons with disabilities. Climate indicators show that the area is above the state average for flood risk, at 11 percent.

For census tract 3605, the environmental burdens above the state average ozone at 40.1 ppb, nitrogen dioxide (NO_2) at 9.7 ppbv, and RMP facility proximity (facility count/km distance) at 1.6. All health indicators are below the state average, aside from those with asthma and persons with disabilities. Climate indicators are below the state average.

EPA's EJ Screen also provides information on critical service gaps. Critical service gaps found for census tract 7501 were for broadband internet, lack of health insurance, transportation access burdens and being in a food desert. Critical service gaps for census tract 9504 were access to broadband internet and transportation access burdens. Critical service gaps identified for census tract 3605 were access to broadband internet, lack of health insurance, transportation access burden, and being in a food desert.

The factors that could impact these three EJ areas of concern are generally construction related impacts. These might include a temporary increase in traffic during construction and other short-term noise and air impacts from construction and operation. Transportation and traffic impacts are further discussed in Section 5.2.10. Noise from construction activities would be short-term, temporary and would occur during daytime hours. Further impacts from noise are discussed in 5.2.6. There are potential impacts on air quality due to construction and operation of the project. HVTLs produce a negligible amount of ozone that won't put a further disproportionate burden on any of the three identified census tracts. They are further discussed in 5.6.1. The project would not further increase burden indicators in the EJ areas of concern and would not result in disproportionate adverse impacts to the EJ areas of concern within the ROI.

5.2.4.7 Mitigation

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

5.2.4.7.1 Commission Sample Routing Permit

The sample routing permit does not include mitigation measures specific to EJ.

5.2.4.7.2 Other Proposed Mitigation

No other mitigation measures are proposed.

5.2.5 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 negligible throughout the project with one exception. Potential impacts to a residential development in the city of Augusta would require further coordination and potential mitigation if Route Segment G1 (Blue Route) or Route Segment G2 are selected.

The impact assessment for land use and zoning was completed for the project as a whole and not carried forward at the regional level because existing conditions are determined by jurisdictional areas (counties) which are broader than the ROI and do not coincide with the project's regional boundaries.

5.2.5.1 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.

The assessment for land use and zoning was completed for the project as a whole and not carried forward at the regional level because existing conditions are determined by jurisdictional areas (counties) which are broader than the ROI and do not coincide with the project's regional boundaries.

Publicly available zoning information was reviewed for each county and municipality crossed by the route alternatives. The project would cross ten counties, including: Lyon, Redwood, Yellow Medicine, Renville, Chippewa, Kandiyohi, Meeker, Stearns, Wright, and Sherburne. Map 6 shows the zoning district data that was gathered for the project. Due to the variation in zoning district names for each county, zoning districts are represented by general categories. These general categories combine similar zoning district names together for ease of visual reference.

Land cover throughout the ROI consists primarily of herbaceous agricultural vegetation, with scattered wetlands and native plant communities, such as prairies and forests (Map 7). The southern portion of the project towards Lyon County is more rural, where farmsteads, agricultural fields, and agricultural support facilities are more prevalent. As the routes continue north, the surrounding area becomes less rural when the routes cross Interstate 94, which loosely parallels the Mississippi River. The northern portion of the route alternatives pass through areas north and south of the Mississippi River in Sherburne, Stearns, and Wright Counties that are more densely populated with residential and commercial developments. Transmission lines are defined in their zoning ordinances as an essential service and found to be either a permitted or conditional use.

5.2.5.1.1 County Plans and Ordinances Analyses

The Lyon County Comprehensive Plan was adopted in 2002. There are seven policies that guide this document, they include: corridor plan development, land use planning, right of way preservation, prioritization and investments, uniformity and performance, safe targets, and growth management (reference (52)). The Lyon County Zoning Ordinance was established in April of 2015. The zoning districts in Lyon County include floodplain, agricultural, suburban residence, urban expansion, highway commercial, rural residential, unincorporated village, and planned unit development districts (reference (53)). The project travels through agricultural, urban development, highway commercial and floodplain districts in Lyon County (Map 6). Similar to the project as a whole, most areas in Lyon County are zoned agricultural and Route Segments A6 and A7 contain a very small area zoned for commercial.

Redwood County Comprehensive Plan (2017) establishes a 20-year vision for the county. Redwood county has eight zoning districts listed in their Comprehensive Plan including agriculture, highway service, flood plain, industry, rural residential, scenic river, shoreland, and urban expansion (reference (54)). Redwood county has a brief code of ordinances (reference (55)). The project goes through agricultural, industrial and scenic river districts in Redwood County. GIS-based data was not available for Redwood County and is therefore not shown on Map 6.

Yellow Medicine County Comprehensive Plan, adopted in April 2006, establishes a 20-year vision. There are eight different zoning districts in Yellow Medicine County including, urban and rural development, cultivated land, hay/pasture/grassland, brushland, forested, water, bog/marsh/fen, mining (reference (56)). The project goes through the rural preservation area, Minnesota River management district, floodplain management district, and shoreland management district. In Yellow Medicine County the project goes through the Town of Hanley Falls (Map 6.4). While they do not have a comprehensive plan, they do have their own zoning map. The project goes through industrial and potential urban growth districts. Urban growth districts in Yellow Medicine County are determined by the location of a parcel of land in relation to an incorporated municipality, in this case Hanley Falls, and the public services that community provides to it or a neighboring parcel of land (reference (57)). The project goes through agricultural, industrial and scenic river districts in Redwood County. GIS-based data was not available for Yellow Medicine County and is therefore not shown on Map 6.

The Renville County Comprehensive Plan adopted in 2002 and revised in 2010 is an ongoing guide for community development. Renville County listed three vision statements they have in place, these include growth and economic vitality, community, and unique character. Renville County has seven zoning districts including agricultural, commercial/industrial, healthcare/mixed use, incorporated cities, rural residential, shoreland, and urban expansion. The project goes through agricultural, commercial – industrial, residential and shoreland districts within Renville County (Map 6.5 and Map 6.6). Within Renville County the project goes through the city of Franklin. The city of Franklin has its own ordinance code (reference (58)) and its own zoning. The project goes through agricultural districts within the city's boundaries.

Chippewa County does not have a comprehensive plan but the Chippewa County Land and Related Resources Management Ordinance dated in 1996. The ordinance regulates the uses and development of land in the unincorporated areas of Chippewa County which affect the public's health, safety, and general welfare. There are seven zoning districts, including agricultural, urban, natural areas, floodplain, shoreland, Minnesota River management, and unincorporated areas (reference (59)). The project goes through agricultural, Minnesota River management, shoreland management, and urban development districts (Map 6.6). The urban development district parcels are identified as partial urban service areas, perimeter urban service areas, potential urban service areas, or freestanding urban concentrations. GIS-based data was not available for Chippewa County and is therefore not shown on Map 6.

The Kandiyohi County Comprehensive Plan, adopted in 2020, establishes a 20-year vision for the county and provides existing conditions and information for each of the plan's strategic elements. Kandiyohi County's comprehensive plan includes eleven goals that introduce a framework for planning decisions: citizen participation, economic development, resource conservation, livable community design, housing, transportation, land use planning, public investments, public awareness, and sustainable development (reference (60)). The Kandiyohi County Zoning Ordinance No.9A was adopted in April of 2018, establishing districts consisting of agricultural, shoreland, residential, and commercial/industrial (reference (61)). The project goes through primarily agricultural district (Map 6.6).

Meeker County does not have a comprehensive plan but does have a land development ordinance adopted in 2018. Meeker County zoning include the following districts: agricultural preservation, suburban residential, rural residential, commercial, neighborhood commercial, general industry. They have several overlay districts, the urban expansion, shoreland management, recreation river, and clearwater river districts (reference (62)). The project goes through the agricultural preservation district, commercial, industrial, residential, the North Fork Crow River management, and Clearwater River watershed districts, but primarily through agricultural district (Map 6.6 through Map 6.8).

Stearns County Land Use and Zoning Ordinance #439 was adopted in June 2010. The Stearns County Land Use and Zoning Ordinance contains goals like natural resource plans and economic development plans. There are four zoning districts: agricultural, residential, commercial, and industrial (reference (63)). The project goes through agricultural, residential, commercial, and scenic river districts as well as the protected lake overlay district (Map 6.8 through Map 6.10).

Within Stearns County the project goes through the city of Saint Augusta, which does not have their own comprehensive plan but has their own zoning ordinances (reference (64)). The project goes through the agricultural district and the wetland overlay district within the city boundaries. A member of the Saint Augusta city council noted in a scoping comment letter that Route Segment G1 (Blue Route) and Route Segment G2 would potentially impact a current residential development area. Figure 5-3 illustrates the proximity of the route width and ROW to the residential development.

Figure 5-3 Saint Augusta Planned Residential Development

Wright County does not have a comprehensive plan. Their County Zoning Ordinance was last amended in 1997. The zoning districts include commercial recreation shorelands, agriculture, business, industrial, highway business, suburban residential, urban, rural, wild, and scenic river (reference (65)). The project goes through agricultural districts and the shoreland area overlay district (Map 6.10).

The Sherburne County 2040 Comprehensive Plan was adopted in November of 2023. It is a twenty-year plan that will guide the county's planning decisions. The comprehensive plan includes land goals: natural resources, rich history, land use planning, diverse communities, growth management practices, community character and identity, and stewardship. Quality of life goals include strategic initiatives, opportunities for future generations to thrive, public health, safety, and welfare. Partnership goals include stakeholders, partnership, stronger communities, and delivery of services (reference (66)). The Sherburne County Zoning Ordinance and Official Zoning Map ORD-002 were last amended in March of 2024. The zoning ordinance districts include agricultural, general rural, urban expansion, commercial, industrial, residential planned unit development overlay, floodplain, shoreland, and shoreland residential (reference (67)). The project travels through agricultural, recreational, industrial, and scenic river districts in Sherburne County (Map 6.10).

Within Sherburne County the project travels through Becker Township and the city of Becker. Becker Township has their own zoning ordinance (reference (68)) The project goes through agriculture and general rural districts within the township boundaries. The city of Becker also has their own zoning ordinance (reference (69)). The project goes through the Power Generation district within the city boundaries (Map 6.11).

The project goes through several watershed districts (reference (70)). These districts span over multiple counties within the ROI and outside of the project area. The Sauk River Watershed is within the boundaries of the project in Stearns, Wright, and Meeker Counties (reference (71)). Clearwater River Watershed is within the boundaries of the project in Stearns, Wright, and Meeker Couties (reference (72)). North Fork Crow River Watershed is within the boundaries of project in Stearns, Meeker, and Kandiyohi Counties (reference (73)). Middle Fork Crow River Watershed is within the boundaries of the project in Stearns, Meeker, and Kandiyohi Counties (reference (74)). Buffalo Creek Watershed is within the boundaries of the project Kandiyohi and Renville Counties (reference (75)). Yellow Medicine River Watershed is within the boundaries of the project within Yellow Medicine and Lyon Counties (reference (76)).

5.2.5.2 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 predominantly crosses areas zoned as agricultural (more than 95 percent) in all counties within the ROI. Transmission lines and substations are typically ether 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. Impacts to a residential development were identified in the city of Augusta and are shown in Figure 5-3. 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.

Construction and operation of substations would represent a long-term impact on existing land uses as these areas would be converted to developed and industrial areas. Existing land uses adjacent to the substation sites would be allowed to continue. Each substation would be located near an existing road and each site would minimize impacts to adjacent land uses to the extent practicable. The substation siting areas are predominantly zoned as agriculture and the likelihood of future residential, commercial, or industrial development within these areas is generally low. No mitigation measures are proposed because of this.

5.2.5.3 Mitigation

5.2.5.3.1 Commission Sample Routing Permit

The sample routing permit does not include mitigation measures specific to land use and zoning. The sampling route permit (Section 1.1 of Appendix D) 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.”

5.2.5.3.2 Other Proposed Mitigation

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.

If the Commission selects a route including Route Segment G1 (Blue Route) or Route Segment G2, further coordination with the city of Augusta would be required to further understand potential mitigation required for impacts to the city's ongoing residential development.

5.2.6 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.

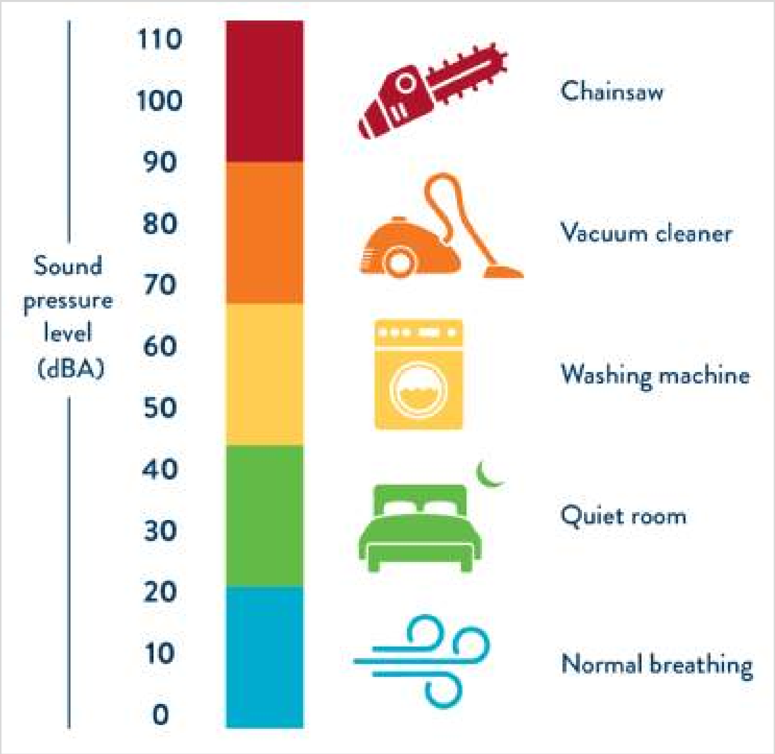
The assessment for noise was completed for the project as a whole because there is limited variability in the potential for noise across the route alternatives. Impacts would be minimized by selecting the route with the least receptors nearby; receptors are quantified by region as part of the aesthetics assessment.

The ROI for noise is the local vicinity which is the area within 1,600 feet of the anticipated alignment. Noises from the project are associated with construction and operation. Noise created by construction activities are anticipated to be minimal for all route alternatives. Construction activity would occur during a specified time during the day, 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.

5.2.6.1 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. Due to the logarithmic decibel scale, a noise level of 70 dBA is perceived approximately twice as loud as a 60 dBA sound to the average human hearing (reference (77)). 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 5-3). 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 5-3). 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 (77)).

Table 5-3 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 (77)

The project is primarily in rural areas. Background noise has the potential to be higher in the northern portion of the project due to the proximity to more populated areas. Rural areas without significant noise might be in the 30 to 40 dBA range, while it could be slightly higher in the northern portion of the project (reference (78)). The primary noise factors within the project area are residences and farmsteads, which are classified as NAC – 1. Noise receptors could also include individuals working outside or using recreational facilities nearby.

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 be around 50 or 60 dBA. Levels around 75 dBA are more common in busy urban areas, and levels up to 85 dBA occur near major freeways and airports.

5.2.6.2 Potential Impacts

5.2.6.2.1 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. 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, auguring foundation holes, setting structures, and stringing conductors.

Noise associated with heavy equipment can range between 80 and 90 dBA at full power 50 feet from the source reference **Invalid source specified.**. 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 **Invalid source specified.**); 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 might exceed state noise standards for short intervals at select times and locations. Any exceedances of 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 human speech begins at about 60 dBA" (Appendix E of reference **Invalid source specified.**). A 70 dBA sound interferes with telephone conversations, and an 80 dBA sound interferes with normal conversation.

5.2.6.2.2 Operational 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. Noise levels are anticipated to be within Minnesota noise standards.

5.2.6.2.3 Operational 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) at the nearest receptor(s).

5.2.6.3 Mitigation

5.2.6.3.1 Commission Sample Routing Permit

The sample routing permit (Section 5.3.6 of Appendix D) 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.”

5.2.6.3.2 Other Proposed Mitigation

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. During operation, permittees are required to adhere to noise standards. No additional mitigation is proposed.

5.2.7 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.

The assessment for property values was completed for the project as a whole because there is limited variability in the potential for property value impacts across the route alternatives. Impacts would be minimized by selecting the route with the least properties nearby; residences and non-residences are quantified by region as part of the aesthetics assessment.

5.2.7.1 Existing Conditions

Residences located within the local vicinity of route alternatives are summarized in the aesthetics sections by region (Chapters 6 through 12). For a general sense of the number of residences throughout the project, more than 500 residences are located within the ROI of the Purple Route and more than 400 residences are located within the ROI of the Blue Route. Map 8 includes residence locations within the route width of the route alternatives; they are also shown in Appendix N.

5.2.7.2 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 electric magnetic fields (EMF). Third, the effects to agricultural production on properties that are used for farming operations.

The aforementioned factors play one role in the many interconnecting factors that affect property values. Because of this, it is difficult to measure how much and all the different 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 H.

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 judgements, 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. Staff acknowledges this section does not and cannot consider or address the fear and anxiety felt by landowners when facing the potential for negative impacts to their property’s value.

5.2.7.3 Mitigation

5.2.7.3.1 Commission Sample Routing Permit

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

5.2.7.3.2 Other Proposed Mitigation

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 3.3.2.1, 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.

5.2.8 Recreation

The ROI for recreation is the route width. Impacts to recreation are assessed through identification of recreational resources within the ROI. Few recreational resources are present within the ROI. Recreational resources that are present include publicly accessible lands (Wildlife Management Areas, Waterfowl Production Areas, and state game refuges) and waters (including state water trails and national or state Wild and Scenic Rivers). The project also crosses two scenic byways.

5.2.8.1 Existing Conditions

Recreation within the route width consists primarily of outdoor recreational opportunities including bird watching, fishing, hunting, canoeing/kayaking, hiking, and snowmobiling. Recreational activities in the project area are primarily associated with rivers, lakes, scenic byways, and trails (Map 5). Publicly accessible lands also provide opportunities for recreational activities such as hunting (Section 5.6.6). No local public parks, state forest campgrounds, or golf courses were identified within one mile of any route alternatives. Other publicly access lands, includes Wildlife Management Areas, Waterfowl Production Areas, and state game refuges are present within the ROI and further discussed in Section 5.6.12.

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 (79)). 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 (80)). Watercourses designated as either state water trails and/or wild and scenic rivers including the Redwood River (Region B, Map 5.2), Crow River (Region D, Map 5.7), and Mississippi River (Region G, Map 5.10) extend from west of the project area to the east of the project area which make them unavoidable. These are crossed by both the Purple Route and the Blue Route (Map 5).

Public water accesses, 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. Numerous public water access points are present throughout the project area. One public water access point is located within the route width of Route Segments D3, D4 (Blue Route), D5 and D6 (Map 5.7).

The route alternatives cross two scenic byways, the Great River Road National Scenic Byway (Map 5.10) in Region B (Section 7.2.1) and the Minnesota River Valley Scenic Byway (Map 5.4) in Region G (Section 12.2.1). National and state scenic byways are alternative road corridors to major highways that have regionally outstanding scenic, natural, recreational, cultural, historic or archaeological significance (reference (10)). The two byways both extend west and east of the project area and are therefore unavoidably crossed by the Purple Route and the Blue Route.

Several snowmobile trails traverse the project area and are discussed in more detail in their applicable regional impact and mitigation assessments. These trails are maintained by Southwest Ridgerunners, Redwood County Trails, Renville County Drift Runners, Cross Country Trail Blazers, Snow-Drifters of Montevideo, Glacial Lakes Trail, Meeker County Sno Drifters, Stearns County Snowmobile Association, Sherburne County Snowmobile Trail Association, and the DNR.

5.2.8.2 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 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 visual impacts caused by new built features introduced to the landscape which could change the aesthetic of a recreational destination in a way that 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.

The project could also increase recreational opportunities once constructed. For example, ROW clearing might provide increased opportunities for wildlife viewing or hunting. While visual impacts would occur, the project is not anticipated to impede recreational activities, such as snowmobiling, golfing, canoeing, hunting, or fishing.

5.2.8.3 Mitigation

5.2.8.3.1 Commission Sample Routing Permit

There are no requirements for mitigation related to recreation in the Commission sample routing permit.

5.2.8.3.2 Other Proposed Mitigation

Impacts to recreation can be mitigated by selecting route alternatives that avoid resources used for recreational resources. The project avoids public lands used for recreational resources.

Impacts can also be mitigated by reducing impacts to natural landscapes. Specifically, the Wild and Scenic River crossing impacts can be minimized by paralleling existing infrastructure. The applicant would continue to work with the DNR to avoid and minimize impacts on recreational resources under DNR's jurisdiction and including the Wild and Scenic Rivers.

5.2.9 Socioeconomics

The ROI for socioeconomics is the ten-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, for all route alternatives. 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.

The impact assessment for socioeconomics was not carried forward at the regional level because there is limited variability in socioeconomics across the route alternatives. Socioeconomic variables are unlikely to change.

5.2.9.1 Existing Conditions

The project is in central and southwestern Minnesota. Labor force and unemployment data was used from the 2018-2022 American Community Survey, 5-Year Estimates from the US Census Bureau and the Minnesota Department of Employment and Economic Development. Table 5-4 shows the compiled population and economic data on counties within the ten-county area.

Table 5-4 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
Chippewa	12,284	21.1	63.8	6,385	2.4	$32,772	$62,112
Kandiyohi	43,839	55.0	67.4	23,106	3.8	$35,814	$73,285
Lyon	25,262	35.4	67.2	13,139	3.0	$35,256	$68,919
Meeker	23,496	38.6	65.6	12,088	2.5	$37,233	$75,926
Redwood	15,361	17.5	62.1	7,484	1.7	$33,175	$65,617
Renville	14,525	14.7	63.0	7,326	3.1	$34,554	$66,313
Sherburne	100,824	223.6	73.5	55,472	3.0	$41,412	$99,431
Stearns	160,405	119.4	70.4	88,722	4.4	$36,087	$73,105
Wright	148,003	223.9	72.7	78,784	2.2	$43,067	$102,980
Yellow Medicine	9,486	12.4	64.6	4,839	3.2	$36,737	$70,605

County populations across the ten-county area range from around 12,000 to 160,000. The highest populations and population densities within the ten-county area are closest to more metropolitan areas, and include Sherburn, Stearns, and Wright counties. The ten-county area comprises less than 10 percent of the state's total population. Minnesota experienced a 7.1 percent increase in population between the 2010 Decennial Census and the 2020 Decennial Census. The route permit application notes that at the county level, change in population ranged from 11.8 percent growth in Wright County to 9.6 percent decline in Yellow Medicine County.

The labor force unemployment rate in the ten-county area ranges from 1.7 percent in Redwood County to 4.4 percent in Stearns County. Stearns County is the only one of the counties to have an unemployment rate higher than the state of Minnesota. Per capita incomes in the ten-county area range from around $32,000 to $43,000. The highest per capita incomes are in Sherburne and Wright counties.

The median household income ranges from $59,051 in Chippewa County to $94,276 in Wright County. Generally, the counties in the ten-county had a median income lower than the state of Minnesota, which has a median income of $77,705. Sherburne and Wright Counties have a higher median household income than the state of Minnesota at $92,374 and $94,276, respectively.

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 Yellow Medicine County, where the largest industry in terms of employment is retail trade. The third largest industry in terms of employment varies across counties. "Retail trade" is the third largest industry in terms of employment in Stearns, Kandiyohi, Sherburne, Chippewa, and Meeker Counties. "Agriculture, forestry, fishing and hunting, and mining" is the third largest industry in Lyon, Yellow Medicine and Renville County. "Construction" is the third largest industry in terms of employment in Wright County.

The project goes through predominantly agricultural land, as referred to in 5.2.5 and 5.6.10. The "Agriculture, forestry, fishing and hunting, and mining" industry has a larger percent of the civilian employed population 16 years and older in the counties that are in the southern portion of the project, versus the northern portion of the project (Table 5-5).

Table 5-5 Agriculture, Forestry, Fishing and Hunting, and Mining Industry Ranking in Terms of Employment

Location	Agriculture, forestry, fishing and hunting, and Mining Industry Ranking	Civilian Employed Population (16 and over) (%)
Minnesota	12th	2.0
Lyon	5th	7.3
Redwood	3rd	11.6
Yellow Medicine	3rd	12.0
Renville	3rd	11.9
Chippewa	5th	6.7
Kandiyohi	10th	4.2
Meeker	6th	5.7
Stearns	10th	3.1
Wright	12th	1.6
Sherburne	13th	0.7

Source: https://data.census.gov

5.2.9.2 Potential Impacts

Potential socioeconomic impacts would be short-term due to an influx of construction jobs and personnel, delivery of construction material, temporary housing, and other purchases from local businesses. Slight increases in retail sales in the project area are expected. These would include purchases of lodging, food, fuel, construction materials (lumber, concrete, aggregate), and other merchandise. No long-term impacts are expected in transmission line and substation projects.

Construction of the transmission line would employ approximately 150 to 210 workers, and construction of the substations would employ approximately 60 workers (reference (81)). Construction personnel would primarily consist of union labor, but job opportunities would likely be posted locally for various trade professionals (reference (81)). Construction would take place over the course of around 24 to 27 months. 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.

The impact assessment for socioeconomics was not carried forward at the regional level because existing conditions are better understood at a broader scale than the ROI.

5.2.9.3 Mitigation

5.2.9.3.1 Commission Sample Routing Permit

The sample routing permit (Appendix D) does not include mitigation measures specific to socioeconomics.

5.2.9.3.2 Other Proposed Mitigation

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

5.2.10 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 ten-county area. For airports, the ROI is the project area. 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. Impacts are unavoidable but can be minimized and mitigated.

The impact assessment for transportation and public services was not carried forward at the regional level because there is limited variability in across the route alternatives. Potential impacts to private airstrips are discussed in land-based economies.

This section summarizes the project's potential impacts on roadways, railways, utilities, emergency services, and airports. Methods for mitigating these impacts are also summarized. Temporary impacts to public services resulting from the project are anticipated to be minimal. Long-term impacts to public services are also anticipated to be minimal, but impacts would depend on the route selected for the project.

5.2.10.1 Roadways/Railways Existing Conditions

The project is located primarily in rural areas. Major roadways located along the project include Interstate 94, US Highways 12, 14, 52, 59, 71 and 212; Minnesota Highways 4, 7, 15, 19, 22, 23, 24, 55, 67, and 68, as well as numerous other county, city, and township roads (Map 9).

The project would cross railroads operated by Minnesota Prairie, Twin Cities and Western, Burlington Northern Santa Fe, and SOO rail lines at several locations (Map 9).

5.2.10.2 Public Utilities Existing Conditions

Electric utilities near the project are provided by numerous entities, including:

- Minnesota Municipal Power Agency
- Kandiyohi Power Cooperative
- Delano Municipal Utilities
- Fairfax Municipal Utilities
- Glencoe Light & Power
- Granite Falls Municipal Utilities
- Grove City Utilities Department
- Hutchinson Utilities
- Litchfield Public Utilities

- Marshall Municipal Utilities
- New Ulm Public Utilities
- Redwood Falls Public Utilities
- Sleepy Eye Public Utilities
- Springfield Public Utilities
- Willmar Municipal Utilities

Natural gas service in the project area is provided by CenterPoint Energy, Great Plains Natural Gas Company, Minnesota Energy Resources Corporation, Sheehan's Gas Company, and Xcel Energy. There are also natural gas pipelines within the ROW including Northern Natural Gas (Lyon, Yellow Medicine, Kandiyohi, Meeker, and Stearns counties), Alliance Natural Gas and Northern Natural Gas (Renville County), and MinnCan (Meeker County).

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

5.2.10.3 Emergency Services Existing Conditions

Emergency services in the ten-county area 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. Appendix I provides a list that includes fire and law enforcement agencies located within the ten-county area.

Ambulance districts provide emergency medical response services throughout the ten-county area. Emergency medical response is available from local hospitals, like the Buffalo Hospital, CentraCare – Rice Memorial Hospital, and Hutchinson Health Hospital Appendix I.

5.2.10.4 Airports Existing Conditions

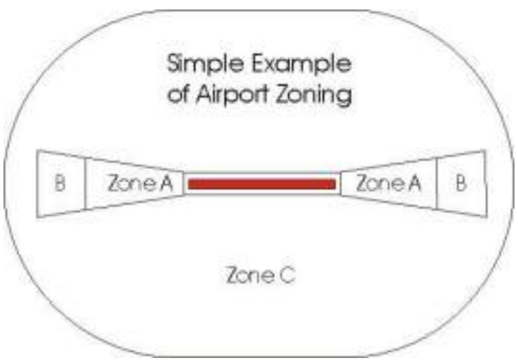
Transmission line structures and conductors can conflict with the safe operation of an airport if they encroach applicable safety zones. Different classes of airports have different safety zones depending on several characteristics, including runway dimensions, classes of aircraft they can accommodate, and navigation and communication systems (reference (82)). These factors determine the necessary take-off and landing glide slopes, which in turn determine the setback distance of transmission line structures.

The FAA and MNDOT have each established development guidelines on the proximity of tall structures to public-use airports. The FAA has also developed guidelines for the proximity of structures to very high frequency omni-directional range (VOR) navigation systems. Transmission lines near public airports are limited by FAA height restrictions, which prohibit transmission line structures above a certain height, depending on the distance from the specific airport. Regulatory obstruction standards only apply to those airports that are available for public use and are listed in the FAA airport directory. 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 (83)).

Figure 5-5 MnDOT Example of Airport Zoning



Source: reference (84)

There are no FAA-listed, public use airports within the project area. The closest public use airports within five miles of the route alternatives (Map 9) are:

- Tracy Municipal Airport (approximately 5 miles east of Route Segments A1 [Purple Route] as shown on Map 9.1),
- Southwest Minnesota Regional Airport - Marshall/Ryan Field (approximately 5 miles west of Route Segment B1 [Purple Route] as shown on Map 9.2),
- Granite Falls Airport (approximately 1.8 miles east of Route Segment B1 [Purple Route] as shown on Map 9.2),
- Willmar Municipal Airport – John L. Rice Field (approximately 3.3 miles north of Route Segment C1 [Purple Route] as shown on Map 9.6), and
- Leaders Clear Lake Airport (approximately 2.4 miles northeast of Route Segment G1 [Blue Route] as shown on Map 9.10),

There are three identified private use airports within the project area (Map 9); they include:

- Fuhr Flying Service Airport (Redwood County as shown on Map 9.3)
- Lux Strip Airport (Meeker County as shown on Map 9.6)
- Tyler Farms Airport (Meeker County as shown on Map 9.8)

5.2.10.5 Potential Impacts

This section summarizes the project's potential impacts on local roadways, utilities, emergency services, and airports. 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.

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 the Minnesota Department of Transportation (MnDOT) 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 their design standards exceed NESC requirements for 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. 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 rights-of-way or cross or parallel electric distribution lines. Given the project is a gen-tie transmission line, no construction-related impacts to electrical service are anticipated as a result of the project. An overarching project objective is to relieve electrical grid congestion and provide an increased ability to support additional renewable generation in the region. Operation of the project 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. 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. The application would complete an engineering analysis and induction study 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 of the project would be handled through local emergency services. Given the limited number of construction workers involved in the project and the low probability of a construction-related accident, the existing emergency services should have sufficient capacity to respond to emergencies.

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. 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.

5.2.10.6 Mitigation

5.2.10.6.1 Commission Sample Routing Permit

The sample routing permit (Sections 5.3.4 and 5.3.14 of Appendix D) 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 sample routing permit (Section 5.3.4 of Appendix D) 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.”

5.2.10.6.2 Other Proposed Mitigation

The applicant committed to ongoing coordination with MnDOT, local road authorities, railroad companies, the FAA, and landowners with private airstrips in the route permit application.

Road and railroad crossings would need to be designed to meet MnDOT and rail operator design guidelines respectively, and a permit from MnDOT would be required for the use of 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 to confirm that the project meets all applicable guidelines during permitting and final design and 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. A final route including Route Segment 223 (Section 8.9.3) is recommended to avoid direct impacts to Lux Strip, a private airstrip.

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

No other proposed mitigation is proposed for emergency services.

5.3 Human Health and Safety

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

5.3.1 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 and the substations would not be accessible to the public. 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.

The impact assessment for EMF was not carried forward at the regional level because there is limited variability in EMF across the route alternatives. Impacts would be minimized by appropriate placement and adhering to electric field standards for transmission lines.

5.3.1.1 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 (85)). 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 though 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 (86)). 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 (87)).

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 (85)). Table 5-6 illustrates the typical ranges of electric and magnetic fields of frequently and commonly used appliances that would be in a home (reference (85)).

Table 5-6 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 (88)).

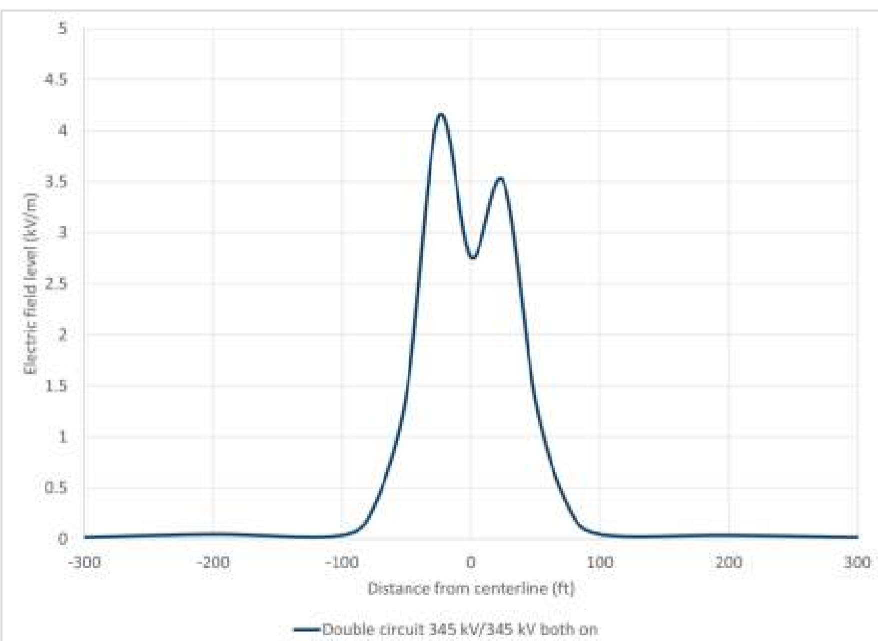
Minnesota, Wisconsin, and California have performed literature reviews and research examining EMF. In 2002, Minnesota formed an Interagency Working Group to evaluate EMF research and develop public health policy recommendations for any potential problems arising from EMF effects associated with high 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 (89)).

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 (90)). The Commission has not adopted a magnetic field standard for transmission lines. Appendix J provides detailed background on EMF health impact research.

5.3.1.2 Potential Impacts

Figure 5-6 provides the electric fields at maximum conductor voltage for the proposed double-circuit 345 kV HVTL. 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 (nominal voltage plus five percent), measured at one meter (3.28 feet) above the ground, is calculated to be 4.14 kV/m. As shown in Figure 5-6, the strength of electric fields diminishes rapidly as the distance from the conductor increases. The electric field values at the edge of the transmission line ROW and sample points beyond are shown in Table 5-7.

Figure 5-6 Electric Field Calculations for Proposed 345 kV HVTL



3.28 feet above ground

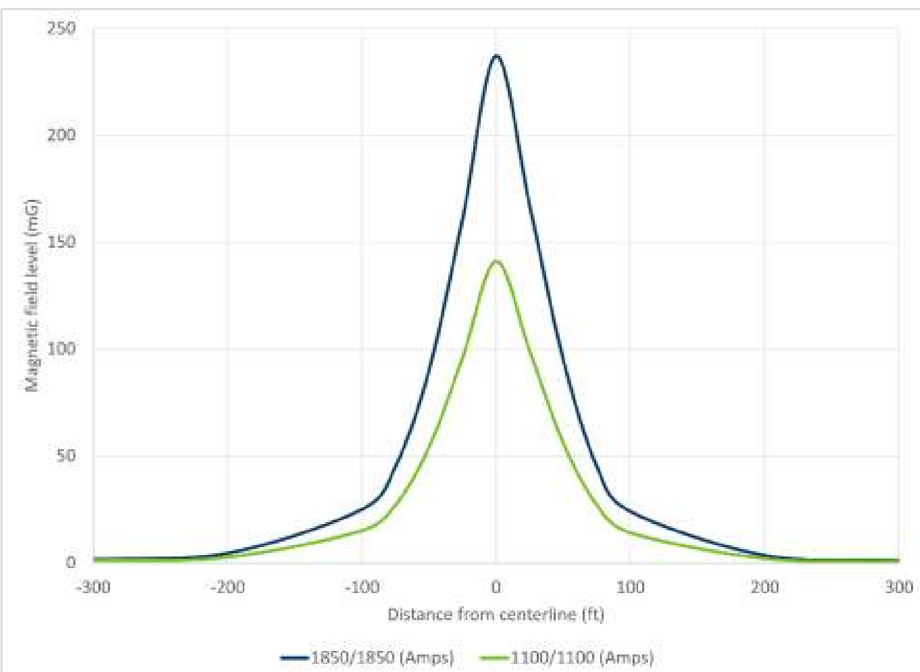
Table 5-7 Electric Field Calculations for Proposed 345 kV HVTL (3.28 feet above ground)

Nominal Voltage	Distance to Proposed Centerline (feet)												
	-300	-200	-100	-75	-50	-25	0	25	50	75	100	200	300
352 kV	0.02	0.05	0.04	0.33	1.44	4.14	2.76	3.5	1.36	0.33	0.05	0.04	0.02

The projected magnetic fields for the project are provided in Figure 5-7 and Table 5-8. 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.

System peak energy demand represents the current flow on the line during the peak hour of system-wide energy demand. Peak demand is 1850 amps on both conductors. Whereas system average energy demand represents the current flow on the line during a non-peak time Average demand is 1,100 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, the data shows that magnetic field levels decrease rapidly as the distance from the centerline increases (Figure 5-7). 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.

Figure 5-7 Calculated Magnetic Flux density (mG) for Proposed 345 kV HVTL



3.28 feet above ground

Table 5-8 Calculated Magnetic Flux density (mG) for Proposed 345 kV HVTL (3.28 feet above ground)

Nominal Voltage	Current (Amps)	Distance to Proposed Centerline (feet)												
		-300	-200	-100	-75	-50	-25	0	25	50	75	100	200	300
Peak System Energy Demand (1100 MVA/1100 MVA)	1850/1850	1.5	4.5	25	45	90	161	237	167	95	45	24	3.5	1
High Wind Utilization (660 MVA/660 MVA)	1100/1100	1	2.6	15	27	54	96	141	99	56	27	14	2	0.6

5.3.1.3 Mitigation

5.3.1.3.1 Commission Sample Routing Permit

The sample routing permit (Section 5.4.2 of Appendix D) 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."

5.3.1.3.2 Other Proposed Mitigation

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.

5.3.2 Implantable Medical Devices

The ROI for implantable medical devices is the ROW. Potential impacts associated with the project are anticipated to be negligible and would be the same across all alternatives. If impacts occur, they can be mitigated.

The impact assessment for implantable medical devices was not carried forward at the regional level because there is limited variability across the route alternatives. Impacts would be minimized by appropriate grounding and adherence to electric field standards for transmission lines.

5.3.2.1 Existing Conditions

Implantable medical devices, such as implantable cardioverter defibrillator 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 (91)). 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, implantable cardioverter defibrillators (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 (92)). 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 5.0 kV/m have the potential to interfere with modern, bipolar pacemaker behavior, but some models have been unaffected at as high as 30 kV/m (reference (93)). There is the potential for interference at lower levels, as differing manufacturers vary in susceptibility to EMI (reference (94)).

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 (95)). While ICD's vary and questions and concerns should be directed to the specific manufacturer, ICD manufacturer's recommended threshold for modulated magnetic fields is 1 G (reference (92)). One gauss is five to 10 times greater than the magnetic field likely to be produced by a high-voltage transmission line (references (92); (96)) During the peak hour of system-wide energy demand the calculated magnetic field levels for the project to be 0.237 G. The maximum electric field was measured to be 4.14 kV/m at around 25 feet from the centerline.

5.3.2.2 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 manufacturer's recommended threshold for magnetic fields. Electrical fields associated with the project are below the 5.0 kV/m interaction level for modern, bipolar pacemakers. There is the potential for impacts to older, unipolar pacemakers directly underneath the project line. Workers with ICDs should consult with their doctors directly with concerns about work in electrical or magnetic environments (references (97); (87)). In the event ICDs are impacted by EMF, it generally results in a temporary asynchronous pacing (reference (92)). Therefore, health impacts or permanent impacts on implantable medical devices are anticipated to be negligible.

5.3.2.3 Mitigation

5.3.2.3.1 Commission Sample Routing Permit

The sample routing permit (Section 5.4 of Appendix D) 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."

5.3.2.3.2 Other Proposed Mitigation

Electric and magnetic field strength is mitigated by increasing the distance from the transmission line and structures. Medical devices will return to normal operation when the person moves away from the source of the EMF (reference (92)). 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.

5.3.3 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.

The impact assessment for public and worker safety was not carried forward at the regional level because there is limited variability across the route alternatives. Impacts would be minimized by appropriate adherence to relevant local and state codes, the NESC, and NERC requirements.

5.3.3.1 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 (98).

5.3.3.2 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 (99)). 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 (92)). 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.

5.3.3.3 Mitigation

5.3.3.3.1 Commission Sample Routing Permit

The sample routing permit (Appendix D) 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."

5.3.3.3.2 Other Proposed Mitigation

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 (100)). 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 and locked. Appropriate signage would be posted that identifies the hazards associated with the substation.

5.3.4 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.

The impact assessment for stray voltage was not carried forward at the regional level because there is limited variability in the potential stray voltage across the route alternatives. Impacts would be minimized by adhering to relevant local and state codes, the National Electric Safety Code, and NERC requirements.

5.3.4.1 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 (101).

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 building and other structures (reference (102)). 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, of 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 (102)). 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 (103)). 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 (96); (103)).

5.3.4.2 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 (Section 5.3.5).

5.3.4.3 Mitigation

5.3.4.3.1 <u>Commission Sample Routing Permit</u>

The sample routing permit (Section 5.3.4 of Appendix D) 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 sample routing permit (Section 5.4.2 of Appendix D) 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."

5.3.4.3.2 Other Proposed Mitigation

No additional mitigation is proposed.

5.3.5 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.

The impact assessment for induced voltage was not carried forward at the regional level because there is limited variability in the potential for induced voltage across the route alternatives. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

5.3.5.1 Existing Conditions

It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line. 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 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 (references (104)). 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.

5.3.5.2 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 (105)). 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 (89)). 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 (106); (107)).

5.3.5.3 Mitigation

5.3.5.3.1 Commission Sample Routing Permit

The sample routing permit (Section 5.3.4 of Appendix D) 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."

5.3.5.3.2 Other Proposed Mitigation

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.

5.3.6 Electronic Interference

The ROI for electronic interference is the ROW. Transmission lines do not generally cause interference or 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.

The impact assessment for electronic interference was not carried forward at the regional level because there is limited variability in the potential for electronic interference across the route alternatives. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

5.3.6.1 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 (108)).

There are a number of FM and AM radio broadcasting stations that operate or can be heard within the project area, such as KNSR (88.9 FM), KSJR (90.1 FM), KMXK (94.9 FM), KTIS (98.5 FM), KZOK (98.9 FM), KFXN (100.3 FM), KIKV (100.7 FM), KQIC (102.5 FM), KCLD (104.7 FM), WCCO (830 AM), and KTIS (900 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 are used in daily life, aviation, vehicle navigation, surveying, 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.

5.3.6.2 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 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 (109)). Interference would be more likely near a transmission line structure, and unlikely under a transmission line (reference (110)) 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 (111)). 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.

5.3.6.3 Mitigation

5.3.6.3.1 Commission Sample Routing Permit

The sample routing permit (Section 5.4.3 of Appendix D) 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."

5.3.6.3.2 Other Proposed Mitigation

The applicant committed to taking feasible action to restore electronic reception to pre-project quality in the case of electronic interference. Interference 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.

5.4 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 experience at a broader scale. The short and long-term impacts of land-based economies are assessed for agriculture, forestry, mining, and tourism.

5.4.1 Existing Conditions

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).

5.4.1.1 Agriculture

The ROI for the land-based economy of agriculture is the route width. 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 (for example, aerial spraying and use of center pivot irrigation systems).

Agriculture is the predominant land cover in Chippewa, Kandiyohi, Lyon, Meeker, Redwood, Renville, Stearns, Wright, and Yellow Medicine counties (Map 7). Principal crops include corn, soybeans, potatoes, forage, and sugar beets. Farmers in the area also raise livestock, including cattle, poultry, hogs and pigs, and sheep and lambs (reference (81)). Barr requested information from the Minnesota Apiary Registry and per the data received in March 2024, there are no beekeeping operations within the route widths of the route alternatives.

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 10). Prime farmland is prevalent throughout the route widths of all the route alternatives. About 90 percent of agricultural land within the Purple and Blue Routes has been designated as prime farmland or farmland of statewide importance (reference (81)). As a percentage of the whole route width, the southern half of the project has more prime farmland compared to the northern half of the project.

Center pivot irrigation systems are in Regions C, D, E, F and G. Identified center pivot irrigation systems are shown in Map 11.

The 2024 directory of Minnesota organic farms from the Minnesota Department of Agriculture (MDA) lists 41 potential organic farms in the ten-county area (reference (112)). 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. The route permit application notes one organic farm is crossed by the Purple Route, and two other organic farms are adjacent to but not crossed by the Purple Route in Stearns County. The application also notes that the Blue Route does not cross organic farms.

Due to the prevalence of agricultural production in the region, there are a number of private airports with airstrips that are likely used for aerial spraying businesses within five miles of the route alternatives. There are three private airstrips in the project area; they are in the southern half of the project in Region B (Section 7.4.1), Region C (Section 8.4.1), and Region E (Section 10.4.1).

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.

5.4.1.2 Forestry

The ROI for the land-based economy of forestry is the route width. Potential impacts are assessed through identification of commercial operations. One Christmas tree farm was identified; no additional forestry resources were identified.

Few forested areas are found in the ROI as most of the land cover is agricultural (Section 5.6.10.1, Map 7). None of the following resources were identified within the ROI:

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

As such, potential impacts to land-based economies for forestry would be negligible with one potential exception. Based on a public comment, there is one known Christmas tree farm located within the route width of Route Segment 244 (Section 12.9.2).

5.4.1.3 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.

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 does not comprise a major industry in the project area; however, there are aggregate (typically sand or gravel) mining sites in the ROI including actives sites in Region F (Section 11.4.2) and Region G (Section 12.4.2). There are prospective sites in Region B (Section 7.4.2) and Region C (Section 8.4.2). These aggregates are primarily mined for local use such as making concrete for highways, roads, bridges, and other construction projects.

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.

5.4.1.4 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.

Recreational opportunities identified within the ROI include publicly accessible lands and waters used for outdoor activities (Section 5.2.8). Nonresidents or tourists could visit the project area to take advantage of the area’s hunting and fishing opportunities.

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, battlefields, 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.

5.4.2 Potential Impacts

5.4.2.1 Agriculture

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 3.2.2).

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.

Transmission line structures could limit the use of the airstrips within the ROI and could potentially affect the coverage and effectiveness of aerial spraying. Structures could limit the ability of aerial applicators to reach specific areas of fields by restricting those areas where applicators could safely fly. Additionally, if structures are constructed near airstrips, they could pose a hazard to aircraft during takeoff and landing (reference (92)).

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. If NEV is prevalent in an agricultural operation it can affect livestock health. This concern has primarily been raised on dairy farms because of its potential to affect milk production and quality. NEV is by and large an issue associated with distribution lines and electrical service at a residence or on a farm (Section 5.3.4). Transmission lines do not create NEV stray voltage as they do not directly connect to businesses, residences, or farms (Section 5.3.4).

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 5.3.6).

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.

5.4.2.2 Forestry

Potential impacts to forestry resources or operations are not anticipated as a result of the project as there are no notable forestry resources within the ROI. However, one Christmas tree farm has been noted within the route width of Route Segment 244 (Section 12.9.2).

For safe operation of the project, trees and other tall-growing vegetation must be removed from the transmission line ROW. Vegetation clearing typically consists of initial tree and vegetation clearing before construction, and on-going maintenance within the ROW following construction. The loss of trees in the ROW of the Christmas tree farm would likely affect short-term production of the business.

5.4.2.3 Mining

There are aggregate (typically sand or gravel) mining sites in the ROI, including active sites in Region F (Section 11.4.2) and Region G (Section 12.4.2). There are prospective sites in Region B (Section 7.4.2) and Region C (Section 8.4.2). 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.

5.4.2.4 Tourism

Impacts to the tourism economy are anticipated to be negligible to minimal and independent of route selected.

5.4.3 Mitigation

5.4.3.1.1 Commission Sample Routing Permit

Mitigation and restoration measures for vegetation on landowner property are standard Commission route permit conditions. The sample routing permit (Section 5.3.7 of Appendix D) 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.”

5.4.3.1.2 Other Proposed Mitigation

Impacts to agricultural operations could 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.

To further mitigate impacts to agriculture, the applicant would implement measures to reduce soil erosion and sedimentation by installing erosion control devices during construction in accordance with the project SWPPP and would compensate farmers for crop damage. The applicant would use BMPs including but not limited to checking that construction mats and vehicle tires are free of soil and vegetation before arriving on-site to avoid the spread of noxious weeds and invasive species in agricultural land. Post-construction restoration efforts would include restoration of any temporary access modifications and deep plowing to remove compaction in agricultural lands. Both crop and livestock activities would be able to continue around project facilities after construction.

The applicant would work with individual landowners through the easement process to verify the locations of organic farms and center-pivot irrigation systems identified to date and to identify any additional specialty crops or CREP/RIM easements that could be affected by the project. 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 RIM programs. Lastly, impacts can be mitigated by compensating individual landowners through negotiated easement agreements.

The applicant developed a Draft AIMP, as provided by the applicant in Appendix K, and would coordinate with the Minnesota Department of Agriculture (MDA) to finalize the AIMP for the project. This plan outlines best practices to minimize and mitigate potential agriculture impacts including measures to protect actively cultivated agricultural fields. For example, the AIMP addresses remediating impacts to drain tiles, such as repair or replacement of the drain tiles.

The applicant would continue to coordinate with the FAA, MNDOT, and privately-owned airstrip operators to identify any project-related concerns for aviation activities as the project progresses and as more detailed design information becomes available, including specific structure locations and heights above ground. For safety purposes, local ordinances and FAA guidelines limit the height of objects in the vicinity of the runways (reference (92)). Utilities could minimize impacts associated with overhead transmission lines by the following measures: route transmission lines outside of the safety zone, use special low-profile structures, construct a portion of the line underground, or install lights or other attention-getting devices on the conductors.

Large, brightly colored balls or markers could be installed on overhead transmission line conductors to improve their visibility to pilots and lessen the risk of collision. These markers are often employed near airports or airstrips, in or near fields where aerial applications of pesticides or fertilizers occur, and in areas where tall machinery, such as cranes, are frequently operated (reference (92)).

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

If the potential for temporary interference with public access to recreation areas is identified, the applicant would work with the owner or managing agency to minimize disruption to the extent practicable. The applicant would continue to work with the DNR to avoid and minimize impacts on recreational resources under DNR’s jurisdiction.

5.5 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 route alternatives. The applicant committed to survey prior to construction at which time potential impacts would be understood with a higher level of certainty. Archaeological resources are concentrated near watercourses and waterbodies in Regions A, B, C, and G.

5.5.1 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 (113)). Pursuant to the Minnesota Historic and Architectural Survey Manual (reference (114)), historic architectural resources are defined as sites, buildings, structures, or objects that are over 45 years in age and “create tangible links to the American past, whether in relation to historical events and people, traditional ways of life, architectural design, or methods of construction” (reference (115)). Traditional cultural properties (TCP) are defined as locations of significance to a community because of their association with important cultural practices and beliefs (reference (116)).

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.

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 (Minnesota Statutes § 138.661 to 138.669) 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 (Minnesota Statutes § 138.31 to 138.42) establishes the position of State Archaeologist and requires State Archaeologist approval and licensing for any archaeological work that takes place on non-federal public property.

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

Coordination with Tribal Historic Preservation Offices (THPO) prevents impacts from the project to known traditional cultural properties. THPOs are officially designated by Tribes and serve the same function as a State Historic Preservation Office (reference (117)). 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 historic properties and instruct municipalities on Section 106 reviews to represent tribal interests. As noted in the route permit application, the applicant has notified and engaged with multiple tribes, and met with various leaders and members of the Lower Sioux Indian Community between 2022 and 2024, including THPO officers.

The Purple Route traverses both the Deciduous Lakes Archaeological Region and the Prairie Lakes Archaeological Region. The Purple Route is within the Deciduous Lakes Region from the northern terminus to mid-eastern Kandiyohi County. The Deciduous Lakes Region covers most of central and east-central Minnesota and extends into west-central Wisconsin. The remainder of the Purple Route is within the Prairie Lakes Region from Kandiyohi County to the southern terminus of the route. The Prairie Lakes Region covers most of southwestern and south-central Minnesota and extends into northeastern South Dakota and north-central Iowa (reference (118)).

The Blue Route traverses the same archaeological regions along a different path. The Blue Route is within the Deciduous Lakes Region from the northern terminus of the route to southwestern Meeker County. The route then continues through the Prairie Lakes Region from southwestern Meeker County to the southern terminus of the route.

The Deciduous Lakes Region is defined by its many rivers and waterways, including the Mississippi-Sauk River which flows through the eastern and central parts of the region, as well as the Lower St. Croix River which defines the eastern boundary. Additional important waterways include the Crow, Rum, Snake, and Red Rivers. Bedrock outcroppings are limited and are generally comprised of granite. Historically, the region has been dominated by elm, maple, and basswood trees with incursions of prairie and oak woods. The northern area of the region was predominately a mixed deciduous-coniferous forest, while the eastern portion was an oak forest. Precontact game animals in this region included deer, bison, elk, beaver, black bear, and moose. The Woodland Period (ca. 1000-500 BC to AD 1650) in this region is moderately well-defined due to the rich archaeological record defined by a variety of pottery assemblages which help define time periods as well as geographic locations. This area also includes complex burials at an earlier date than the Prairie Lake Region. Common site types in the Deciduous Lakes Region from the Lake Woodland Period (ca. AD 500-700 to 1650) include semi-sedentary villages, wild rice harvesting and fishing stations, and a variety of hunting and gathering sites (reference (118)).

The Prairie Lakes Region contains the swell and swale of a typical ground moraine, with hilly end moraines found at the northern, eastern, and southern edges. The two major topographic features are the Minnesota River Valley which bisects the area, and the Coteau des Prairies highland to the west. Larger rivers within the region follow the path of glacial meltwater channels, and rivers in this region empty into the Mississippi River. Bison, elk, and white-tailed deer were historically present in this region, which is filled with many shallow prairie “pothole” lakes. Late Archaic components are limited in this region and have been grouped into the Mountain Lake phase (3800-200 BC). The transition into the Woodland Period (ca. 1000-500 BC to AD 1650) is generally defined by the introduction of distinctive ceramics; however, the ceramic assemblage of the Prairie Lakes Region remains poorly understood. The small number of assemblages in this region present pottery that have well-defined vertical cord-marking on the exterior surface, thick body walls, and fingernail impression decorations along the rim. Near the end of the Woodland Period, around AD 700, ceramic technology changed dramatically, and burial mounds were widespread. These changes mark the beginning of the Lake Benton Phase, a transitional phase from the Precontact era into the Contact era. The Prairie Lakes Region contains the largest concentration of Lake Benton sites south of the Minnesota River and east of the Blue Earth River (reference (118)).

Across both regions, the emergence of the Post-contact Period saw dramatic changes in the lifeways of both Native American and European American communities. The factors which had previously influenced the locations of Native American settlements, such as access to subsistence resources, began to change. As Euro-American settlers gained farmland, the landscape of the state changed. Rural landscapes became dominated by homesteads and farm fields cut by drainages, both natural and manmade. In rural areas, which are common in both archaeological regions, this agricultural landscape remains largely intact.

Regionally, archaeological sites are generally in proximity to established water resources. Early prehistoric sites could be deeply buried in the colluvium and alluvium along major river valleys. Middle to late Prehistoric sites can be found on the islands and peninsulas of moderate to large-sized lakes, as well as in the wooded areas of galley forests along the major rivers. Late Prehistoric sites include large agricultural village sites located on terraces of the major river systems. Small campsites and special activity sites from all periods are scattered throughout the region. Some deeply buried Late Prehistoric period sites might also be present in the Minnesota River valley. Historic village sites associated with the Dakota are concentrated along the Minnesota River. Trading posts were concentrated for the most part along the upper Minnesota River between 1750 and 1800. By the early 1800s they were established by American traders at wooded locations in the interior.

Because proximity to fresh water and food resources were vital to the survival of the early inhabitants of Minnesota, archaeological sites are typically concentrated on well-drained upland terraces along bodies of water, such as the Minnesota and Mississippi Rivers.

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 State Historic Preservation Office's (SHPO) 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 (119)). 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 a route segment's route width, the project may not impact this resource, and are therefore discussed as an added precaution. These impacts are described in subsequent chapters for each route alternative.

Within the regional study areas, the highest densities of archaeological sites are consistent with the following patterns.

- Archaeological resources are concentrated along the Cottonwood River in Region A.
- Sites are concentrated along the Minnesota River near Franklin, along the Yellow Medicine River in Yellow Medicine County and around the Granite Falls lakeshores in Region B.
- In Region C, the highest density of sites is along waterbody shores in northern Kandiyohi County.
- There are no heavy site concentrations in Regions D, E, of F.
- In Region G, most site concentrations are densest along the Mississippi River.

Historic architectural resources present within the study area include bridges, culverts, roadways, residential, commercial and industrial structures, government buildings, churches, schools, town halls, farmsteads and associated structure, railroads, etc. Most of these resources fall outside of the route widths but have the potential to be indirectly impacted by the project in terms of viewshed alteration. The HVTL and/or new substations could be visible from a number of these resources, primarily impacting those resources that are occupied by residents or frequented by visitors or commuters.

5.5.2 Potential Impacts

The ROI for archaeological and historic architectural resource is the route width. However, for 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 the route alternatives' anticipated alignments and the footprints of the Garvin Substation (Section 3.2.4.1), the intermediate substation (Section 3.2.4.2) and the support substation (Section 3.2.4.3).

Impacts to archaeological and historic resources could result from construction activities such as ROW clearing, placement of structures, new substations, new access roads, temporary construction areas, and vehicle and equipment operation. Impacts could also result from the removal of historic buildings or structures.

Additional impacts can result from transmission line location and operation, such as with 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 especially pertinent when considering cultural resources, where the surrounding environment plays a crucial role in defining their character and significance.

5.5.3 Mitigation

5.5.3.1 Commission Sample Routing Permit

The sample routing permit (Section 5.3.15 of Appendix D) contains the following mitigation related to archaeological and historic resources:

- "The Permittee shall make every effort to avoid impacts to archaeological and historic resources when constructing the Transmission Facility. In the event that a resource is encountered, the Permittee shall consult with the State Historic Preservation Office and the State Archaeologist. Where feasible, avoidance of the resource is required. Where not feasible, mitigation must include an effort to minimize Transmission Facility impacts on the resource consistent with State Historic Preservation Office and State Archaeologist requirements."
- "Prior to construction, the Permittee shall train workers about the need to avoid cultural properties, how to identify cultural properties, and procedures to follow if undocumented cultural properties, including gravesites, are found during construction. If human remains are encountered during construction, the Permittee shall immediately halt construction and promptly notify local law enforcement and the State Archaeologist. The Permittee shall not resume construction at such location until authorized by local law enforcement or the State Archaeologist. The Permittee shall keep records of compliance with this section and provide them upon the request of Commerce or Commission staff."

5.5.3.2 Other Proposed Mitigation

The preferred means of mitigating impact to cultural resources is prudent routing or structure placement by avoiding known archaeological and historic resources. If archaeological resources are anticipated or known to exist within a specific part of a route, potential resource impacts could be mitigated by measures developed in consultation with the SHPO or THPO prior to construction.

If unanticipated archaeological or historic resources are discovered during construction, Commission route permits require that construction activities cease at that location and that SHPO be contacted to assist in the development of appropriate measures to protect the resource. In addition, if human remains or suspected burial sites are discovered during construction, the state archaeologist and THPOs would be contacted, and construction would cease at the location until the applicant and the state archaeologist have developed adequate mitigation measures as per Minnesota Statute § 307.08. An Unanticipated Discoveries Plan would be available for use during construction of the project that outlines the procedures to be followed in the event unanticipated archaeological materials are found. Construction workers would receive training to recognize archaeological resources in the field so that work is halted in the event of an accidental relevant resource discovery.

The applicant noted in the route permit application that previously documented cultural resources sites were taken into consideration during initial route design with efforts made to avoid the 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 avoid or mitigate potential effects on resources identified during survey.

If cultural resources or mortuary sites/cemeteries are identified during the Phase I Survey, avoidance would be the primary mitigation measure. Avoidance of resources could include adjustments to the project design and designation of sensitive areas to be left undisturbed or spanned by the project.

5.6 Natural Environment

5.6.1 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.

The impact assessment for air quality was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

5.6.1.1 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 (120)). NAAQS are set to address the public health and welfare risks posed by certain widespread air pollutants (references (121); (122)).

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 the route alternatives 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 (123)).

The Marshall air quality monitoring station is in central Lyon County, approximately 5.5 miles from the Purple Route. The station monitors for O_3 and $PM_{2.5}$. Table 5-9 summarizes the days in each AQI category at the Marshall monitoring station for the most recent five-year period available, 2018-2022.

Table 5-9 Days in Each Air Quality Index Category - Marshall Monitoring Station

Year	Good	Moderate	Unhealthy for Sensitive Groups	Unhealthy	Very Unhealthy
2022	324	30	0	2	0
2021	289	65	3	2	0
2020	330	30	0	0	0
2019	326	35	0	0	0
2018	333	32	0	0	0

Air quality at the Marshall monitoring station has been considered "good" for the majority of the past five reported years. During the reporting period 2021 had the largest number of days classified as moderate or worse with 65 days classified as moderate, three days classified as unhealthy for sensitive groups, and two days classified as unhealthy.

The St. Cloud air quality monitoring station is in northwestern Sherburne County, approximately 7 miles from the Blue Route. The station monitors O_3 and $PM_{2.5}$. Table 5-10 summarizes the days in each AQI category at the St. Cloud monitoring station for the most recent five-year period available (2018-2022).

Table 5-10 Days in Each Air Quality Index Category - St. Cloud Monitoring Station

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

Air quality at the St. Cloud monitoring station has been considered "good" for the majority of the past five reported years. During the reporting period, 2021 had the largest number of days classified as moderate or worse with 66 days classified as moderate, three days classified as unhealthy for sensitive groups, and two days classified as unhealthy.

5.6.1.2 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 $PM_{10}/PM_{2.5}$. Emissions from construction vehicles could be minimized by using modern equipment with lower emissions ratings. Adverse effects on the surrounding environment are expected to be negligible due to the temporary disturbance during construction and the intermittent nature of the emission- and dust-producing construction phases. If construction activities generate problematic dust levels, the applicant should employ construction-related practices to control fugitive dust.

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. If dust levels become problematic during operation and maintenance activities, the applicant would employ fugitive dust control practices such as wetting unpaved roads. Cleared ROWs, storage areas, and access roads would be restored and revegetated once construction is complete, limiting the potential for further dust production associated with the project.

During operation of the HVTL and substations, small amounts of nitrogen oxides (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 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 (124)). 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.

5.6.1.3 Mitigation

5.6.1.3.1 Commission Sample Routing Permit

The sample routing permit does not contain mitigation measures specific to air quality. The sample routing permit states, "The Permittee shall comply with all applicable state rules and statutes."

5.6.1.3.2 Other Proposed Mitigation

As noted in the 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.

The DNR recommended not using dust control products that contain chlorides to avoid the potential for chloride products accumulating to levels that are toxic to plants and wildlife (scoping comment #285).

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.

5.6.2 Climate

The ROI for climate change is the ten-county 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.

The ROI located within Wright County was identified as highest risk for potential climate change impacts to the project as this area susceptible to major flood risk. The project would also be susceptible to more frequent high-winds and more frequent wildfires. The project would minimally contribute to climate change impacts as a result of GHG emissions. The project would be designed to minimize the potential for galloping during high winds. During construction, a SWPPP would be implemented to manage stormwater and reduce the potential for runoff and erosion. During operation of the project, vegetative cover would minimize potential for erosion impacts to waterways.

The impact assessment for climate was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

5.6.2.1 Existing Conditions

Climate change is observed as changes in temperature and precipitation patterns, increases in ocean temperatures and sea level, changes in extreme weather events, and ecosystem changes. These changes are largely attributed to the greenhouse effect. As the amount of greenhouse gases (GHGs) in the Earth's atmosphere increases, the greenhouse effect causes the Earth to become warmer (reference (125)).

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 (126)).

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 (127)).

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. The DNR's Minnesota Climate Explorer tool provides a summary of historical climate data for various regions across Minnesota (reference (128)). Data for counties traversed by the project (Chippewa, Kandiyohi, Lyon, Meeker, Redwood, Renville, Sherburne, Stearns, Wright, and Yellow Medicine counties) were analyzed as a conglomerate.

Figure 5-8 summarizes the mean, maximum, and minimum average daily temperature from 1895 to 2023 for counties traversed by the project. It also shows the temperature trends per decade from 1895 to 2023 and from 1994 to 2023 to represent the full record of data and the most recent 30-year climate normal period, respectively (reference (128)). In each temperature statistic, the counties exhibit an increase in daily temperature from 1895 to 2023. The annual average minimum daily temperature has increased at the largest rate of the three temperature statistics within both the full record of data and the most recent 30-year climate normal period. Table 5-11 summarizes the trends for mean, maximum, and minimum average daily temperatures.

Figure 5-8 Historical Annual Mean, Maximum, and Minimum Daily Air Temperature (°F) for Counties Traversed by the Project from 1895 to 2023

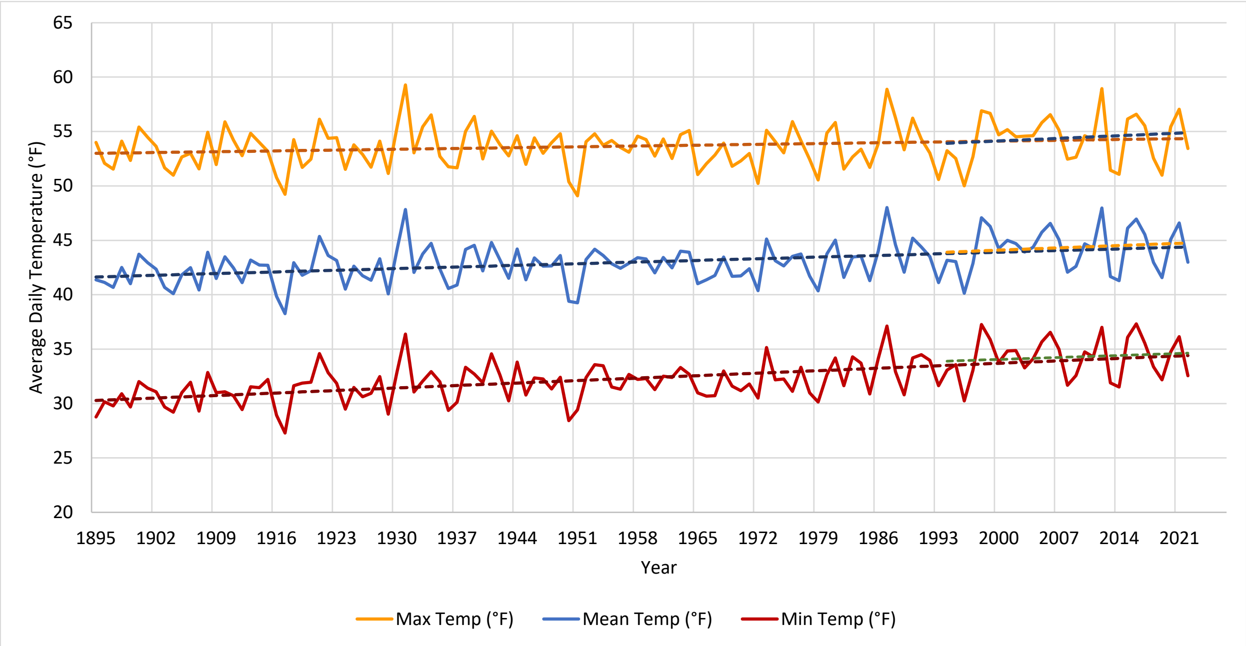


Table 5-11 Historical Annual Mean, Maximum, and Minimum Daily Air Temperature Trends (°F/decade) for Counties Traversed by the Project from 1895 to 2023

Temperature Statistic	Years	Trend (°F/decade)
Minimum Average Daily	1895-2023	0.35
Minimum Average Daily	1994-2023	0.27
Mean Average Daily	1895-2023	0.24
Mean Average Daily	1994-2023	0.19
Maximum Average Daily	1895-2023	0.29
Maximum Average Daily	1994-2023	0.23

Figure 5-9 shows the total annual precipitation for counties traversed by the project from 1895 to 2023. Total annual precipitation has increased from 1895 to 2023 by a rate of 0.30 inches/decade and decreased from 1994 to 2023 by a rate of 0.17 inches/decade.

Figure 5-9 Historical Total Annual Precipitation (inches) for Counties Traversed by the Project from 1895 to 2023

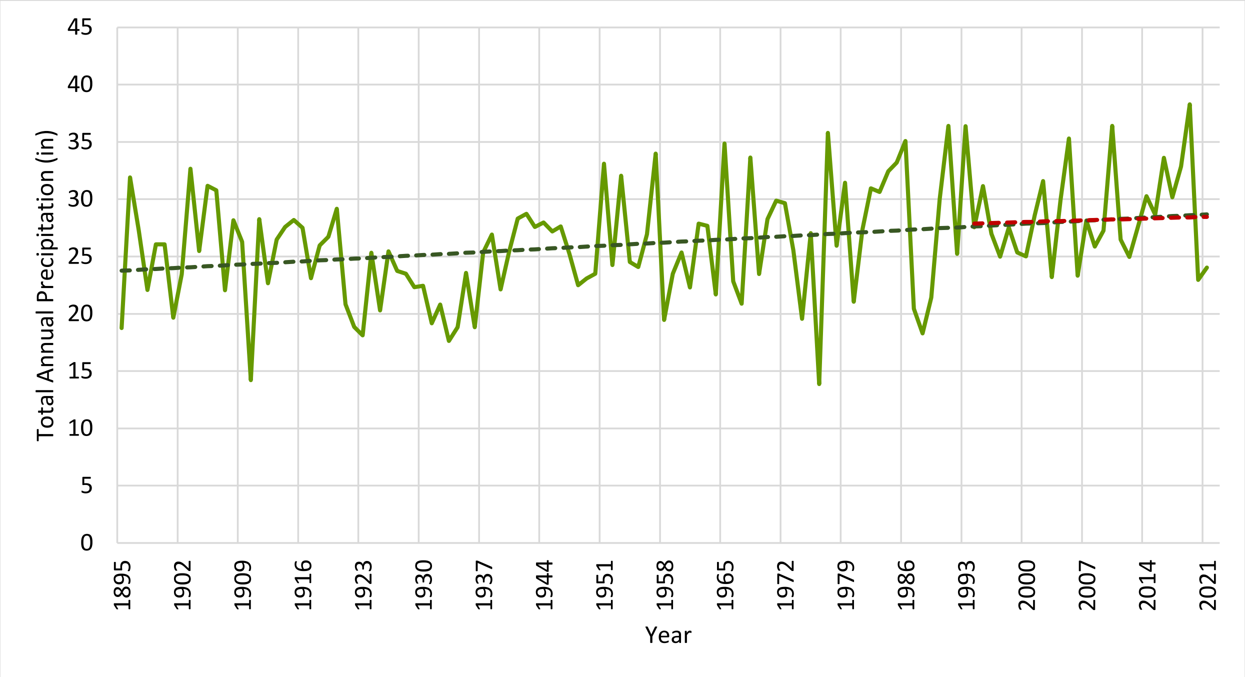
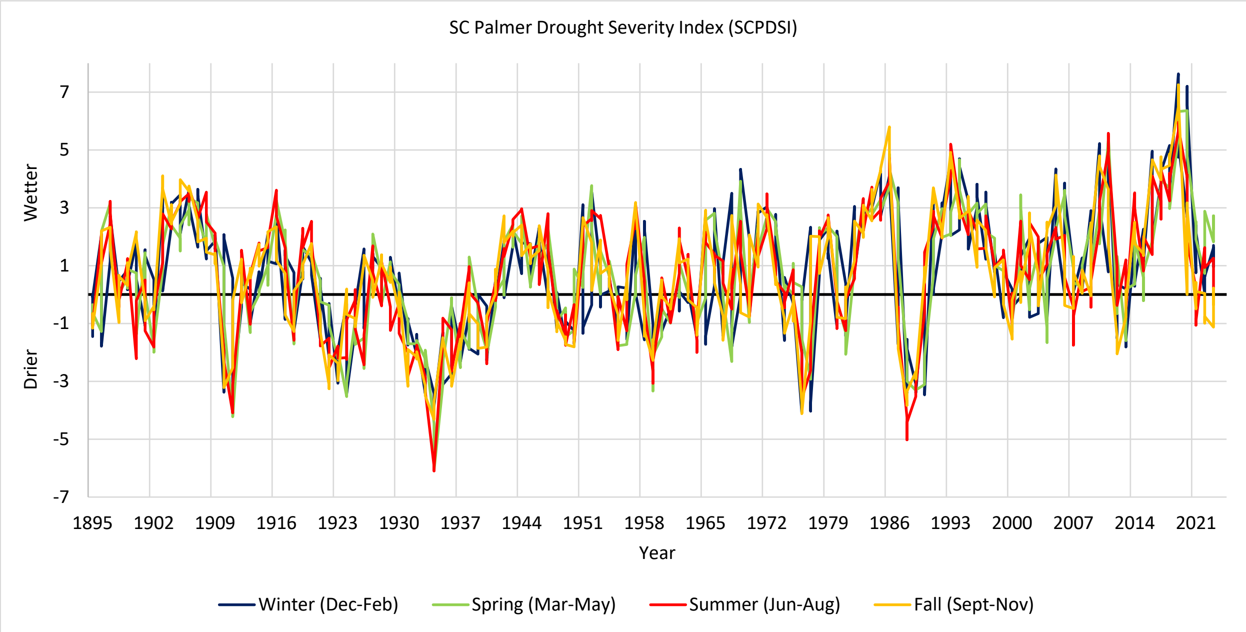


Figure 5-10 shows the seasonal drought severity for counties traversed by the project from 1895 to 2023 using the Self-Calibrated Palmer Drought Severity Index (scPDSI). The scPDSI is a meteorological drought index that measures the departure of moisture. Negative scPDSI values indicate drought conditions, positive values indicate wet conditions, and values near zero indicate normal conditions (reference (129)). The counties experienced frequent drought episodes from 1910 to 1940 and 1955 to 1965. From 1966 to 2023, seasonal wet conditions have generally been more frequent than drought conditions.

Figure 5-10 Historical Drought Severity for Counties Traversed by the Project from 1895 to 2023



Future projections are based on dynamically downscaled climate model data that was developed by the University of Minnesota and are summarized in two scenarios, Representative Concentration Pathway (RCP) 4.5 and RCP 8.5 (reference (130)). RCP is a measure adopted by the Intergovernmental Panel on Climate Change to represent various greenhouse gas concentration pathways. The numbers (specifically, 4.5 and 8.5) represent the amount of net radiative forcing the earth receives in watts per meter squared where a higher RCP signifies a more intense GHG effect resulting in a higher level of warming. RCP 4.5 represents an intermediate scenario where emissions begin to decrease around 2040, and RCP 8.5 represents a scenario with no emissions reductions through 2100 (reference (130)).

Figure 5-11 shows the modeled upper limit, average, and lower limit of the annual mean, maximum, and minimum historical and projected air temperature for counties traversed by the project. Table 5-12 presents the increase for each temperature statistic compared to Historical Present (1980 to 1999) conditions under each climate model.

Figure 5-11 Modeled Historical and Projected Annual Mean, Maximum, and Minimum Temperature for Counties Traversed by the Project

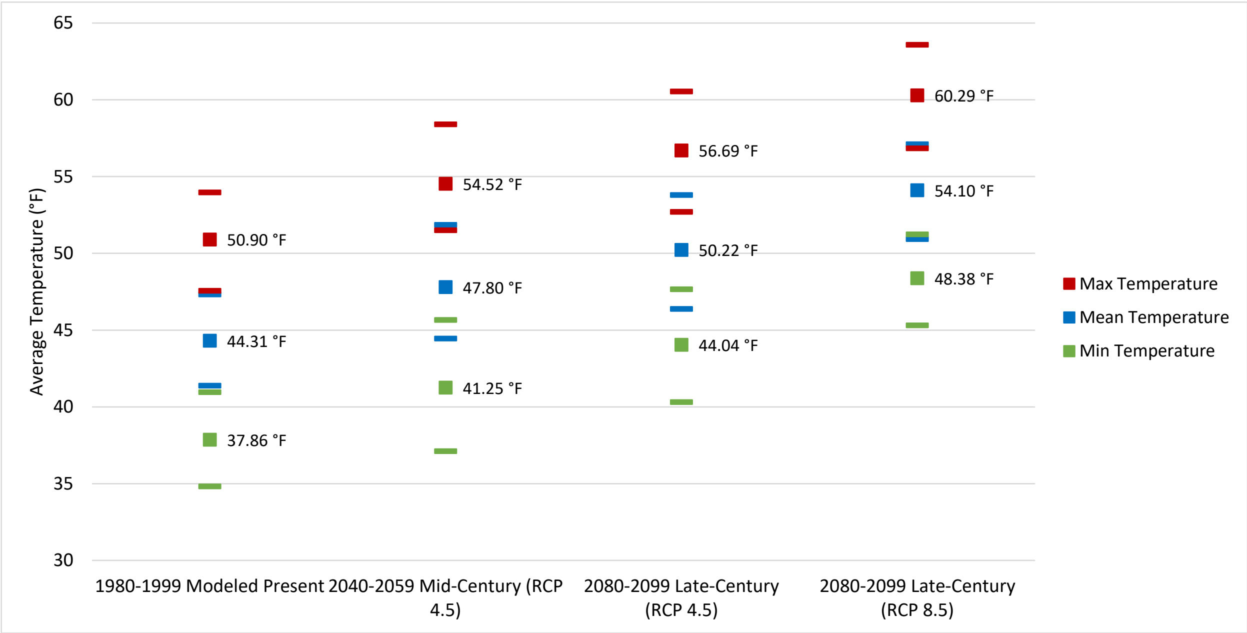
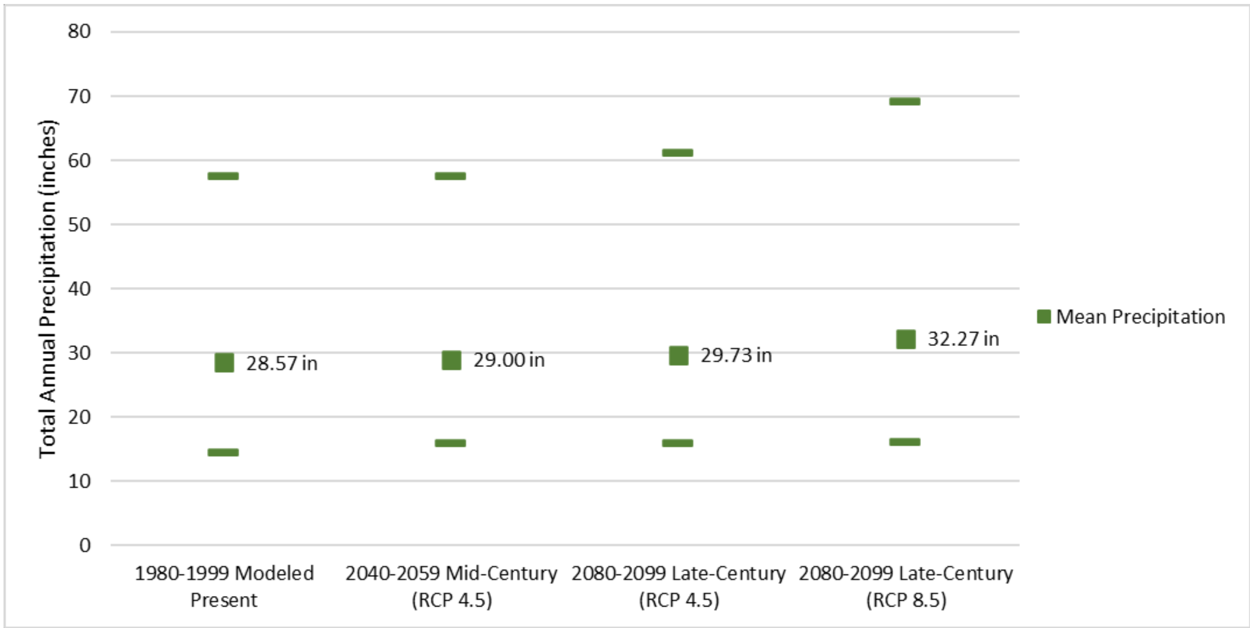


Table 5-12 Modeled Historical and Projected Annual Mean, Maximum, and Minimum Temperature Increases for Counties Traversed by the Project

Temperature Statistic	Climate Model	Temperature Increase (°F) Compared to 1980-1999 Modeled Present
Annual Minimum	2040-2059 Mid-Century (RCP 4.5)	3.39
Annual Minimum	2080-2099 Late-Century (RCP 4.5)	6.18
Annual Minimum	2080-2099 Late-Century (RCP 8.5)	10.52
Annual Mean	2040-2059 Mid-Century (RCP 4.5)	3.49
Annual Mean	2080-2099 Late-Century (RCP 4.5)	5.91
Annual Mean	2080-2099 Late-Century (RCP 8.5)	9.79
Annual Maximum	2040-2059 Mid-Century (RCP 4.5)	3.62
Annual Maximum	2080-2099 Late-Century (RCP 4.5)	5.79
Annual Maximum	2080-2099 Late-Century (RCP 8.5)	9.39

Figure 5-12 shows the modeled upper limit, mean, and lower limit historical and projected total annual precipitation for counties traversed by the project. The model mean shows that from the Historical Present to Mid-Century under RCP 4.5 conditions, there could be a slight increase in average precipitation of 0.43 inches. For Late-Century, the model mean shows an increase of 1.16 inches (RCP 4.5) and 3.7 inches (RCP 8.5), annually.

Figure 5-12 Modeled Historical and Projected Total Annual Mean Precipitation (inches) for Counties Traversed by the Project



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 (131); (132)). 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, a 'Not as Stormy' future to a 'Stormy' future. Within the counties traversed by the project, the 2035 time period shows a 2.4 to 3.9 percent increase in the 100-year storm intensity for the ‘Not as Stormy’ scenario, and a 13.8 to 15.5 percent increase for the ‘Stormy’ scenario. The 2060 time period shows a 4.6 to 7.5 percent increase in the 100-year storm intensity for the ‘Not as Stormy’ scenario, and a 26.9 to 30.2 percent increase for the ‘Stormy’ scenario.

The EPA Streamflow Projections Map summarizes general projections related to streamflow under climate change (reference (133)). The EPA Streamflow Projections Map for 2071 to 2100 (RCP 8.5) anticipates a general change in average streamflow of streams within the ten-county area by a ratio of 1.19 to 1.30 (90th percentile) under wetter projections and a ratio of 0.79 to 0.96 (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 the project to help identify current and future climate change risks (reference (134)). Table 5-13 summarizes risks for flood, wildfire, wind, air quality, and heat as defined by Risk Factor (references (135); (136); (137); (138); (139)).

Table 5-13 Climate Change Risks for Counties Traversed by the Project

County	Flood Risk	Wildfire Risk	Wind Risk	Air Quality Risk	Heat Risk
Chippewa	Moderate	Moderate	Minimal	Moderate	Minor
Kandiyohi	Minor	Moderate	Minimal	Moderate	Minor
Lyon	Minor	Moderate	Minimal	Minor	Minor
Meeker	Minor	Moderate	Minimal	Moderate	Minimal
Redwood	Minor	Moderate	Minimal	Minor	Minor
Renville	Minor	Moderate	Minimal	Minor	Minor
Sherburne	Moderate	Moderate	Minimal	Moderate	Minor
Stearns	Moderate	Moderate	Minimal	Moderate	Minor
Wright	Major	Moderate	Minimal	Minor	Minor
Yellow Medicine	Moderate	Moderate	Minimal	Minor	Minor

Flood risk is minor or moderate for most counties but major for Wright County. The wildfire risk is moderate for all counties, and the wind risk is minimal for all counties. The air quality risk is minor to moderate for all counties. Heat risk is minor for all counties except for Meeker County, which has minimal heat risk.

5.6.2.2 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 5.6.4. The climate change risks most susceptible to the project include increases in 100-year storm frequencies and soil erosion from increased storm intensities. The portion of the project located within Wright County could also be susceptible to the major flood risk. Tree and vegetation loss in the ROW from construction eliminates related climate resilience benefits, leading to more intense runoff during storms or flooding. The project could also be susceptible to more frequent high-winds and more frequent wildfires.

5.6.2.3 Mitigation

5.6.2.3.1 Commission Sample Routing Permit

The sample routing permit does not contain mitigation measures specific to climate; it does include reference to construction stormwater requirements (Section 5.3.8 of Appendix D) and the required SWPPP.

5.6.2.3.2 Other Proposed Mitigation

The project would be designed to be resilient under changing climatic factors. The project's design incorporates elements that minimize impacts from more extreme weather events such as increased rainfall and flooding, storms, high winds, and heat waves that are expected to accompany a warming climate. Transmission infrastructure has few mechanical elements and is built to withstand weather extremes that are normally encountered. Apart from outages due to severe weather such as tornadoes and heavy ice storms, transmission lines rarely fail. When this happens, transmission lines are automatically taken out of service by protective relaying equipment when a fault is sensed on the line. Such interruptions are usually only momentary. Scheduled maintenance outages are also infrequent. As a result, the average annual availability of transmission infrastructure is more than 99.9 percent.

The applicant would design the top of concrete for the structure foundations to be one foot above the 100-year floodplain elevation anywhere structures are installed in areas prone to flooding. If flooding were to exceed the 100-year flood level, the structures and foundations have the resilience to resist the flood loads. This includes flood-prone areas in Wright County. The project design would include shield wire for lighting protection, and steel structures and twisted pair conductor to withstand more frequent and intense rain events.

During construction, a SWPPP would be implemented to manage stormwater and reduce the potential for runoff and erosion. Where areas are subject to higher rates of erosion, vegetation establishment would be achieved within the timelines required in the SWPPP thereby minimizing potential impacts for erosion. During operation of the project, vegetative cover would minimize potential for erosion impacts to waterways. Storm events would also be considered during development of the SWPPP to design permanent stormwater features. During operation, wildfire prone debris could be removed as a maintenance activity.

5.6.3 Geology and Topography

The ROI for geology and topography is the ROW. Structure foundations have the potential to impact bedrock. Negligible impacts are anticipated to topography along the HVTL ROW given that original surface contours are re-graded and revegetated to the extent feasible. New substations could alter existing topography, and permanent stormwater management measures would address drainage from newly established impervious areas and any changes in topography.

The impact assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

5.6.3.1 Existing Conditions

The project area surface geology is dominated by quaternary aged glacial deposits from the most recent Wisconsinian glaciation. Gravelly sand to sandy loam sediments deposited by ice of the Des Moines lobe are most prevalent within the project area and are part of the New Ulm Formation. Deposits of glaciolacustrine sediments and post glacial alluvium are also present within the project area. Various surface glacial features are present including end and ground moraine, drumlins, eskers, and hummocks (reference (140)). Thickness of the glacial deposits vary depending on the location and type of deposit; thicknesses generally range from 50-650 feet, with some areas where bedrock outcrops or is present just below the surface (reference (141)). The project area bedrock consists of Cretaceous shale and sandstone, and Precambrian igneous and metamorphic rocks (reference (142)).

There are no karst features within the project area. The nearest karst feature is a stream sink located approximately 5 miles north of Redwood Falls (reference (143)).

Elevations range from about 1,592 feet above sea level to 800 feet within the project area. Topography along the route alternatives and alternative alignments 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 (144)).

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 (145)). The USGS United States Landslide Inventory has no records of landslides within the vicinity of the project (reference (146)).

5.6.3.2 Potential Impacts

Thick glacial deposits cover most of the project area. Bedrock is generally deeper than 50 feet, however in some areas bedrock is present as outcrops or 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.

Earthquakes are unlikely to occur in or near the project area. Changes in slope are not anticipated during the project, so there would be limited risk of landslides.

5.6.3.3 Mitigation

5.6.3.3.1 Commission Sample Routing Permit

The sample routing permit (Section 5.3.8 pf Appendix D) contains the following mitigation related to geology and topography: “Areas disturbed by construction activities shall be restored to pre-construction conditions.” The sample routing permit (Section 5.5.2 of Appendix D) also states that “the Permittee shall comply with all applicable state rules and statutes. The Permittee shall obtain all required permits for the project and comply with the conditions of those permits unless those permits conflict with or are preempted by federal or state permits and regulations.”

5.6.3.3.2 Other Proposed Mitigation

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.

Substations would be constructed at grade to the extent possible, and disturbed areas within the temporary workspaces would be restored to pre-construction conditions to the maximum extent feasible. Appropriate permanent stormwater management measures would address drainage from newly established impervious areas and any changes in topography.

5.6.4 Greenhouse Gases

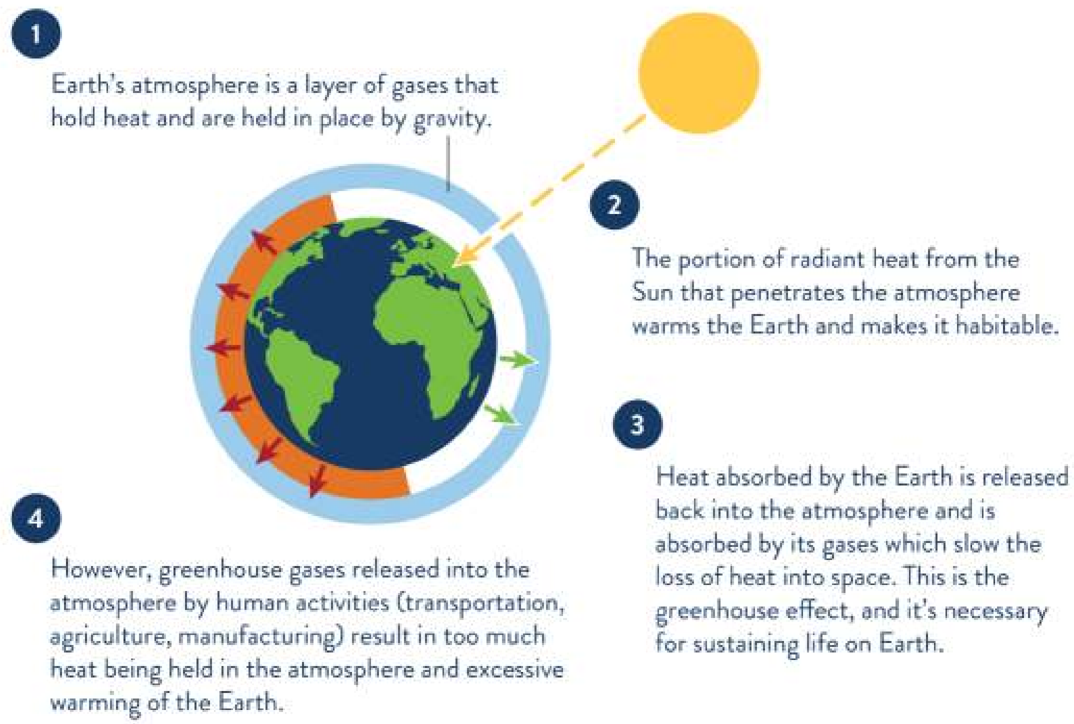
The ROI for greenhouse gas (GHG) emissions is the ROW. Construction activities would result in short-term increases in GHG emissions because of the combustion of fossil fuels in construction equipment and vehicles. These emissions would be short-term and dispersed over the ROI; therefore, total emissions 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.

The impact assessment for greenhouse gases was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected given their similar lengths.

5.6.4.1 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 5-13. This warming process is known as the greenhouse effect (reference (147)).

Figure 5-13 Greenhouse Gasses 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 (148)).

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

More recently in 2021, the United States announced the Net Zero World Initiative to reach net zero emissions by 2050 and the 2030 Greenhouse Gas Pollution Reduction target to achieve a 50-52 percent reduction in greenhouse gas emissions from 2005 levels. These reductions would be accomplished by accelerating transitions to net zero, resilient, and inclusive energy systems (references (149); (150)).

The state of Minnesota has also 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).

5.6.4.2 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. Indirect emissions associated with the construction and operation of the project include the GHG emissions associated with electrical consumption. GHG emissions for each route segment by region are summarized in Appendix H. Variability in total anticipated GHG emissions by route segment (be region) are a function of varying lengths and/or differences in anticipated land use change. Because the total length of route alternatives would be similar, and because the project area has limited variability in land use, GHG emissions are anticipated to be similar for each route alternative.

Construction emissions from mobile combustion were calculated for on-road vehicles (commuter vehicles, delivery trucks, concrete mixer trucks) and off-road construction equipment (dump trucks, cranes, bulldozers, etc.). Construction emissions from combustion sources are anticipated to be similar for each route alternative. Therefore, the total construction combustion emissions and length of the applicant's proposed Green Route Segment and Purple Route were used to calculate an emission rate per route length, in metric tons CO_2e/mile, to quantify combustion emissions for each route 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 route length is 139.10 metric tons CO_2e/mile.

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 were calculated for equipment used for transmission line ground inspections, transmission line drone inspections, substation inspections, and vegetation maintenance. Operational emissions from mobile combustion are anticipated to be similar for each route alternative. Therefore, operational emissions from mobile combustion have only been calculated for the applicant-proposed routes. 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 include the operation of the Garvin Substation, intermediate substation, and Voltage support substation. The project-related modifications at the existing Sherco Substation and Sherco Solar West Substation would be minor. Therefore, operational emissions were not calculated for these sources.

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 (151)). 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 (152)).

The impact assessment for greenhouse gases was not carried forward at the regional level because existing conditions are better understood at a broader scale than the ROI.

5.6.4.3 Mitigation

5.6.4.3.1 Commission Sample Routing Permit

The sample routing permit does not contain mitigation measures specific to GHG emissions. The sample routing permit states, “The Permittee shall comply with all applicable state rules and statutes.”

5.6.4.3.2 Other Proposed Mitigation

Minimization efforts to reduce project construction GHG emissions would include limiting vehicle idling to only times when necessary. Minimization efforts to reduce project operational GHG emissions from SF_6 would include following safe handling practices during refilling, avoiding exposure to high temperatures, and monitoring for leaks.

5.6.5 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, understood, and a plan is implemented to manage pressurized groundwater conditions should they be encountered, impacts would be minimized and/or mitigated.

5.6.5.1 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 project area crosses three main groundwater provinces: the Central Province, Western Province, and the Arrowhead/Shallow Bedrock Province. The Central Province has thick glacial sediment, sand and gravel aquifers are common, and the deeper fractured crystalline bedrock has poor aquifer properties and limited use as an aquifer. The Western Province contains fractured bedrock commonly buried deep beneath glacial sediment and is of limited use as an aquifer. The Arrowhead/Shallow Bedrock Province has thin or absent glacial sediment with limited use as an aquifer except in major river valleys where sediment thickness is greater. It is mostly underlain by crystalline bedrock that typically has limited groundwater available for use (reference (153)).

Groundwater flow direction in these shallow, unconsolidated sediments is expected to follow surface topography and surface water flow. However, groundwater flow direction could vary throughout the project area 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 in the project area (reference (154)).

No springs were identified within the route width based on a search of the Minnesota Spring Inventory database (reference (155)).

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 in the project area (reference (156)).

Wells are abundant throughout 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 approximately 20 active wells within the ROW of the route alternatives; several other wells within the ROW are reported as sealed. Table 5-14 includes the active wells or those with unknown status within ROW (reference (157)).

Table 5-14 MWI Active Water Wells within ROW of Route Alternatives

MWI Unique Well ID	Status	Depth (Feet)	Static Water Level (Feet) on MWI Report	Use	Route Alternative
209140	Active	485	135	Domestic	Route Segment A5
637702	Active	224	NL	Environmental Boring	Route Segment B1 (Purple Route)
637745	Active	222	NL	Piezometer	Route Segment B1 (Purple Route)
771162	Active	230	NL	Monitoring Well	Route Segment B3
247901	Unknown	67	NL	Test Well	Route Connector 211, Route Connector 219
710409	Active	260	4	Industrial	Route Segment 211, Route Segment 219
247908	Unknown	42	NL	Test Well	Route Segment 211, Route Segment 219
840605	Active	65	NL	Domestic	Route Segment 214
786168	Active	52	10	Irrigation	Route Segment C1 (Purple Route), Route Segment 225
223881	Unknown	1010	NL	Exploration	Route Segment C3, Route Connector 104
242291	Active	18	NL	Unknown	Route Segment F4 (Blue Route)
170075	Active	50	20	Domestic	Route Segment G1 (Blue Route), Route Segment G2
466093	Active	118	58	Domestic	Route Segment G1 (Blue Route), Route Segment G2
558020	Active	115	17	Irrigation	Route Segment G1 (Blue Route), Route Segment G2
871653	Active	58	12	Irrigation	Route Segment G1 (Blue Route), Route Segment G2
474439	Active	86	NL	Irrigation	Route Segment G3 (Purple Route), Route Segment G4, Route Segment G5, Route Segment G6, Route Segment 248
160617	Active	58	15	Domestic	Route Segment G4, Route Connector 115
403737	Active	53	12	Domestic	Route Segment G5

MWI Unique Well ID	Status	Depth (Feet)	Static Water Level (Feet) on MWI Report	Use	Route Alternative
143831	Active	102	19	Irrigation	Route Segment 240
751857	Active	70	17	Irrigation	Route Segment 242
451782	Active	66	28	Domestic	Green Route Segment

NL = Not Listed

In addition to the active wells listed in Table 5-14, there are approximately 80 active domestic water wells within the proposed substation siting areas.

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 (158)). 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 5-15 summarizes the DWSMAs/WHPAs included in the MDH database that are crossed by the anticipated alignments.

Table 5-15 Drinking Water Supply Management Areas and Wellhead Protection Areas Crossed with the ROW

County	DWSMA/WHPA Name	Location	Vulnerability to Contamination
Meeker	Eden Valley	Directly SE of city of Eden Valley	High
Kandiyohi	Raymond 3	Directly NE of city of Raymond	Moderate
Yellow Medicine	Marshall-Sandnes Wellfield #28	2 miles NE of city of Cottonwood	Low
Yellow Medicine	Marshall-Sandnes Wellfield #31	2 miles NE of city of Cottonwood	Low
Yellow Medicine	Cottonwood	1.4 miles NW of city of Cottonwood	Low
Yellow Medicine	Wood Lake	Within the city of Wood Lake	Low
Renville	Bird Island	0.6 miles E of city of Bird Island	Low
Redwood	Redwood Falls West	Directly SW of city of Redwood Falls	Moderate
Redwood	Redwood Falls East 2	2 miles S of city of Redwood Falls	Low

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 in the project area (reference (159)).

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 which 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 (160)).

5.6.5.2 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.

5.6.5.3 Mitigation

5.6.5.3.1 Commission Sample Routing Permit

The sample routing permit (Section 5.3.8 of Appendix D) contains the following mitigation related to groundwater resources: "Areas disturbed by construction activities shall be restored to pre-construction conditions."

The sample routing permit (Section 5.5.2 of Appendix D) also states that "the Permittee shall comply with all applicable state rules and statutes. The Permittee shall obtain all required permits for the project and comply with the conditions of those permits unless those permits conflict with or are preempted by federal or state permits and regulations."

5.6.5.3.2 Other Proposed Mitigation

The applicant would coordinate with the MNDNR, 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 that if shallow depths to groundwater resources are identified during geotechnical design of the project, specialty structures with wider, shallower foundations could be used. EERA staff recommends these locations be shown on the plan and profile submitted for the project, and that appropriate mitigation measures be identified as part of the filing.

Depending on the results of the geotechnical evaluations, the applicant would obtain a Water Appropriation Permit from MNDNR 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.

Several DWSMAs/WHPAs are crossed by the route alternatives. Associated wellhead protection plans should 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.

5.6.6 Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands often involve unique resources intended for protection and/or preservation. 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, Waterfowl Production Areas, and state game refuges. No other public lands such as local parks, state forests, or national forests were identified. Designated lands with easements within the ROI include: CREP and RIM easements, one designated Water Bank, and one Wild and Scenic River Bank.

5.6.6.1 Existing Conditions

Public lands include those owned at the local, state, and federal levels. Coordination would be required to occupy public lands within the ROW and/or temporary workspace areas for construction activities within the route width.

Public lands within the ROI, but not crossed by the anticipated alignments, include Wildlife Management Areas and Waterfowl Production Areas. Two state game refuges are within the ROI of Region F and G and one is crossed by Region G. Waterfowl Production Areas are small natural wetlands and grasslands designated by USFWS that provide breeding, resting, and nesting habitat for waterfowl, shorebirds, grassland birds and other wildlife (Section 5.6.12). The DNR manages Wildlife Management Area land to protect wildlife habitat as well as provide hunting and recreational activities related to wildlife (Section 5.2.8). The following public lands were not identified within the ROI:

- National parks, forests, and wildlife refuges

- State parks and forests
- Local parks
- Military land
- Scientific and Natural Areas
- School Trust Lands
- Consolidated Conservation lands (commonly referred to as Con-Con lands)

Privately held land could also be subject to special designations. The route alternatives cross 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 (161)). 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 (162)). RIM Reserve and CREP lands are present in Regions A, B, and C.

A designated Water Bank is present in Region B. The Water Bank Program is federal conservation program in which landowners receive annual payments for conserving and protecting wetlands and adjacent lands from adverse land uses and activities, such as drainage, that would destroy the wetland characteristics of those lands (reference (163)).

A Wild and Scenic River Bank is present in Region G along the Mississippi River. Wild and Scenic River Banks are scenic easements that are permanently protected private lands adjacent to state-designated Wild and Scenic Rivers with limited land alteration, vegetation removal, building, dumping, and placement of structures (reference (164)).

5.6.6.2 Potential Impacts

The programs with conservation easements aim to establish native and permanent plant species and/or conserve and protect the natural habitat. Permanent clearing of vegetation within the conservation areas would impact the function and intent of these areas and potentially have long-term effects to the unique resources.

5.6.6.3 Mitigation

5.6.6.3.1 Commission Sample Routing Permit

The sample routing permit (Section 5.3.17 of Appendix D) 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."

5.6.6.3.2 Other Proposed Mitigation

The applicant avoided areas with designated easements as practicable and in some areas requested additional route width to allow for flexibility to avoid conservation easements. 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 RIM programs. Additionally, the applicant would continue to coordinate potential easement crossings with BWSR.

5.6.7 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. 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.

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, such as native plant communities. 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 1 mile of the project. Although these reviews do not represent a comprehensive survey, they provide 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 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.

5.6.7.1 Federally Protected Species Existing Conditions

The USFWS IPaC online tool was queried on June 3, 2024, for a list of federally threatened and endangered species, proposed species, candidate species, and designated critical habitat that could be present within the vicinity of the project (Appendix N). The IPaC query identified six federal species that could potentially be in the project area, including one endangered species, one threatened species, two proposed endangered species, a candidate species, and an experimental population, non-essential species. These species and their typical habitats are summarized in Table 5-16. The project does not traverse federally designated critical habitat.

Table 5-16 Federal Species Potentially Present in the Vicinity of the Project

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]
Lespedeza leptostachya	Prairie bush clover	Threatened	Threatened	Bedrock outcrop prairie or north-, northeast-, or northwest-facing mesic to dry prairie slopes.[1]
Perimyotis subflavus	Tricolored bat	Proposed Endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Simpsonaias ambigua	Salamander mussel	Proposed Endangered	Endangered	Under flat rocks or under ledges of rock walls.[1]
Danaus plexippus	Monarch butterfly	Candidate	Not listed	Areas with a high number of flowering plants. Presence of milkweed (*Asclepias* spp.) to complete the caterpillar life stage.[2]
Grus americana	Whooping crane	Experimental population, non-essential	Not listed	Wetlands, lakes, ponds, rivers, and agricultural fields.[3]

[1] Habitat information from reference (165).
[2] Habitat information from reference (166).
[3] Habitat information from reference (167).

5.6.7.2 State Protected Species Existing Conditions

The DNR's NHIS database was queried in June 2024 (Barr License Agreement LA-2022-008), to determine if any state endangered, threatened, or special concern species have been documented within 1 mile of the project; the 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 the project area, given presence of suitable habitat. The NHIS database identified records for seven endangered, 11 threatened, and 28 special concern species within 1 mile of the project. State threatened and endangered species documented in the NHIS database, along with their typical habitats are summarized in Table 5-17. A state-listed endangered species is defined as a species threatened with extinction throughout all or a significant portion of its range within Minnesota. A state-listed threatened species is defined as being likely to become endangered in the foreseeable future throughout all or a significant portion of its range in Minnesota.

State special concern species documented in the NHIS database within 1 mile of the project are summarized in Appendix N. These species are tracked by the DNR because they are extremely uncommon in Minnesota or have unique or highly specific habitat requirements, however, they are not legally protected under the Minnesota Endangered Species Statute.

Table 5-17 Natural Heritage Information System Database Records of State or Federally Threatened or Endangered Species within 1 Mile of the Project

Scientific Name	Common Name	Type	State Status	Federal Status	Habitat1
Ammodramus henslowii	Henslow's sparrow	Bird	Endangered	Not listed	Uncultivated grasslands and old fields.
Juglans cinerea	Butternut	Vascular plant	Endangered	Not listed	Mesic hardwood forests.
Lampsilis teres	Yellow sandshell	Mussel	Endangered	Not listed	Large rivers.
Lanius ludovicianus	Loggerhead shrike	Bird	Endangered	Not listed	Upland prairies.
Oarisma poweshiek	Poweshiek skipperling	Butterfly	Endangered	Endangered	Wet to dry native prairie. Important larval hosts include prairie dropseed (Sporobolus heterolepis) and little bluestem (Schizachyrium scoparium var. scoparium).
Rallus elegans	King rail	Bird	Endangered	Not listed	Shallow freshwater, brackish, or saltwater marshes.
Simpsonaias ambigua	Salamander mussel	Mussel	Endangered	Proposed endangered	Under flat rocks or under ledges of rock walls.
Actinonaias ligamentina	Mucket	Mussel	Threatened	Not listed	Medium to large rivers.
Alasmidonta marginata	Elktoe	Mussel	Threatened	Not listed	Medium to large rivers.
Asclepias sullivantii	Sullivant's milkweed	Vascular plant	Threatened	Not listed	Undisturbed wet and mesic tallgrass prairie.
Bacopa rotundifolia	Waterhyssop	Vascular plant	Threatened	Not listed	Small rainwater pools on bedrock outcrops.
Berula erecta	Stream parsnip	Vascular plant	Threatened	Not listed	Wet seepage meadows, calcareous fens, and spring-fed streams in forested ravines.

Scientific Name	Common Name	Type	State Status	Federal Status	Habitat1
Emydoidea blandingii	Blanding's turtle	Turtle	Threatened	Not listed	Calm, shallow waters with rich, aquatic vegetation for foraging and adjacent sandy uplands for nesting.
Eurynia dilatata	Spike	Mussel	Threatened	Not listed	Small to large rivers.
Lasmigona costata	Fluted-shell	Mussel	Threatened	Not listed	Medium to large rivers.
Lespedeza leptostachya	Prairie bush clover	Vascular plant	Threatened	Threatened	Bedrock outcrop prairie or north-, northeast-, or northwest-facing mesic to dry prairie slopes.
Minuartia dawsonensis	Rock sandwort	Vascular plant	Threatened	Not listed	Dry sedimentary bedrock outcrops sandstone, limestone, and dolomite), where the species grows in crevices and in very shallow accumulations of organic matter over the exposed bedrock.
Quadrula nodulata	Wartyback	Mussel	Threatened	Not listed	Large rivers.

[1] Habitat information from reference (165).

5.6.7.3 Sensitive Ecological Resources Existing Conditions

The DNR has established several classifications for sensitive ecological resources across the state, many of which are scattered throughout the geographic area (Map 12). Some of these sensitive ecological resources are crossed by the project's route width including Sites of Biodiversity Significance, native plant communities, railroad rights-of-way prairies, prairie bank easements, and Lakes of Biological Significance.

The DNR maps Sites of Biodiversity Significance 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 (168)). The DNR assigns biodiversity significance ranks, as follows:

- **Outstanding** – best occurrences of the rarest species and native plant communities.
- **High** – good quality occurrences of the rarest species and high-quality examples of native plant communities.
- **Moderate** – occurrences of rare species, moderately disturbed native plant communities.
- **Below** – sites with moderately disturbed native plant communities, but lacking occurrences of rare species).

As shown on Map 12, several Sites of Biodiversity Significance are crossed by the project's route width.

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 (169)). 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 12, several native plant communities have been mapped across the project area, many of which are crossed by the project's route width, including the following types and associated state conservation status (or range of statuses if multiple subtypes):

- Basswood - Bur Oak - (Green Ash) Forest; S3
- Dry Hill Prairie (Southern); S2
- Pin Oak - Bur Oak Woodland; S3
- Southern Wet-Mesic Hardwood Forest; S2, S3
- Crystalline Bedrock Outcrop (Prairie), Minnesota River Subtype; S2
- Mesic Prairie (Southern); S2
- Prairie Wetland Complex; S1, S2, S3
- Wet Prairie (Southern); S2

The 1997 Minnesota State Legislature directed the DNR to survey active railroad rights-of-way for native prairie (reference (170)). These areas undergo active management to maintain the existence of prairie communities. As shown on Map 12, railroad rights-of-way prairie are scattered throughout the central and southern parts of the project area, some of which are crossed by the project's ROI for sensitive ecological resources.

Native prairie bank easements were authorized by the 1997 Minnesota State Legislature to protect and manage native prairie while allowing the land to remain in private ownership (reference (171)). At present, more than 15,000 acres of land are protected under native prairie bank easements in Minnesota. As shown on Map 12, several prairie bank easements are scattered across the southwestern part of the project area, a few of which are crossed by the project's ROW for sensitive ecological resources.

The DNR maps certain waterbodies as Lakes of Biological Significance based on the unique presence of aquatic plants or animals (reference (172)). 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 12, several Lakes of Biodiversity Significance are scattered across the northeastern and southwestern parts of the project area, a few of which are crossed by the project's ROI for sensitive ecological resources.

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 (173)). As shown on Map 12, Scientific and Natural Areas are scattered across the project area; however, none of them are located within the project's route width based on the proposed alignments.

State and federal lands that are preserved or managed for wildlife would also be considered sensitive ecological resources; these lands are discussed in Section 5.6.12.1.

5.6.7.4 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 5.6.12.2 and could include displacement during construction activities that generate noise, dust, or disturbance of habitat. Permanent clearing of vegetation in areas identified as sensitive ecological resources could impact protected species associated with these habitats.

5.6.7.4.1 Federally Protected Species

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

The NHIS database does not document the presence of northern long-eared bats, maternity roost trees, or hibernacula within 1 mile of the project. The project area is predominantly agricultural, with only small areas of forested habitat. However, 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 tricolored bat and salamander mussel are both federally proposed endangered species, which means that the USFWS has determined they are in danger of extinction throughout all or a significant portion of their range and has proposed a draft rule to list them as endangered. Until the rule to list these species is finalized, they are not protected by the take prohibitions of the federal ESA.

The NHIS database does not identify any records of tricolored bats within 1 mile of the project; however, habitat suitable for the species is present in the area. Potential impacts to and minimization measures for tricolored bats would be similar to those described for northern long-eared bats.

As noted in Table 5-17, the NHIS database documents the presence of salamander mussel within 1 mile of the project. However, direct impacts to the salamander mussel or other aquatic protected species are not anticipated, as waterbodies and watercourses would be spanned for the entire project and appropriate BMPs would be used, as discussed in Section 5.6.9.

As noted in Table 5-17, the NHIS database documents the presence of prairie bush clover within 1 mile of the project. Impacts to prairie bush clover could occur should this species or suitable prairie habitat be present in areas undergoing grading or clearing activities associated with project construction.

The monarch butterfly is a federal candidate species, which means that it is a species for which the USFWS has sufficient information to propose listing them as endangered or threatened under the ESA, but their listing is precluded by other higher listing activities. Candidate species have no federal protection under the ESA. The NHIS database does not track documented records of monarch butterflies. Potential impacts to monarch butterflies could occur as a result ground disturbing activities and/or removal of suitable reproductive (milkweed plants) or feeding (flowering plants) habitat; however, impacts are anticipated to be minimal given the predominance of agricultural land in the project area.

Whooping cranes are designated as a non-essential experimental population in Minnesota. This designation refers to a population that has been established within its historical range under Section 10(j) of the ESA to aid in recover of the species. Consultation under Section 7(a)(2) of the ESA is only required if project activities would occur within a national wildlife refuge or national park. If project activities are proposed on lands outside of a national wildlife refuge or national park, consultation is not required. The project does not intersect any national wildlife refuges or national parks. Whooping cranes are rare in the state of Minnesota, and the NHIS database does not track documented records of them. Potential impacts to whooping cranes would be similar to those described for other waterfowl/avian species in Section 5.6.12.2.

5.6.7.4.2 State Protected Species

The state threatened and endangered species identified in Table 5-17 and special concern species identified in Appendix N are known to occur in the project's geographic area where suitable habitat is present. The discussion below is focused on potential impacts to 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.

The state threatened and endangered vascular plants identified in Table 5-17 might occupy habitats that are traversed by the project. 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 Blanding's turtles could occur during project construction as a result of ground disturbing activities in wetland habitat and adjacent sandy upland nesting habitat.

Potential impacts to state protected bird species identified in Table 5-17 would be similar to those described for other avian species in Section 5.6.12.2.

The Poweshiek skipperling butterfly is a federally and state protected species and is known to be rare in the state of Minnesota based on surveys conducted by the DNR (reference (174)). Given the rarity of the species and that the IPaC query did not identify it as potentially occurring in the vicinity of the project area suggests that the species is unlikely to be found in the project area. However, potential impacts to the Poweshiek skipperling butterfly could occur as a result of removal of suitable prairie habitat.

All watercourses would be spanned; as such, direct impacts to the state protected mussel species identified in Table 5-17 are not anticipated from the project.

5.6.7.4.3 Sensitive Ecological Resources

Impacts to sensitive ecological resources could occur as a result of project construction; however, impacts can be minimized by avoiding and/or spanning these resources. 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, which could result in reduced community sizes and habitat loss. Removal of vegetation and/or conversion to open habitats could increase the potential for the spread of invasive plant species/ noxious weeds and could alter the structure and function of sensitive ecological resources, potentially making them less suitable for the rare species that would typically inhabit them.

5.6.7.5 Mitigation

Through implementation of BMPs and mitigation measures, impacts to federally or state protected species and sensitive ecological resources are anticipated to be minimal. 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 prudent routing— that is, by avoiding and/or spanning these communities if possible. In addition, following existing rights-of way and division lines such as roads, existing transmission lines, and field lines, would reduce the potential for fragmentation of these resources.

5.6.7.5.1.1 Commission Sample Routing Permit

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 D, 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 5.6.10.3 and Section 5.6.12.3, respectively.

5.6.7.5.1.2 Other Proposed Mitigation

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:

- Impacts to federally and state protected prairie bush clover and Poweshiek skipperling would be minimized by maximizing structure spacing to span suitable native prairie habitats.

- Impacts to the federally and state protected salamander mussel and other state protected mussel species would be minimized by not conducting any in-stream work and implementing BMPs to prevent erosion and sediment runoff to protect water quality, such as silt fence, straw bale, and other erosion control device installation. These BMPs would be outlined in the project Stormwater Pollution Prevention Plan (SWPPP).
- Impacts to the federal candidate monarch butterfly would be minimized by primarily routing through cultivated cropland, which does not provide suitable reproductive habitat.
- Impacts to state protected bird species would be minimized by coordinating with the DNR to schedule vegetation clearing activities.
- Impacts to state protected vascular plant species would be minimized by avoiding or spanning areas of suitable habitat to the extent possible.
- Impacts to Blanding's turtles would be minimized by coordinating with the DNR to identify the appropriate conservation measures to implement for this species. The DNR has developed recommendations for avoiding and minimizing impacts to Blanding's turtles in an effort to assist developers and contractors during construction within Blanding's turtle habitat (reference (175)). Recommendations include things such as the use of silt fencing around construction sites and the training of construction workers to minimize potential impacts to Blanding's turtles.
- Coordinate with the DNR to avoid adverse impacts to protected species and implement appropriate, species-specific BMPs if project activities take place during any of the species' active seasons.
- Impacts to sensitive ecological resources were minimized by the applicant conducting early coordination with the DNR and the applicant refining route alternatives based on the DNR's recommendations. The applicant has committed to continuing to work with the DNR to minimize impacts to sensitive ecological resources.
- Implement integrated vegetation management plans associated with its existing pollinator initiative, which was created to enhance pollinator habitat; these plans minimize chemical use by avoiding broadcast applications and employ spot treatments for control of invasive species.

In their Natural Heritage Review response (MCE 2023-00890; scoping comment #285), the DNR recommended the following to minimize potential impacts to sensitive ecological resources:

- As much as possible, operate within already-disturbed areas.
- Confine construction activities to the opposite side of the road from Minnesota Biological Survey Sites and rare native plant communities (S1-S3). If this is not feasible, confine construction activities to the existing road rights-of-way.
- Retain a buffer between proposed activities and both Minnesota Biological Survey Sites and rare native plant communities (S1-S3).
- 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 (MCE 2023-00890; scoping comment #285), the DNR recommended the following to minimize potential impacts to state-listed species:

- To avoid impacting state protected plants, all native prairie habitats and all rock outcrop habitats must be avoided. If avoidance is not feasible, a botanical survey will be needed.
- 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.
- To avoid impacts to black sandshell mussels, 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 minimize impacts to northern long-eared bats and other bat species, tree removal should be avoided from June 1 through August 15.

5.6.8 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. Most soils within the ROI have a moderate or severe rutting hazard rating.

5.6.8.1 Existing Conditions

Soil information for the ROW was obtained from the USDA-Natural Resource Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database (reference (176)). Soil mapped in the ROW generally includes four soil texture classes: loam, silty clay loam, sandy loam, or clay loam (Map 13). The drainage classes of these soils range from very poorly drained to well drained.

According to the SSURGO database, exposed soils within the ROW have a slight, moderate, or severe potential erosion hazard. The ratings in this interpretation indicate the hazard of soil loss from off-road and off-trail areas after disturbance activities that expose the soil surface. A rating of "slight" indicates that erosion is unlikely under ordinary climatic conditions; "moderate" indicates that some erosion is likely and that erosion-control measures could be needed; and "severe" indicates that erosion is very likely and that erosion-control measures, including revegetation of bare areas, are advised.

Soil compaction susceptibility within the ROW ranges from low to high. 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 "low" rating means the soil is able to support standard equipment with minimal compaction. A "medium" rating means that after the initial compaction (that is, the first equipment pass), the soil is able to 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.

Soil rutting potential within the ROW ranges from slight to severe. 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 "slight" indicates that the soil is subject to little or no rutting, "moderate" indicates that rutting is likely, and "severe" indicates that ruts form readily.

Soils with a low revegetation potential are within project ROW. Soils with a non-irrigated land capability classification of 3 or greater were considered to have low revegetation potential. The revegetation potential of soil is based on several characteristics, including topsoil thickness, soil texture, available water capacity, susceptibility to flooding, and slope. These soils have characteristics that cause high seed mortality, which requires additional management and could be difficult to revegetate. The clearing and grading of soils with poor revegetation potential can result in a lack of adequate vegetation following construction and restoration.

Hydric soils are present throughout the ROW. 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.

5.6.8.2 Potential Impacts

Transmission line and substation 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 and substation components. Localized soil erosion, compaction, and topsoil and subsoil mixing could affect revegetation within temporary work areas. Construction of new substations (Chapter 14) would result in permanent impacts to soils for the facilities' operational lifetime. During operation, soils could be temporarily disturbed for equipment access to the HVTL for maintenance.

Modifications to two existing substations and construction of three new substations would result in permanent impacts to soils. Construction work within the substation sites would include site preparation, grading, and installation of substructures and electrical equipment. 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. Where present, operation of the substations would constitute a permanent loss of prime farmland soils. It is important to note that the prime farmland soil designation is independent of current land use at the proposed substation sites, which might have already been significantly modified by previous development.

5.6.8.3 Mitigation

5.6.8.3.1 Commission Sample Routing Permit

The sample routing permit (Section 5.3.8 of Appendix D) 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 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 Minnesota Pollution Control Agency 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 Minnesota Pollution Control Agency 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."*

5.6.8.3.2 Other Proposed Mitigation

During construction of the transmission line, the applicant would implement measures to reduce soil compaction and has committed to soil decompaction during restoration of temporary workspaces, including travel lanes. Impacts to soils along the transmission line would be mitigated through the proper use and installation of BMPs, such as minimizing the number of vehicles trips and segregation of topsoil and subsoil.

During construction and modification of the substations, the applicant indicated in the route permit application that the limit of disturbance would be within the footprint of the substations for both the foundation equipment and the concrete delivery trucks. Topsoil from the substation footprints would be moved to a pre-established storage area near the removal site, suitable for storage due to soil depth and grading that facilitates revegetation. Subsoil would be removed, if necessary, to a similarly suitable area for storage.

5.6.9 Surface Water

The ROI for surface water is the route width. Impacts to surface waters are assessed through identification of watercourses and waterbodies and consideration of their type, proximity to the project, and special designations.

5.6.9.1 Existing Conditions

5.6.9.1.1 Watercourses and Waterbodies

The project is in the Upper Mississippi and Minnesota River Basins. Eight watersheds are in the project as assigned by USGS by the 8-digit Hydrologic Unit Codes (HUC):

- Cottonwood River (8-digit HUC 7020008)
- Redwood River (8-digit HUC 7020006)
- Middle Minnesota (8-digit HUC 7020007)
- Hawk-Yellow Medicine (8-digit HUC 7020004)
- South Fork Crow River (8-digit HUC 7010205)
- North Fork Crow River (8-digit HUC 7010204)
- Sauk River (8-digit HUC 7010202)
- Clearwater Elk (8-digit HUC 7010203)

The DNR rates the health of all of the watersheds within the project area as “medium” according to the Watershed Health Assessment Framework (WHAF). The WHAF ranks watershed health using five biological, geological, and water quality components to generate a score from low health to high health (reference (177)). At the state scale, watersheds further downstream tend to decrease in health score. The DNR indicates the “medium” rankings with higher levels of degradation than their northern watersheds near the St. Cloud area are in part due to impervious surfaces, intensity of water use and point source pollution. In contract, the highest rankings are in north central Minnesota where there is lower levels of development and agriculture, and more prominent wetland and forested land cover (reference (178)).

Surface waters in the ROI include rivers and streams (watercourses) and lakes and ponds (waterbodies). Many of these watercourses and waterbodies are designated as public watercourses and public water basins by the DNR in the public waters inventory (PWI).

Major watercourses in the ROI include (Map 14):

- Meadow Creek
- Cottonwood River
- Redwood River
- Yellow Medicine River
- Crow River
- Clearwater River
- Minnesota River
- Mississippi River

Of these, the Mississippi River (Region G) and Minnesota River (Region B) are designated Section 10 which means they are navigable waters regulated under Section 10 of the Rivers and Harbors Act (reference (179)). Numerous jurisdictional watercourses and county ditches traverse the ROI, including two trout streams in Region G (Johnson Creek and Fairhaven Creek). In addition, three Outstanding Resource Value Waters, the Minnesota River, Crow River, and Mississippi River, are in Regions B, D, and G, respectively. Watercourses designated as either state water trails and/or wild and scenic rivers including the Redwood River (Region B), Crow River (Region D), and Mississippi River (Region G) are also present and crossed by both the Purple Route and the Blue Route.

There are several Federal Emergency Management Administration (FEMA) designated 100-year and 500-year floodplains crossed by the project (Map 14). FEMA-designated 100-year floodplains are associated with specific waterbodies along the route alternatives. 500-year floodplains are less prevalent and primarily located along wide, bottom-land terraces associated with large rivers along the route alternatives.

Waterbodies associated with the 100-year floodplains crossed by the project include the Mississippi River, Clearwater River, Crow River, Grove Creek, three unnamed perennial ditches, one unnamed intermittent ditch, Hawk Creek, Minnesota River, one unnamed stream, Yellow Medicine River, Threemile Creek, Redwood River, Meadow Creek, Half Moon Lake Creek, and Cottonwood River. Waterbodies associated with the 500-year floodplains crossed by the project are the Minnesota River, one unnamed intermittent stream, and Meadow Creek.

The ROI contains several larger waterbodies including, but not limited to: Belle Lake, Locke Lake, Lynden Lake, Wilcox Lake, Long Lake, and Sather Lake (Map 14). Several lakes within the ROI are designated as shallow wildlife lakes; the DNR Shallow Lakes Program works to protect and enhance wildlife habitat on larger lakes that are dominated by shallow water (reference (180)). Shallow wildlife lakes are discussed under Wildlife and Wildlife Habitat in Chapters 6 through 12. Several Lakes of Biological Significance are scattered across the northeastern and southwestern parts of the ROI. The DNR designates these lakes based on the unique presence of aquatic plants or animals (reference (172)). Lakes of Biological Significance are discussed under Rare and Unique Natural Resources in Chapters 6 through 12. No trout lakes are in the ROI.

Numerous impaired waters are crossed by the anticipated alignments. Most of the impairments (that is, stressors) are related to aquatic life, mercury in fish tissue, sediment, bacteria, insecticides, and nutrients/eutrophication.

5.6.9.1.2 Regulation of Watercourses and Waterbodies

Several federal and state laws regulate watercourses and waterbodies. The 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 and 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 Environmental Protection Agency (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 within the ROI 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 or 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.

The project area includes two trout streams, Johnson Creek and Fairhaven Creek, which are each crossed by an anticipated alignment in Region G. However, route segment G4 avoids any trout stream crossings. 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 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.

The project area includes three outstanding resource value waters: the Minnesota River (Region B), Crow River North Fork (Region D), and Mississippi River (Region G). All of the route segments in these three regions cross an outstanding resource value water. Avoiding the crossing of these outstanding resource value waters, would not be feasible due to the long length of these outstanding resources, which traverse all or a majority of their regions. 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.

5.6.9.2 Potential Impacts

The applicant-proposed routes avoid and minimize impacts to waterbodies, rivers, streams, and ditches to the extent practicable. The project is designed to span waterbodies such that no direct impacts to the bed and bank would occur. The crossing distance for all watercourses and waterbodies in the project area is less than 1,000 feet (the typical transmission line span for the project), meaning that the project is expected to be able to span all watercourses and waterbodies. Thus, no structures would be placed within these features, and no direct impacts on watercourses and waterbodies are anticipated. However, indirect impacts such as erosion or sedimentation could occur to streams with increased potential intensity of impacts where the anticipated alignments parallel. In addition, tree clearing within the ROW would occur during construction and operation of the transmission line which would potentially impact shading and temperature of the watercourse. Substations proposed as part of the project would be sited to avoid impacts on waterbodies, rivers, and streams (Chapter 14).

The applicant would work with the DNR to confirm that all proper licenses and approvals are obtained for public water crossings. Further, through the licensing process, the applicant would work with the DNR to determine appropriate mitigation measures for these crossings.

Although watercourses and waterbodies are anticipated to be spanned, indirect impacts associated with crossing these resources could occur. Removal of vegetation and soil cover could result in short-term water quality impacts due to increased turbidity. Construction impacts could also 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 removal of vegetation. The project might require that transmission line structures be placed within FEMA-designated floodplain. There are approximately ten floodplain crossings that exceed 1,000 feet. However, 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.

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. Substations would not be sited within floodplains; therefore, no impacts on floodplains are anticipated from construction and operation of the substations proposed as part of the project and no mitigation measures are proposed.

5.6.9.3 Mitigation

5.6.9.3.1 Commission Sample Routing Permit

The sample routing permit (Section 5.3.9 of Appendix D) 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.
- 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.

5.6.9.3.2 Other Proposed Mitigation

Impacts to surface waters could be avoided by prudent routing, selecting the routes that cross the fewest watercourses or waterbodies. 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. A temporary seed mix would be installed where appropriate to support bank stabilization during restoration activities. If new access roads for vehicles and equipment are required, access roads would be selected to avoid disturbance to watercourse banks. Vegetation would be maintained along the transmission line through the operational life of the project according to the Vegetation Management Plan.

Crossed waterways would be maintained for proper drainage using temporary culverts or other temporary crossing devices, according to BMPs and permit requirements. If tree removal is required adjacent to waterways, trees would be cut so that the root system is not disturbed in order to retain bank stability.

The applicant would coordinate with applicable agencies regarding transmission line crossings of waterbodies, including public waters and Section 10 Waters.

In their Natural Heritage Review response (MCE 2023-00890; scoping comment #285), the DNR recommended the following to minimize potential impacts to water resources:

- Employing directional boring techniques to install cable under the area or attaching the cable to roadway bridges passing over such areas.
- Work in watercourses should be conducted during low flow whenever possible.
- If possible, conduct the work under frozen ground conditions.
- Wetland basins, lake beds, and stream/riverbeds should be restored to preconstruction contours. The work should not promote wetland drainage.
- Appropriate wildlife friendly erosion control measures, such as fabric, straw bales, mulch, and silt fences should be used to prevent sedimentation of adjacent wetlands, lakes, or watercourses.
- Impacts to existing vegetation should be kept to a minimum. Disturbed soil areas should be reseeded with native species suitable to the local habitat immediately upon project completion.

In their Natural Heritage Review response (MCE 2023-00890; scoping comment #285), the DNR also identified concerns for specific water resources, including the following:

- The Purple Route crosses Fairhaven Creek, a designated trout stream. However, the DNR would prefer avoiding disturbance to the stream, which is sensitive to sedimentation and temperature changes.
- The Blue Route crosses Johnson Creek, a designated trout stream. However, the DNR would prefer the Blue Route cross Johnson Creek at an existing road and bridge crossing.
- The Blue Route runs directly west of School Section Lake, a DNR public water basin, posing a hazard to migratory birds. While the Purple Route avoids School Section Lake, it crosses two DNR PWI wetlands, dissecting a wildlife corridor.

5.6.10 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 dominated by herbaceous

agricultural vegetation with the highest concentrations of forested areas occurring near the northern end of the project.

5.6.10.1 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 (181)). The ECS splits the state of Minnesota into Ecological Provinces, Sections, and Subsections.

The project spans two ECS provinces, the Eastern Broadleaf Forest Province in the northeastern third of the project and the Prairie Parkland Province for the southwestern two-thirds of the project (Map 15). 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 (181)). The Prairie Parkland Province is situated in the part of Minnesota that was historically dominated by tallgrass prairie. The landscape in this province was heavily influenced by the most recent glaciation.

The project traverses the Anoka Sand Plain, Big Woods, and Hardwood Hills Subsections in the Eastern Broadleaf Province and the Minnesota River Prairie and Coteau Moraines Subsections in the Prairie Parkland Province (Map 15).

Prior to European settlement, vegetation in the Anoka Sand Plain Subsection consisted of oak barrens in the uplands, with areas of Jack pine, brushland, upland prairie and floodplain forest also present (reference (181)). At present, the subsection is dominated by agricultural vegetation, with urban development rapidly expanding in the subsection. Deciduous forest, including oak woodland and maple-basswood forest, was the dominant vegetation prior to European settlement (reference (181)). At present, the majority of the subsection consists of agricultural vegetation, with approximately 10 to 15 percent consisting of upland forest or wetland.

Vegetation in the Hardwood Hills Subsection consisted of predominantly of woodland/forest vegetation prior to European settlement. Irregular topography and the presence of waterbodies and wetlands created a barrier to fire, which limited the development of prairie vegetation. However, tallgrass prairie did grow on the more level terrain in the subsection (reference (181)). At present, the subsection is dominated by agricultural vegetation.

Prior to European settlement, vegetation in the Minnesota River Prairie Subsection was dominated by tallgrass prairie, with islands of wet forest also present and floodplain forests along the Minnesota River and other streams in the subsection (reference (181)). At present, remnant tallgrass prairie is rare and the subsection is dominated by agricultural vegetation.

Vegetation in the Coteau Moraines Subsection consisted almost entirely of tallgrass prairie prior to European settlement. Wet prairie vegetation was restricted to the edges of streams and forest vegetation was restricted to ravines along streams (reference (181)). At present, agricultural vegetation dominates the subsection, with very few areas of pre-settlement vegetation remaining.

In general, the vegetation resources across the project are dominated by herbaceous agricultural vegetation and crops including corn, soybeans, potatoes, forage, and sugar beets (Section 5.4.1.1). According to the National Landcover Database (NLCD), areas of natural vegetation including wetlands and native plant communities, such as prairies and forests, are scattered across the project area with the highest concentrations of forested areas in Region G near the northern end of the project. The NLCD is derived from Landsat imagery along with various other data sources. As such, it provides only an approximation of existing landcover types. Wetlands are discussed in Section 5.6.11.1 and native plant communities and other sensitive ecological resources are discussed in Section 5.6.7.3.

5.6.10.2 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. Vegetation would be permanently removed where structures 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 applicant would permanently convert forested areas to low-stature vegetation by clearing woody vegetation throughout the entire ROW where it occurs. The clearing of woody vegetation within the ROW would result in the widening of existing corridors or bisecting (fragmenting) forests to establish new ROW. However, given the predominance of agricultural vegetation in the region, forest fragmentation is anticipated to be minimal for the project.

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

Construction and maintenance activities have the potential to result in the introduction or spread of noxious weeds and other non-native species. Noxious weeds, 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.

5.6.10.3 Mitigation

The primary means of mitigating impacts to vegetation is to avoid particular vegetation, such as trees, through prudent routing. Mitigation can be achieved, in part, by using or sharing existing infrastructure rights-of way (for example, roadway, transmission line) such that tree removal is minimized. However, minimal opportunities for ROW sharing were identified for the project. Mitigation can also be accomplished by spanning areas of sensitive vegetation, native plant communities, and other sensitive ecological resources; these resources are discussed in Section 5.6.7.5.

5.6.10.3.1 Commission Sample Routing Permit

Mitigation and minimization measures for potential impacts to vegetation resources are standard Commission route permit conditions (Appendix D) 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 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.

5.6.10.3.2 Other Proposed Mitigation

As summarized in the route permit application, the applicant has committed to the following measures to minimize the potential for the introduction or spread of noxious weeds and invasive species:

- Disturbed areas would be revegetated using weed-free seed mixes and weed-free straw and hay for erosion control.
- Invasive species/noxious weeds would be removed via herbicide or manual means in accordance with the easement conditions and landowner restrictions.
- Where possible, the ROW could be mowed before noxious weeds and invasive species go to seed, if present.
- Construction vehicles would be inspected and cleaned to remove dirt, mud, plants, and debris from vehicles prior to arriving at and leaving construction sites.

These BMPs would be included in the project's Vegetation Management Plan, which the applicant would prepare in coordination with applicable agencies prior to construction, as provided in the applicant's route permit application. Furthermore, the applicant, in coordination with landowners, would implement integrated vegetation management plans associated with its existing pollinator initiative, which was created to enhance pollinator habitat; these plans minimize chemical use by avoiding broadcast applications and employ spot treatments for control of invasive species.

5.6.11 Wetlands

The ROI for wetlands is the route width. Impacts to wetland are evaluated by examining wetland types, sizes, and potential for spanning. Wetlands are more prevalent in the northeast portion of the project area compared to the southwest portion.

5.6.11.1 Existing Conditions

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 soils, topography, climate, hydrology, water chemistry, vegetation, and other factors.

The USFWS National Wetlands Inventory (NWI), as updated by the DNR, identifies numerous wetland complexes and small isolated wetlands throughout the ROI (Map 14). Wetlands are more prevalent in the northeast portion of the project area compared to the southwest portion. Many of the wetlands are associated with riverine and floodplain ecosystems or are in localized depressions. One calcareous fen (Gennessee 21 site) is located within 5 miles of the project (reference (182)). Calcareous fens are rare and distinctive peat-accumulating wetland that receive hydrology from groundwater that is rich in calcium and other minerals.

In addition to rivers, streams, and lakes, wetlands can also be designated as public waters in Minnesota (Minnesota Statutes § 103G.005). Wetlands identified in the PWI data set are located within the ROI.

5.6.11.1.1 Regulation of Wetlands

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. In addition, the DNR regulates calcareous fens under Minnesota Rules 8420.0935.

5.6.11.2 Potential Impacts

Transmission line and substation sites could temporarily or permanently impact wetlands if they cannot be avoided through project design. In most cases, wetlands can be spanned to avoid placing structures within the wetland. When a wetland cannot be spanned, construction would occur within the wetland. Transmission line structure construction typically includes vegetation clearing, movement of soils, and construction traffic. These activities could alter or impair wetland function. Even small changes in hydrology (for example, periods of inundation, changes in flow, sedimentation) can impair wetland function. Any wetland that would receive permanent HVTL infrastructure would also be impacted long term during operation of the project due to equipment access through the wetland for maintenance.

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 establishment of invasive plant species, such as reed canary grass, which would adversely impact wetland function by reducing vegetative biodiversity and altering wildlife habitat.

Forested wetlands within the transmission line ROW would likely undergo a permanent change of vegetation type as a result of the project. Transmission lines cannot be safely or reliably operated with trees growing within their ROW. Therefore, existing trees must be removed throughout the ROW, including within forested wetlands. The applicant may be required to provide wetland mitigation for the conversion of forested wetlands to non-forested wetlands that occurs as a result of the project.

5.6.11.3 Mitigation

5.6.11.3.1 Commission Sample Routing Permit

The sample routing permit (Section 5.3.9 of Appendix D) 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.
- 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.

5.6.11.3.2 Other Proposed Mitigation

Impacts to wetlands would be avoided or minimized to the extent practicable. The applicant would design the project to span wetlands where feasible and substations would be sited to avoid impacts to wetlands. Where impacts to wetlands cannot be avoided by transmission line structures and clearing of trees within the ROW, several mitigation strategies would be implemented, including using all-terrain construction equipment that is designed to minimize soil impact in wet areas.

Temporary dredge and fill impacts to wetlands due to installation of construction matting and grading activities to support structure installation activities would be restored as required by permit conditions. Permanent wetland fill (loss) due to the installation of structure foundations would be mitigated for as determined through consultation with the appropriate regulatory parties (USACE, DNR, and WCA local governmental unit).

Trees located within the ROW pose a hazard to the structural integrity of the transmission line, which could cause harm to the operation of the transmission line or put the general public in danger. Vegetation maintenance under transmission lines prohibits the establishment of trees and requires removal of existing trees throughout the ROW. Tree removal would likely include those in forested wetlands. Additional mitigation for community type conversion would be determined through consultation with the appropriate regulatory parties.

The applicant would obtain all appropriate permits and approvals from the watershed districts (if necessary) for any actions determined to occur in wetlands.

In their Natural Heritage Review response (MCE 2023-00890; scoping comment #285), the DNR recommended the following to minimize potential impacts to water resources, including wetlands:

- Employing directional boring techniques to install cable under the area or attaching the cable to roadway bridges passing over such areas.
- Work in watercourses should be conducted during low flow whenever possible.

- If possible, conduct the work under frozen ground conditions.
- Wetland basins, lake beds, and stream/riverbeds should be restored to preconstruction contours. The work should not promote wetland drainage.
- Appropriate wildlife friendly erosion control measures, such as fabric, straw bales, mulch, and silt fences should be used to prevent sedimentation of adjacent wetlands, lakes, or watercourses.
- Impacts to existing vegetation should be kept to a minimum. Disturbed soil areas should be reseeded with native species suitable to the local habitat immediately upon project completion.
- In order to avoid impacting or altering the Gennessee 21 fen, the applicant would need to obtain a no effect concurrence decision from the DNR prior to construction should a route be chosen that is within 5 miles of the fen. The applicant would need to demonstrate that any temporary or permanent disturbance from any project-related activities, including dewatering (amount, timing, and duration), are avoided.

5.6.12 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. 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.

5.6.12.1 Existing Conditions

Wildlife inhabiting the ROI are typical of those found in disturbed habitats associated with agriculture and rural and suburban residential development. Watercourses and waterbodies and areas of natural vegetation, such as forest, wetlands, and open herbaceous areas also provide habitat for wildlife in the area. Typical wildlife species inhabiting the ROI include mammals such as deer, fox, squirrels, and racoons; songbirds, such as robins and red-winged blackbirds; waterfowl, such as eagles and wood ducks; reptiles, such as garter snakes and painted turtles; amphibians, such as American toads and western chorus frogs; and aquatic biota such as fish and mussels.

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

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

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 (183)). 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 corridors to support biological diversity and ecosystem resilience with a focus on SGCN. As shown on Map 16, several Wildlife Action Network corridors are scattered through the project area. 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 (183)).

Several lands that are preserved or managed for wildlife and associated habitat are scattered throughout the project's local vicinity, including DNR Wildlife Management Areas, DNR state game refuges, lakes that are part of DNR Shallow Lakes Program, USFWS Grassland Bird Conservation Areas, USFWS Waterfowl Production Areas, and National Audubon Society Important Bird Areas; these areas are shown Map 16.

The DNR manages over one million acres of land as Wildlife Management Areas to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses (reference (183)). DNR state game refuges are established to protect and preserve natural habitat and game populations (reference (184)). The DNR Shallow Lakes Program works to protect and enhance wildlife habitat on larger lakes (greater than 50 acres in size) that are dominated by shallow water (littoral zone) (reference (180)). The USFWS designates Grassland Bird Conservation Areas 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. The USFWS established Waterfowl Production Areas to conserve some of the most threatened and productive migratory bird habitat in the country (reference (185)). The National Audubon Society works to identify, monitor, and protect habitat for bird species throughout the U.S., in part by designating sites as Important Bird Areas; these areas are designated when they meet certain criteria related to providing habitat for vulnerable species (reference (186)). 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 5.6.7.3.

5.6.12.2 Potential Impacts

Construction activities that generate noise, dust, or disturbance of habitat could result in short-term, indirect impacts on wildlife. During construction of the project, wildlife would generally be displaced within and adjacent to the ROW and footprints of associated facilities including the substations. 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; 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. The applicant would permanently clear trees within the ROW and substation footprints. Wildlife species previously occupying forested communities in these areas would be displaced in favor of species that prefer more open vegetation communities. Impacts would be minimal in situations where an existing ROW is expanded because habitat fragmentation would already have occurred; however, minimal opportunity for ROW sharing has been identified. Where ROW paralleling would occur, the fragmented landscape would be extended.

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 by the Wildlife Action Network, GBCAs, Wildlife Management Areas, Important Bird Areas, and the like.

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

5.6.12.3 Mitigation

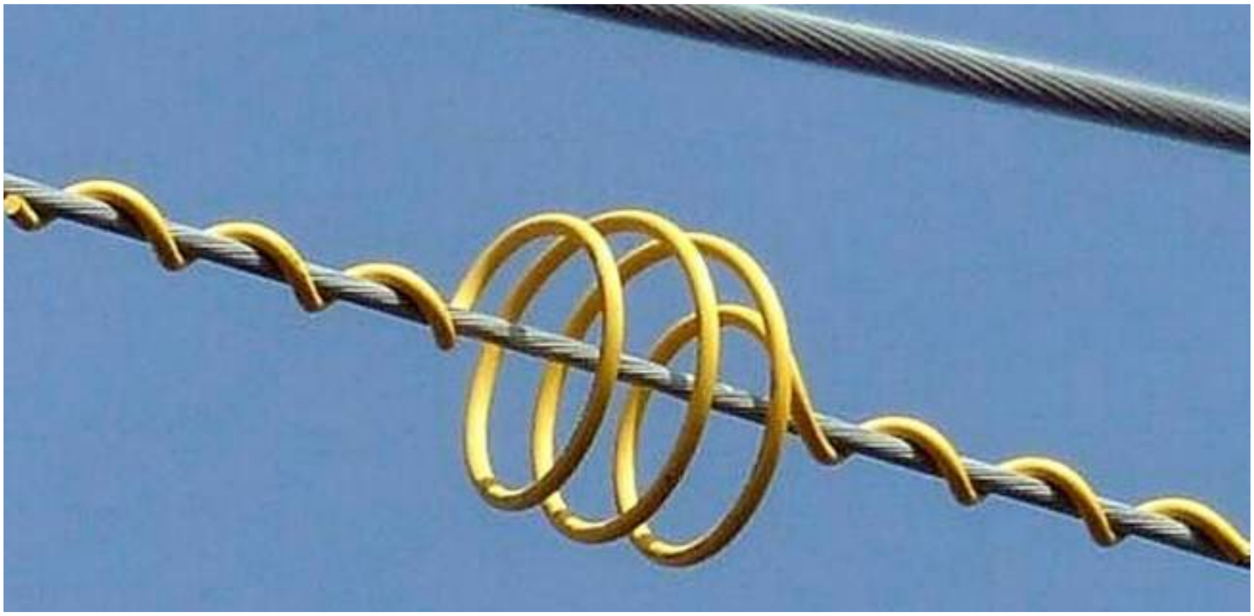
Potential to wildlife and wildlife habitat can often be minimized or mitigated through several strategies. The primary strategy for mitigating impacts is to select route alternatives away from areas known to contain high-quality habitat or which serve as migratory corridors. Use of existing rights-of-way 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.

5.6.12.3.1 Commission Sample Routing Permit

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 D, 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 5.6.10.3, 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



5.6.12.3.2 Other Proposed Mitigation

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 during a constraints analysis completed during the routing process.
- Implementation of several BMPs to minimize impacts to wildlife, including wildlife training for construction personnel, posted speed limits, spill prevention measures, and general construction housekeeping such as trash removal and maintaining a clean work area.

- Implementation of specific BMPs for protected species that will also be beneficial to wildlife in general; these are discussed in Section 5.6.7.5.
- 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.

To minimize potential impacts to wildlife, the DNR recommended use of downward facing lights on associated facilities (scoping comment #285). In addition, the DNR recommended that if LED lights are used, that the applicant follow the MnDOT Approved Products for luminaries, which limits the uplight rating to 0. A nominal color temperature below 2700K is preferable for wildlife; as such, the DNR also recommends choosing products that have the lowest number for backlight and glare.

The DNR recommended use of wildlife friendly erosion control and that erosion control blankets be limited to “bio-netting” or “natural netting” types, and specifically not products containing plastic mesh netting or other plastic components (scoping comment #285).

5.7 Use or Paralleling of Existing Rights-of-Way

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

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

The only opportunity for ROW sharing and double-circuiting with existing transmission lines for the project is the Green Route Segment, which adds a second circuit to the applicant’s existing Line 5651 gen-tie line between the Sherco Solar West Substation and the Sherco Substation. As such, the Green Route Segment would not require any additional new ROW. The Green Route Segment is further summarized in Chapter 13.

Additional opportunities for ROW sharing for the project include those associated with public roads and existing transmission lines. The feasibility of the project sharing ROW for each type varies. ROW sharing with railroads would not be feasible given the potential for AC interference. There is minimal opportunity (less than 5 miles) for ROW sharing with pipelines. ROW sharing with pipelines would require further studies to understand potential AC interference impacts. Exact locations for ROW sharing would be finalized after a route is selected and be determined through further coordination efforts as described below.

The applicant indicates it would work with public road authorities to overlap portions of road ROW where feasible. Placing transmission line structures adjacent to and outside public road ROW can help reduce the amount of new ROW on adjacent land parcels needed while minimizing the potential relocation of the transmission line in the future due to road projects. Such ROW sharing is subject to the local road authority's approval. The amount of ROW overlap is typically determined by the space needed to safely operate the roadway and transmission line, and to safely provide maintenance access to both the roadway and transmission line. As part of the coordination process with the local road authority, the applicant states it would also need to work with the road authorities regarding any known future road ROW expansions to minimize relocation of the transmission line in the future.

The applicant would examine areas of the permitted route that parallel Xcel Energy-owned transmission lines for opportunities to overlap portions of ROW and reduce the amount of new ROW on adjacent land parcels. The amount of ROW overlap would be determined by the space needed to safely operate both of the transmission lines, and the space needed to safely provide maintenance access to both transmission lines. For transmission lines not already owned by the applicant, the applicant would work with other utilities to overlap portions of rights-of-way where the permitted route parallels their existing electric transmission lines to reduce the amount of new ROW on adjacent land parcels. If the other utility allows ROW sharing, the amount of overlap would be determined by the space needed to safely operate both of the transmission lines, and the space needed to safely provide maintenance access to both transmission lines.

Several opportunities exist for paralleling existing ROW—a transmission line, road, or railway—or existing field, parcel, or section lines. Data pertaining to ROW paralleling is presented in the aesthetics sections of Chapters 6 through 12. Specific analysis and comparisons of ROW paralleling between the different route alternatives are discussed in relevant resource sections throughout Chapters 6 through 12.

5.8 Electric System Reliability

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

Two contingency categories apply to the project. Under Category C, NERC requires utilities to analyze the consequences of a single storm or other event that causes simultaneous outages of both circuits on a double-circuit transmission line. The applicable Category D contingencies are loss of all transmission lines along a common ROW and loss of an entire voltage level at a substation. The effects of these transmission contingencies on the system, and the transmission system's ability to serve load, must be monitored and managed by utilities. Route permits issued by the Commission require permittees to comply with NERC standards.

In addition, transmission line crossings can increase risk with system reliability and safety concerns. Most significantly, there is a greater risk that an outage of one transmission line can result in an outage of the second transmission line at the same time, reducing system resiliency and potentially structural damage to both transmission lines that could complicate and increase restoration times. New transmission line crossings also create safety risks during maintenance activities that could require one line to remain energized while work is occurring on the second line. Taking multiple transmission lines out of service can stress the remaining system components and lead to overloads and voltage issues, and potentially stability concerns should there be a loss of another system element at the same time.

In developing possible routes, the applicant analyzed whether these routes created reliability concerns. There can be reliability concerns with additional transmission line crossings and therefore the number of new crossings should be limited to the extent practical. However, the project overall supports and enhances the reliability of the regional electrical system.

5.9 Costs that are Dependent on Design and Route

As outlined in the route permit application and discussed in Section 3.5, the estimated project construction cost at the time of the application was approximately $1.1 billion, with cost varying by the route alternatives selected for the project. Construction cost estimates rely on the best available information at the filing time of the route permit application. Estimates include permitting, engineering, materials (for example: steel, conductor, and insulators), land rights and ROW, and construction costs. The cost estimate assumes the applicant would pay prevailing wages for applicable positions during project construction.

The construction cost estimate of $1.1 billion was developed specifically for the applicant-proposed routes. Construction costs for each alternative are discussed in Chapters 6 through 12. The estimated costs vary between each alternative due to the following variables which are considered when estimating costs.

- **Terrain –** topographic changes along a route can impact transmission structure spacing and height which can impact transmission costs. Structure spacing might be closer in locations where there is varied relief in terrain and could result in taller structures. Increasing the number of structures and structure heights increase costs due to the number and size of foundations, the amount of steel in a structure (bigger structures require more steel) and the tooling needed to construct the HVTL (for example, heavier towers could require larger equipment such as cranes used to set towers) and potentially require larger work areas (matting and restoration) used to complete construction activities.
- **Alignment –** the alignment of a HVTL can have an impact on transmission construction costs. Linear alignments are more economical to construct. Introduction of angles and corner structures have additional costs. Typically angle structures require more steel and larger foundations than tangent structures. Angles and corner structures on double-circuit 345kV HVTLs can also require two separate foundations and structures, double the cost of a single tangent structure.
- **Soil Conditions –** the type of soil can impact the size of a foundation or potential for specialty foundations needed to support the transmission structures. Poor soils might require larger or deeper foundations which results in additional reinforcing steel (rebar) and concrete volume or might require a pile cap foundation. Rock near the surface also can lead to changes in the

foundation type. If the rock is competent, the foundation material could be lessened as the foundation would be attached to the rock. If the rock is fractured, additional labor and equipment might be required for excavation.

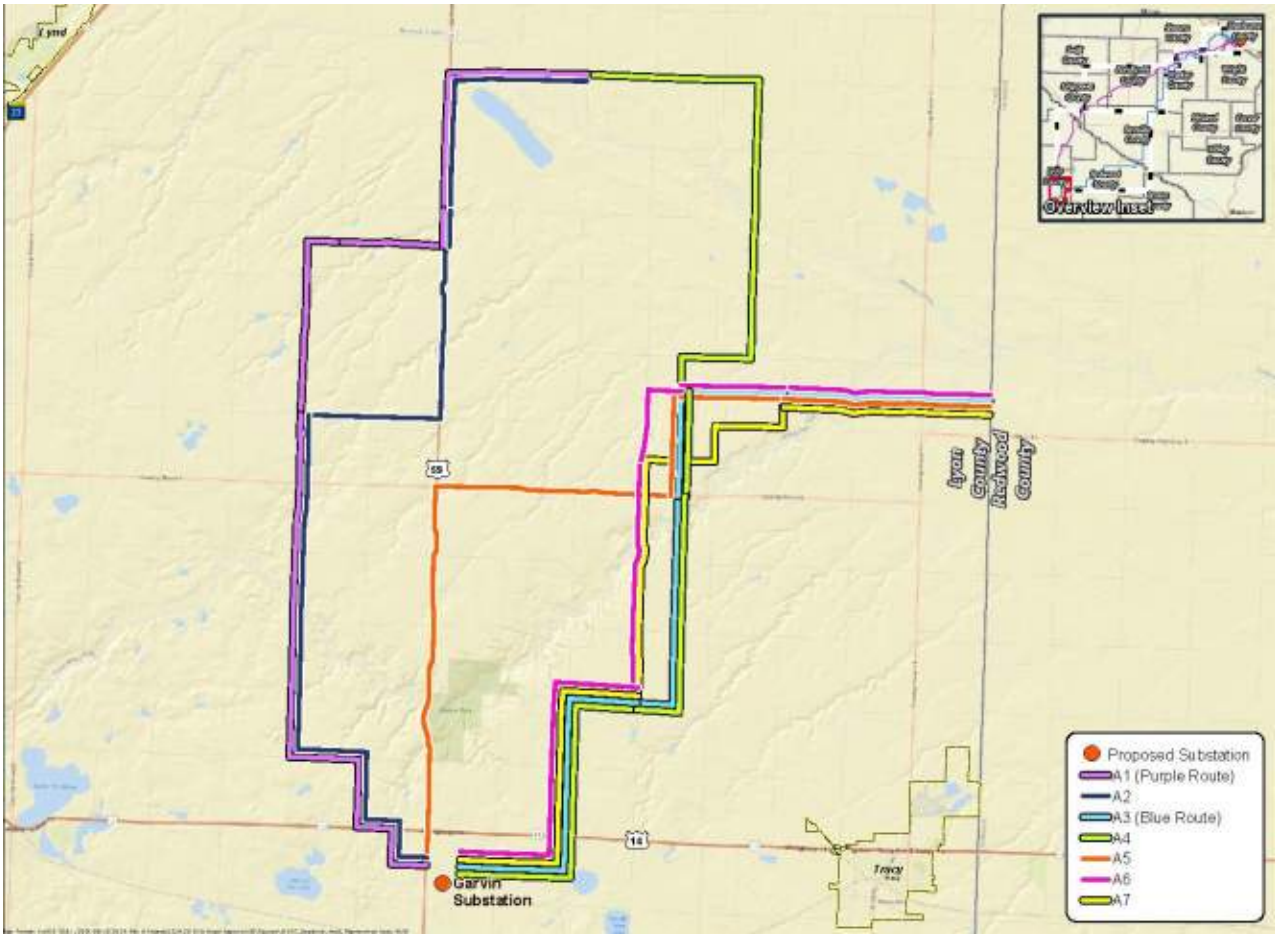
- **Micro-routing to avoid specific features–** site specific routing modifications to avoid specific human or environmental features can also have an impact to transmission costs. For example, modifications to alignments where the HVTL crosses roadways or deflects around a sensitive environmental area adds to the costs due to additional structures and foundations. Spans lengths could be shortened and require additional structures to meet the requirements.
- **Existing Transmission Crossings –** crossing of existing HVTLs can impact the number of transmission structures and height required for a crossing. Each line crossing needs to be reviewed for safe operations of the existing and new HVTL. Typically, high voltage lines cross over lower voltages and crossing geometry would need to be coordinated between utility companies. The crossing could require structures to be taller to cross over or shorter to cross under. In addition, a vertical or horizontal configured crossing might also impact the cost of the crossing because it could require additional structures, foundation and increased construction costs.
- **Pipeline & Railroads –** construction of high voltage HVTLs in close proximity to pipelines or railroads might require AC induction mitigation. The cost of mitigation would be dependent on the amount of AC induction and acceptable mitigation measures by the pipeline company or railroad. Detailed mitigation studies would be completed where HVTLs are within a quarter mile of any railroads or pipelines.
- **Distribution Line Relocation –** If a HVTL is routed in the same location as an existing electric distribution line, the distribution line might need to be relocated so it does not interfere with the operation and maintenance of the new HVTL. The HVTL developer would work with the distribution line owner and assumes the cost to move or bury the distribution line.
- **Material Pricing –** market fluctuations in material pricing can have a substantial impact to the cost of transmission projects. Increases in metal costs has a direct impact on the cost of steel structures and conductor. Additionally, where the material is procured (domestic or foreign) can also be impacted by the tariffs imposed.
- **Right of Way –** Changes in land values between project proposal and easement acquisition and the number of voluntary easements would affect project costs.
- **Specialized construction practices & mitigation** – areas which require specialized construction or avoidance/minimization measures can also increase costs to the extent they require additional equipment, etc. (for example - matting).
- **Length** – The overall length of a HVTL can impact the overall cost. However, a longer, straight HVTL using single, tangent structures can be less expensive than a shorter line that includes double angle structures, poor soils, and other cost escalating features described above.

6 Region A - Potential Impacts and Mitigation

Chapter 6 describes potential impacts in Region A, which is the southern-most region and is in Lyon County (Map 2). The seven route segments in Region A are shown in Figure 6-1 and described below.

- Route Segment A1 is the applicant's proposed Purple Route. It is 17.5 miles long.
- Route Segment A2 is a variation of the Purple Route. It is 17.6 miles long. It includes Route Segment 205 which was proposed as an alternative to prevent erosion and potential impacts to wildlife habitat.
- Route Segment A3 is the applicant's proposed Blue Route. It is 14.6 miles long.
- Route Segment A4 is a variation of the Blue Route. It is 18.1 miles long. It includes a portion of the applicant's proposed Blue Route and the applicant's proposed Route Connector 101 (proposed by the applicant as a means of shifting from one proposed route to the other).
- Route Segment A5 is a variation of the Blue Route. It is 15.1 miles long. It includes Route Segment 201 which was proposed as an alternative to minimize potential impacts to wildlife habitat and protect the indigenous cultural value at the mile-long segment that travels south along farm lines after departing the east-west County Road (CR) 2.
- Route Segment A6 is a variation of the Blue Route. It is 14.5 miles long. It includes Route Segment 202 which was proposed as an alternative to prevent impacts to subsurface tile drainage systems and crop yield.
- Route Segment A7 is a variation of the Blue Route. It is 14.6 miles long. It includes Route Segment 203 which was proposed as an alternative to prevent tree removal and the loss of farmland by crossing the Cottonwood River at a different location and more closely following field lines.

Figure 6-1 Region A, Route Segments



6.1 Environmental Setting

Region A is dominated by agricultural land use and rural residential and commercial development (Map 6). Major waterways crossed by the route alternatives within Region A include the Cottonwood River and Meadow Creek (Map 14).

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. Under this classification system, Region A is in the North Central Glaciated Plains section of the Prairie Parkland Province (Map 15). This section is further divided into subsections, including the Coteau Moraines and Minnesota River Prairie Subsections. These subsections are used below to classify the environmental setting of the project.

The Coteau Moraines Subsection is characterized by two distinct parts, the middle Coteau and the outer Coteau. The northeast portion of this subsection consists of a steep escarpment which fades towards the Iowa border. The middle Coteau is characterized by landscapes of rolling moraine ridges with loess one to three feet thick. The outer Coteau is characterized by terminal and end moraines and ranges from undulating to steeply rolling and hilly. Most of this subsection is covered in 600 to 800 feet of glacial drift over diverse bedrock. Loamy soils are dominant, with both dry and moist prairie soils present. Dry prairie soils are found occurring on eroded topography while moister prairie soils occur on rolling end moraines (reference (187)).

The Minnesota River Prairie Subsection most predominantly spans the route alternatives throughout the project and is present in the on the northeastern portion of Region A. This area is characterized by large till plains that are bisected by the broad valley of the Minnesota River. Topography is steepest along the Minnesota River and the Big Stone Moraine, which has steep kames and broad slopes, while topography outside of the river valley consists of level to gently rolling ground moraine. Glacial drift generally ranges between 100 and 400 feet throughout this subsection. Soils are mostly well to moderately well-drained loams formed in gray calcareous till with some localized inclusions of clay, sand, and gravel soils. Wetlands were common within this subsection prior to pre-European contact, and most have been drained to establish usable cropland (reference (188)).

Region A is in Lyon County (Map 2). Major communities nearest the route alternatives include Balaton and Tracy to the south and Marshall to the north. Existing transmission lines are prevalent throughout the region (Map 2). Region A is generally bound by U.S. Highway 59 to the east and U.S. Highway 14 to the south. No state highways are present within Region A. Federal highways within Region A include U.S. Hwys 59 and U.S. Highway 14, both of which are within the project area. County and township roads are also present within Region A and the project area (Map 9).

6.2 Human Settlement

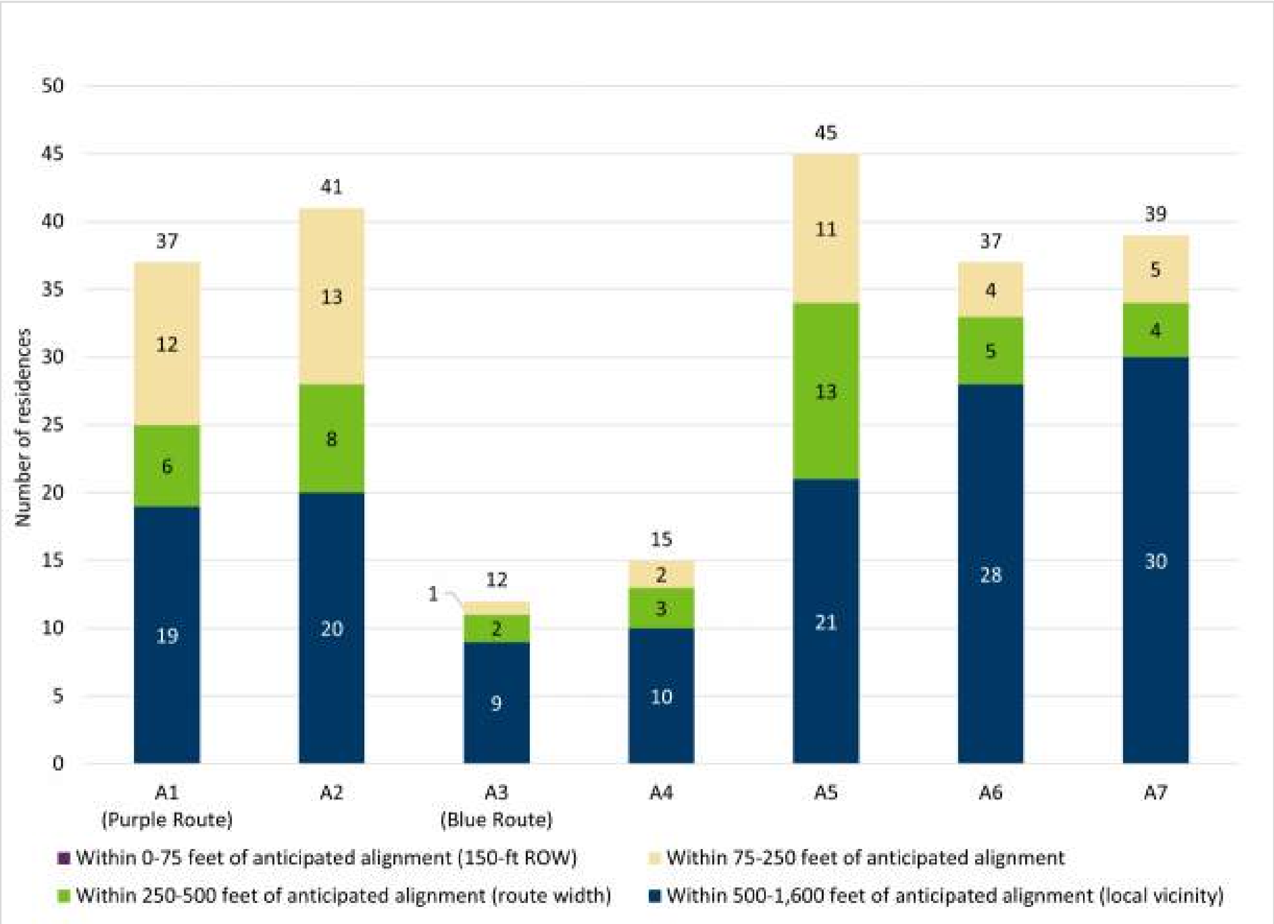
6.2.1 Aesthetics

The ROI for aesthetics is the local vicinity. Transmission lines alter a viewshed (Section 5.2.1.2**). Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes. 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. Additional details regarding potential impacts to aesthetics and potential mitigation measures is provided in Section 5.2.1**.**

Appendix N shows human settlement features (for example, residences and nursing homes) in the local vicinity of the route segments. No recreational resources where people might congregate were identified within the ROI (Section 6.2.8). The proximity of residential structures (homes) and non-residential structures to route segments at various distances is shown in Figure 6-2 and Table 6-1, respectively. Route Segments A3 (Blue Route) and A4 have the least residences (12 and 15, respectively) and non-residential structures (78 and 115, respectively) within the local vicinity. Route Segment A5 has the most residences (45) and non-residential structures (205) within the local vicinity.

Figure 6-2 Region A, Route Segments, Proximity of Residential Structures



For total count of residential structures within the route width, combine residential structures within 75-250 feet and residential structures within 250 and 500 feet. For total count of residential structures within the local vicinity, combine residential structures within each distance; this number is also stated at the top of each bar.

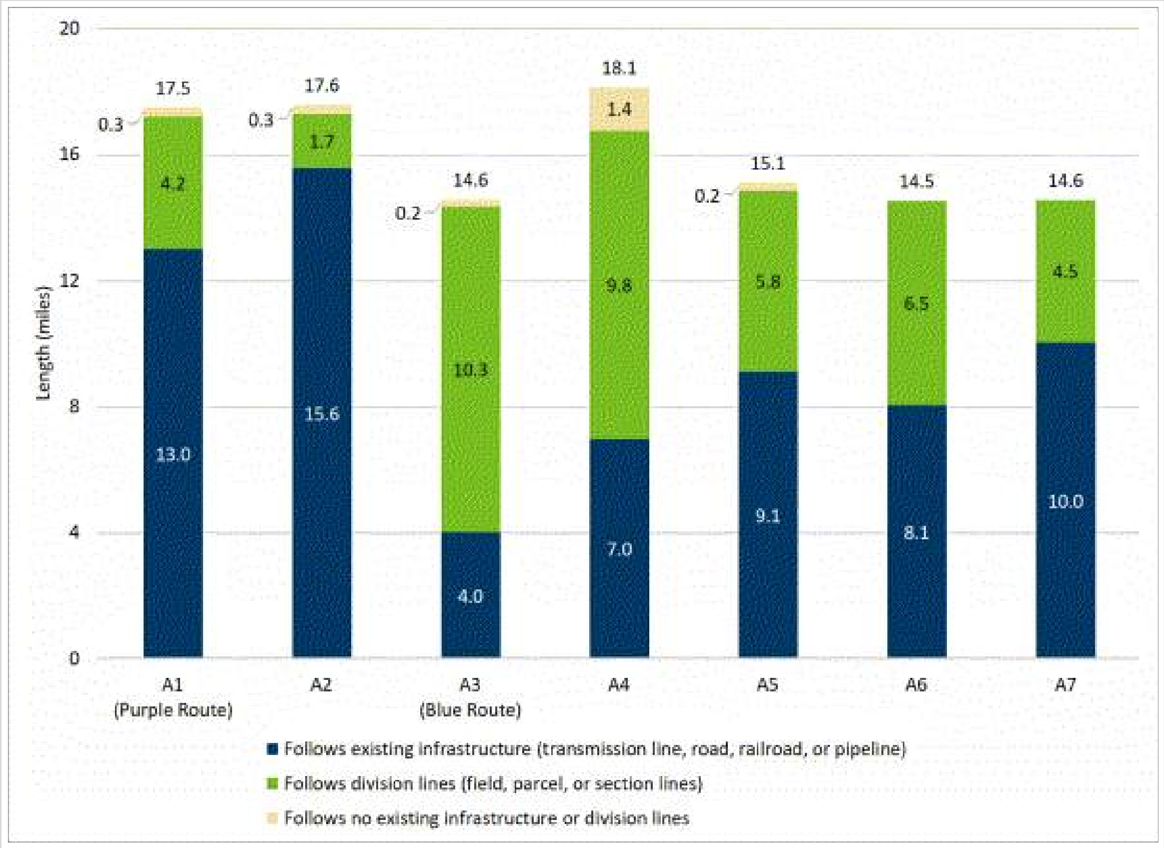
Table 6-1 Region A, Route Segments, Proximity of Non-Residential Structures

Non-Residential Structures	Route Segment						
Distances from Anticipated Alignment	A1 (Purple Route)	A2	A3 (Blue Route)	A4	A5	A6	A7
0-75 feet (150-foot-ROW)	0	0	0	0	2	0	0
75-250 feet	23	25	1	7	10	2	2
250-500 feet (generally route width)	30	54	10	15	50	18	24
500-1,600 feet (local vicinity)	98	109	67	93	143	114	123
Total	151	188	78	115	205	134	149

Non-residential structures include churches, schools (public and private), daycares/child-care centers/pre-schools, hospitals, nursing homes, and commercial and non-residential structures.

Each route segment would parallel with existing infrastructure or division lines as shown in Figure 6-3 and Table 6-2. In some cases, portions of a route segment could parallel ROW with more than one of these existing features at the same time. Map 9 illustrates where ROW paralleling occurs and shows existing infrastructure and division lines in the region. Route Segment A2 parallels the most ROW with existing infrastructure (15.6 miles and 89 percent of its length), followed by Route Segment A1 (Purple Route) (13.0 miles and 74 percent of its length). Route Segment A5 parallels the most ROW with existing transmission line (24 percent of its length); Route Segments A1 (Purple Route), A2, and A4 parallel ROW with an existing transmission line for 6 to 8 percent of their lengths. Route Segments A3 (Blue Route) and A4 parallel do not parallel ROW with an existing transmission line and parallel the least amount of road ROW.

Figure 6-3 Region A, Route Segments, ROW Paralleling of Existing Infrastructure and/or Division Lines Summary



The total mileage at the top of each route segment represents that route segment's total length. Numbers may not sum due to rounding.

Table 6-2 Region A, Route Segments, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

Infrastructure and/or Division Lines	Route Segment						
	A1 (Purple Route)	A2	A3 (Blue Route)	A4	A5	A6	A7
Follows existing transmission line (miles, %)	1.0 (6)	1.0 (6)	0 (0)	1.5 (8)	3.7 (24)	0 (0)	0 (0)
Follows existing roads (miles, %)	13.0 (74)	15.6 (89)	4.0 (27)	7.0 (38)	9.1 (60)	8.1 (55)	10.0 (69)
Follows existing railroad (miles, %)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total ROW paralleling (w/transmission line, road, and railroad) (miles, %)	13.0 (74)	15.6 (89)	4.0 (27)	7.0 (38)	9.1 (60)	8.1 (55)	10.0 (69)
Follows Field, parcel, and Section Lines (miles, %)	17.2 (98)	17.3 (98)	14.3 (98)	16.8 (92)	14.9 (98)	14.5 (100)	14.6 (100)
Total- All (miles, %) [1]	17.2 (98)	17.3 (98)	14.3 (98)	16.8 (92)	14.9 (98)	14.5 (100)	14.6 (100)

Totals might not sum to 100 percent due to rounding.

[1] This total is indicative of the full length of the route segment that parallels existing infrastructure ROW and/or division lines. For Region A, the total presented here is the same as the total for following division lines because there is not any length that follows existing infrastructure that doesn't allow follow division lines.

6.2.2 Cultural Values

Potential impacts to cultural values are discussed for the entire project in Section 5.2.2. The assessment was completed for the project as a whole because existing conditions are better understood at a broader scale than the regional level. Impacts to cultural values are independent of the route selected.

6.2.3 Displacement

The ROI for displacement is the ROW. Displacement occurs when a residence or building is required to be removed for construction of the project. Residential buildings within the ROI would require removal, whereas non-residential buildings could stay within the ROI if the activities taking place in these buildings are compatible with the safe operation of the line. Additional details regarding displacement and potential mitigation measures are provided in Section 5.2.3**.**

There are no residences within the ROI for the route segments within Region A. Route Segment A5 includes two non-residential structures in its ROW (Table 6-1), both are agricultural buildings. The non-residential structures are shown in Map N.15.

6.2.4 Environmental Justice

No EJ areas were identified in Region A. See Section 5.2.4 for the assessment on environmental justice in Region A.

6.2.5 Land Use and Zoning

Potential impacts to land use and zoning are discussed in Section 5.2.5. The assessment for land use and zoning was completed for the project as a whole because existing conditions are determined by jurisdictional areas (counties) and do not coincide with the project's regional boundaries.

6.2.6 Noise

Potential impacts from noise are discussed for the entire project in Section 5.2.6. The assessment for noise was completed for the project as a whole because there is limited variability in the potential for noise across the route alternatives.

6.2.7 Property Values

Potential impacts to property values are discussed for the entire project in Section 5.2.7. The assessment for property values was completed for the project as a whole because there is limited variability in the potential for property value impacts across the route alternatives.

6.2.8 Recreation

The ROI for recreation is the route width. 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 5.2.8.2**). 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. Impacts to recreation are assessed through identification of recreational resources within the ROI. The project is not anticipated to directly impede recreational activities within the ROI such as snowmobiling, golfing, canoeing, hunting, or fishing. Additional details regarding potential impacts to recreation and potential mitigation measures for the project is provided in Section 5.2.8**.**

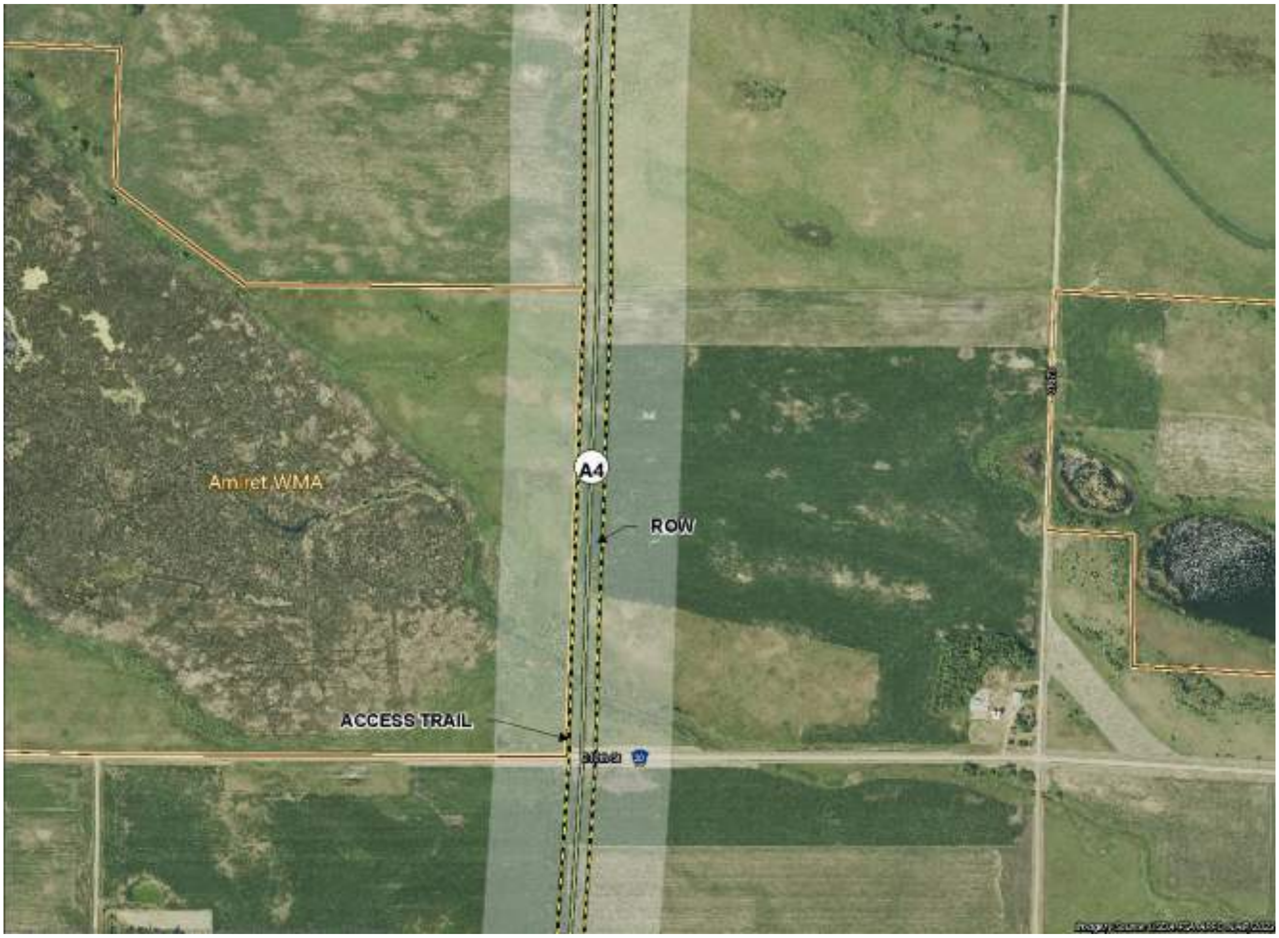
Route segments in Region A do not cross any land-based public trails, state water trails, Wild and Scenic Rivers, or scenic byways.

Route Segments A1 (Purple Route), A2, and A5 are parallel to snowmobile trails referred to as the Lyon County Trail (Map 5). These trails are maintained by the Southwest Ridgerunners and are adjacent to U.S. Hwy 59. The total length of snowmobile trail within the route widths is as follows:

- Route Segment A1 (Purple Route) parallels the highway/snowmobile trail for approximately 5.6 miles.
- Route Segment A2 parallels the highway/snowmobile trail for approximately 10.7 miles.
- Route Segment A5 parallels the highway/snowmobile trail for approximately 10.4 miles.

Public lands, including Wildlife Management Areas are publicly accessible and can be used for recreational purposes. One Wildlife Management Area in Region A was specifically noted for its proximity to Route Segment A4 (Section 6.6.12) and its higher potential for recreational use in the direct proximity of the anticipated alignment. The DNR noted in its comment letter that the area parallel and adjacent to the anticipated alignment of Route Segment A4 is used as an access trail for a Wildlife Management Area known as the Amiret Access Trail. The access trail noted by the DNR is shown in Figure.

Figure 6-4 Proximity of Amiret Access Trail to Route Segment A4



6.2.9 Socioeconomics

Potential impacts to socioeconomics are discussed for the entire project in Section 5.2.9. This is because the assessment was completed at the county-level which does not always align with regional boundaries.

6.2.10 Transportation and Public Services

The impacts to transportation and public services are discussed for the entire project in Section 5.2.10. The assessment was completed for the project as a whole and not carried forward at the regional level because there is limited variability in across the route alternatives. Potential impacts to private airstrips are discussed in land-based economies.

6.3 Human Health and Safety

Potential impacts to human health and safety are discussed for the entire project in Section 5.3. The assessment was completed for the project as a whole because there is limited variability across the route alternatives and impacts would be minimized by appropriate placement and adhering to applicable transmission line standards and codes.

6.4 Land-based Economies

Land-based economies are assessed by considering four elements: agriculture, forestry, mining, and tourism (Section 5.4). Impacts to three elements of land-based economies are anticipated to be minimal and independent of the route segment selected in Region A, including:

- **Forestry –** No known forestry operations were identified within the ROI (the route width) for Region A.
- **Mining** - No active aggregate mining was identified within the ROI (the route width) for Region A.
- **Tourism –** Limited recreational resources are located within the ROI (local vicinity) for Region A (Section 6.2.5); therefore, any direct impacts to the recreation that would cause an indirect impact to tourism based economies are anticipated to be negligible (Section 5.4.2.4).

6.4.1 Agriculture

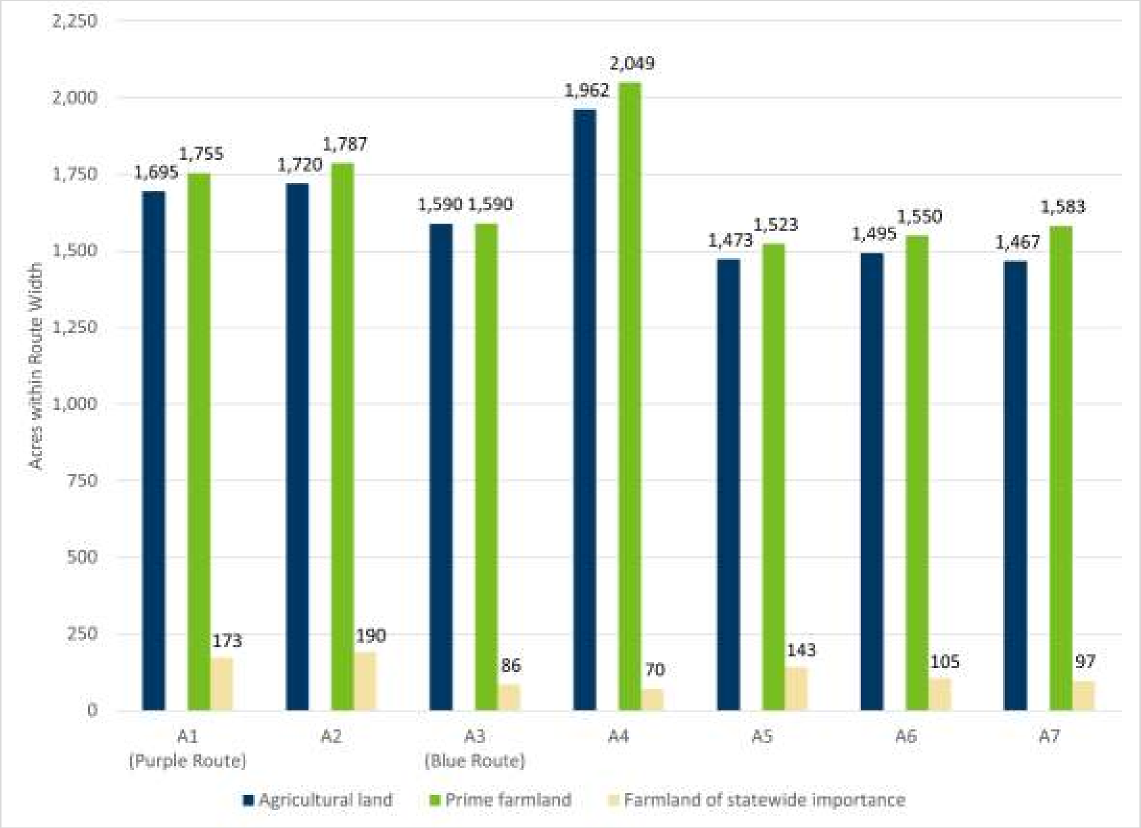
The ROI for the land-based economy of agriculture is the route width. Construction and operation of a HVTL impacts agriculture (Section 5.4.2.1). During construction, impacts would include the limited use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Permanent impacts would also occur when the footprint of the HVTL structures directly impedes agricultural production and/or impedes efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields.

Prudent routing (paralleling existing infrastructure and/or paralleling division lines) could help minimize potential impacts. Implementation of the AIMP (Appendix K), would minimize and mitigate impacts to agriculture. Additional details regarding potential impacts to agriculture and potential mitigation measures is provided in Section 5.4**.**

Figure 6-5 summarizes the total acres within the route widths of Region A, Route Segments that are designated as agricultural land use, as well as soil classifications for prime farmland and farmland of statewide importance. Most land (60 percent or more) within the route widths of the different route segments in Region A is designated as agricultural land use (cultivated crops and hay/pasture; see Section 6.6.10). Route Segment A4 has the most prime farmland and is the longest route segment (18.1 miles). Route Segment A5 has the least prime farmland.

As noted in Table 6-2, Route Segment A2 parallels the most existing infrastructure (89 percent of its total length) while Route Segment A3 (Blue Route) parallels the least amount (27 percent). Route Segment A4 has the greatest distance that does not follow existing infrastructure or division lines at 1.4 miles (Figure 6-3), while the other segments have 0.3 miles or less that do not follow existing infrastructure or division lines.

Figure 6-5 Region A, Route Segments, Acres of Agricultural Lands and Prime Farmland within Route Widths



Source: Agricultural land, NLCD and prime farmland/farmland of statewide importance, SSURGO (Appendix C)

The RIM/CREP program provides financial incentives to farmers to remove land from production (Section 5.6.6.1). The anticipated alignment of Route Segment A4 crosses a portion of RIM land (Map N.20). The RIM Reserve program compensates landowners for granting conservation easements. No other anticipated alignment in this region crosses an easement area (Section 6.6.6). The applicant committed to working with the landowners if/when easements are present to avoid and/or minimize impacts (Section 5.6.6.3.2). Impacts can be mitigated by compensating individual landowners through negotiated easement agreements.

6.5 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 (Section 5.5.2). 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. Indirect 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. Additional details concerning potential impacts and mitigation for the project as a whole regarding archaeological and historic resources are provided in Section 5.5.3.

Documented archaeological and historic resources within Region A are summarized in the following tables.

- Table 6-3 summarizes the number of archaeological and historic resources within the project area (which is within one mile of the anticipated alignments).
- Table 6-4 summarizes the number of archaeological and historic resources within the ROI (route width) for each of the Region A, route segments.
- Table 6-5 provides descriptions of the resources located within the route widths.

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

Table 6-3 Region A, Route Segments, Number of Archaeological and Historic Resources within the Project Area

Route Segment	Archaeological Resources	Historic Architectural Resources	Historic Cemeteries
A1 (Purple Route)	8	11	0
A2	10	12	0
A3 (Blue Route)	17	17	3
A4	15	12	2
A5	21	17	4
A6	16	16	4
A7	17	17	4

Table 6-4 Region A, Route Segments, Number of Archaeological and Historic Resources within the Route Width

Route Segment	Archaeological Resources	Historic Architectural Resources	Historic Cemeteries
A1 (Purple Route)	2	5	0
A2	3	8	0
A3 (Blue Route)	1	1	0
A4	1	1	0
A5	2	4	1
A6	1	3	0
A7	3	3	0

Table 6-5 Region A, Route Segments, Archaeological and Historic Resources within the Route Width Summary

Route Segment(s)	Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Description
A1 (Purple Route), A2	21LY0039	Archaeological Site	Precontact Habitation Site	Unevaluated	Site 21LY0039 is a precontact habitation site consisting of 93 recovered lithic artifacts, including debitage and tools. Based on an analysis of one diagnostic projectile point, the site is likely to date to the late prehistoric period [1]
A1 (Purple Route), A2	21LY0079	Archaeological Site	Precontact Lithic Scatter	Unevaluated	Sites 21LY0079 and 21LY0040 both consist of a precontact lithic debitage scatters of undetermined time period [2, 3]
A2	21LY0040	Archaeological Site	Precontact Lithic Scatter	Unevaluated	
A3 (Blue Route), A4	21LY0017	Archaeological Site	Precontact Lithic Scatter	Unevaluated	Site 21LY0017 is a precontact that consists of lithic tools and flakes. Artifacts recovered include three bifaces, seven retouched flakes, seven cores and 32 flakes [4]
A5	21LY0041	Archaeological Site	Isolated lithic debitage find	Unevaluated	Site 21LY0041 consists of one isolated find of lithic debitage [5]
A5	21LY0044	Archaeological Site	Precontact Habitation Site	Unevaluated	Site 21LY0044 is a precontact habitation site. Artifacts recovered include 27 lithic finds consisting of tools and debitage [6]
A6, A7	21LY0020	Archaeological Site	Precontact Lithic Scatter	Unevaluated	Site 21LY0020 is a precontact (potentially late Woodland or Early Plains) lithic scatter consisting of a notched projectile point, two bifaces, one retouched flake, one core and 15 flakes [7]
A7	21LY0067	Archaeological Site	Precontact (Woodland) Artifact Scatter	Unevaluated	Site 21LY0067 is Woodland period artifact scatter consisting of ceramic sherds, a projectile point, a flaked tool, a ground stone tool, and debitage [8]
A7	21LY0069	Archaeological Site	Precontact Lithic Scatter	Unevaluated	Site 21LY0069 is a precontact lithic scatter consisting of a projectile point and a flaked lithic tool [9]
A5	Amiret Cemetery	Unrecorded Historic Cemetery	Amiret Cemetery (mapped at PLS forty level)	N/A	-

Route Segment(s)	Site / Resource Number	Resource Type	Resource Name / Description	NRHP Status	Description
A5, A6, A7	LY-AMC-00006	Historic Architecture	Stone Railroad Trestle	Unevaluated	-
A6, A7	LY-AMC-00014	Historic Architecture	Bridge L1705	Unevaluated	-
A5	LY-CUS-00012	Historic Architecture	Bridge 6175	Not Eligible	-
A1 (Purple Route), A2	LY-LMT-00007	Historic Architecture	Bridge 5330	Not Eligible	-
A1 (Purple Route), A2	LY-SOD-00001	Historic Architecture	Township Hall	Unevaluated	-
A2	LY-SOD-00009	Historic Architecture	Culvert 95480	Not Eligible	-
A2	LY-SOD-00010	Historic Architecture	Culvert 95558	Not Eligible	-
A1 (Purple Route), A2	LY-SOD-00013	Historic Architecture	Culvert 97262	Not Eligible	-
A2	LY-SOD-00014	Historic Architecture	Bridge 5328	Not Eligible	-
A1 (Purple Route), A2, A3 (Blue Route), A4, A5, A6, A7	XX-ROD-00016	Historic Architecture	Trunk Highway/U.S. Highway 14	Not Eligible	-
A1 (Purple Route), A2, A5	XX-ROD-00168	Historic Architecture	Trunk Highway 59	Not Eligible	-

[1] Source: reference (189)
[2] Source: reference (190)
[3] Source: reference (191)
[4] Source: reference (192)
[5] Source: reference (193)
[6] Source: reference (194)
[7] Source: reference (195)
[8] Source: reference (196)
[9] Source: reference (197)

6.5.1 Archaeological Resources

Nine documented archaeological sites, none of which have been evaluated for listing on the NRHP, are present within the route widths, as shown in Table 6-5.

Route Segments A3 (Blue Route), A4 and A6 contain one unevaluated archaeological site within their route widths. Route Segments A1 (Purple Route) and A5 contain two unevaluated archeological sites within their route widths, and Route Segments A2 and A7 contain three unevaluated archaeological sites within their route widths.

6.5.2 Historic Architectural Resources

Historic architectural resources within Region A include three unevaluated resources and eight ineligible resources as shown in Table 6-5.

Route Segments A3 (Blue Route) and A4 do not have eligible or unevaluated resources within the route width, whereas Route Segments A1 (Purple Route), A2 and A5 each contain one unevaluated resource in the route widths, and Route Segments A6 and A7 each contain two unevaluated resources within the route widths.

6.6 Natural Environment

6.6.1 Air Quality

Potential impacts to air quality are expected to be similar to those discussed for the entire project in Section 5.6.1. The assessment for air quality was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

6.6.2 Climate

Potential impacts to climate are expected to be similar to those discussed for the entire project in Section 5.6.2. The assessment for climate was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

6.6.3 Geology and Topography

Potential impacts to geology and topography are expected to be similar to those discussed for the entire project in Section 5.6.3. The assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

6.6.4 Greenhouse Gases

Potential impacts to greenhouse gases are expected to be similar to those discussed for the entire project in Section 5.6.4. The assessment for greenhouse gases was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected given their similar lengths.

6.6.5 Groundwater

Potential impacts to groundwater are expected to be similar to those discussed for the entire project in Section 5.6.5. The assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

6.6.6 Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands often involve unique resources intended for protection and/or preservation and would be subject to short and long-term impacts depending upon their use (Section 5.6.6.2**). Public and designated lands within the ROI are first identified and then further reviewed to better understand potential impacts such as vegetation clearing. Occupying public and designated lands would require coordination with the landowner (Section 5.6.6.3).**

There are no Waterfowl Production Areas or state game refuges in the ROI of Region A. There are two Wildlife Management Areas in Region A within the ROIs of Route Segments A1 (Purple Route), A2, and A4; these are discussed in Section 6.6.12.

Designated lands with existing easements located within the route widths are summarized in Table 6-6 and shown in Appendix N. There are at least 5 acres of CREP easements within the ROIs of all route segments except for Route Segment A4, which has none. No CREP land is crossed by the anticipated alignments and their associated ROWs, and it is anticipated to be avoided during final design. RIM easement area is crossed by the anticipated alignment of Route Segment A4 and a total of 13 acres are present within the ROI; coordination with the landowner would be required (Map N.20). If Route Segment A4 were selected, impacts to the RIM easement area would include vegetation clearing.

There are 26 acres of native prairie banks within the ROI of Route Segment A5 located south of 150th Street (Map N.1 and Map N.13). Areas of native prairie bank are not crossed by any other anticipated alignments or their associated ROWs and, thus, are anticipated be avoided during final design.

Table 6-6 Region A, Route Segments, Designated Lands within Route Width

Designated Land Type	Unit	A1 (Purple Route)	A2	A3 (Blue Route)	A4	A5	A6	A7
Conservation Reserve Enhancement Program (CREP)	Acres	11	6	5	0	11	5	5
Reinvest in Minnesota (RIM) Reserve Partnership Easement	Acres	0	0	0	13	0	0	0
Native Prairie Bank	Acres	0	0	0	0	26	0	0

6.6.7 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 construction and operation-related impacts to protected species and sensitive ecological resources are discussed in Section 5.6.7.4**. 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. 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.**

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 that 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, are described in Section 5.6.7.5**.**

Sensitive ecological resources within Region A are shown in Map 12. To secure federally and state protected species from exploitation or destruction, documented locations of these species are not identified on maps.

6.6.7.1 Protected Species

According to the NHIS database, between one and two protected species have been documented within 1 mile of each route segment in Region A; these are summarized in Table 6-7. Some of these protected species have been documented within the route width or ROW; that information is discussed below and provided in Appendix M. In addition, several state special concern species have been documented within 1 mile of the route segments in Region A; these are summarized in Appendix M.

Table 6-7 Region A, Route Segments, Natural Heritage Information System Database Documented Records of Protected Species within One Mile

Scientific Name	Common Name	Type	State/Federal Status 1	Route Segment						
				A1 (Purple Route)	A2	A3 (Blue Route)	A4	A5	A6	A7
Ammodramus henslowii	Henslow's sparrow	Bird	Endangered / not listed			X	X		X	X
Oarisma poweshiek	Poweshiek skipperling	Butterfly	Endangered / endangered			X	X		X	X
Bacopa rotundifolia	Waterhyssop	Vascular plant	Threatened / not listed	X	X					
Berula erecta	Stream parsnip	Vascular plant	Threatened / not listed					X		

[1]The status of the species is provided at the state level prior to the dash and the status of the species is provided at the federal level after the dash.

None of the protected species identified in Table 6-7 have been documented within the ROW or route width of Route Segments A1 (Purple Route), A2, or A5 (Appendix N). The Poweshiek skipperling, both a federal and state protected species, has been documented within the ROW of Route Segments A3 (Blue Route), A4, A6, and A7 (Appendix N). However, this Poweshiek skipperling NHIS record is from 1993; as discussed in Section 5.6.7.4, given the rarity of the species in Minnesota, it is unlikely to be found in the area today.

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 ROW or route width of the route segments. Prior to construction, the applicant could be required to conduct field surveys in coordination with the USFWS and/or DNR for the potential presence of protected species.

6.6.7.2 Sensitive Ecological Resources

The route width of all route segments in Region A would intersect Sites of Biodiversity Significance and native plant communities, with Route Segment A5 also intersecting a prairie bank conservation easement (Table 6-8; Map N.1 and Map N.13). In addition to being the only route segment to intersect a prairie bank conservation easement, the route width of Route Segment A5 would also intersect the most Site of Biodiversity Significance acres and is the only route segment that would impact Sites of Biodiversity Significance ranked outstanding and high. The route width of Route Segment A5 would also intersect the most acres of native plant community, including those with a conservation status of S1(community is critically imperiled) or S2 (community is imperiled) (Table 6-8). The anticipated alignments of all route segments in Region A would cross sensitive ecological resources. Route Segment A2 minimizes potential impacts to Sites of Biodiversity Significance and native plant communities and its anticipated alignment is the only one that would not cross a sensitive ecological resource that might be too large to span (>1,000 feet), thus requiring the placement of transmission line structures within it. Route Segments A1 (Purple

Route) and A3 (Blue Route) would have the most crossings of sensitive ecological resources that are greater than 1,000 feet.

Table 6-8 Region A, Route Segments, Sensitive Ecological Resources within Route Width

Resource	Units	A1 (Purple Route)	A2	A3 (Blue Route)	A4	A5	A6	A7
Sites of Biodiversity Significance	Outstanding rank (acres)	0	0	0	0	27	0	0
	High rank (acres)	0	0	0	0	12	0	0
	Moderate rank (acres)	64	41	36	30	22	25	20
	Below rank (acres)	30	15	40	23	40	48	40
	Total acres	94	56	76	53	101	73	60
Native Plant Communities	Conservation Status S1 (community is critically imperiled) or S2 (community is imperiled) (acres)	31	14	22	16	32	16	10
	Total acres (Conservation Status S1-S5)	31	14	36	30	51	25	20
Prairie Bank Easement	Total acres	0	0	0	0	26	0	0

6.6.8 Soils

The ROI for soils is the ROW. Common soil impacts include rutting, compaction, and erosion (Section 5.6.8.2**). 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 vehicles trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored a suitable location. Disturbed areas would be promptly seeded after construction. Additional details regarding potential impacts to soils and potential mitigation measures is provided in Section 5.6.8.

Map 13 shows the surface soil textures across the region. Soil types within the ROW were reviewed to identify soil characteristics that could be more prone to impacts in some areas versus others (Table 6-9). Less than one third of soils within the ROW of the route segments of Region A are soils prone to compaction, soils susceptible to erosion, or hydric soils. Nearly all soils within the ROW of the route segments within Region A have a moderate or severe rutting hazard rating.

Table 6-9 Region A, Route Segments, NRCS Mapped Soils Within ROW

Soil Data	Unit	A1 (Purple Route)	A2	A3 (Blue Route)	A4	A5	A6	A7
Area within Route Segment ROW	Acres	318	320	265	330	275	265	265
Hydric Soils [1]	Acres	78	76	81	81	63	81	79
Rutting Hazard [2]	Acres	318	320	265	330	274	264	264
Compaction Prone [3]	Acres	96	89	57	74	91	67	56
Erosion Hazard (Off-Road, Off-Trail) [4]	Acres	39	35	9	11	30	12	10
Revegetation Concerns [5]	Acres	0	0	0	0	0	0	0

[1] Hydric soil include hydric soils (100%) and predominantly hydric soils (67-99%).
[2] Soils considered susceptible to Rutting Hazard include those with a rating of "Moderate" or "Severe".
[3] Soils considered to be Compaction Prone soils include those with a rating of "Medium" or higher.
[4] Soils considered susceptible to erosion hazard soils include those with a rating of "Medium", "Severe", or "Very Severe".
[5] Soils considered to have revegetation concerns include soils with a non-irrigated land capability classification of 3 or greater.

6.6.9 Surface Water

The ROI for surface water is the route width. Potential impacts to surface waters are discussed in Section 5.6.9.2**. Direct impacts caused by structures placed in surface waters would be avoided by spanning the 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 or waterbodies and/or special or impaired waters.**

Impacts would be mitigated by using BMPs . 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. Additional details regarding potential impacts to surface waters and potential mitigation measures, including those provided in the DNR's Natural Heritage Review response, is provided in Section 5.6.8.3.

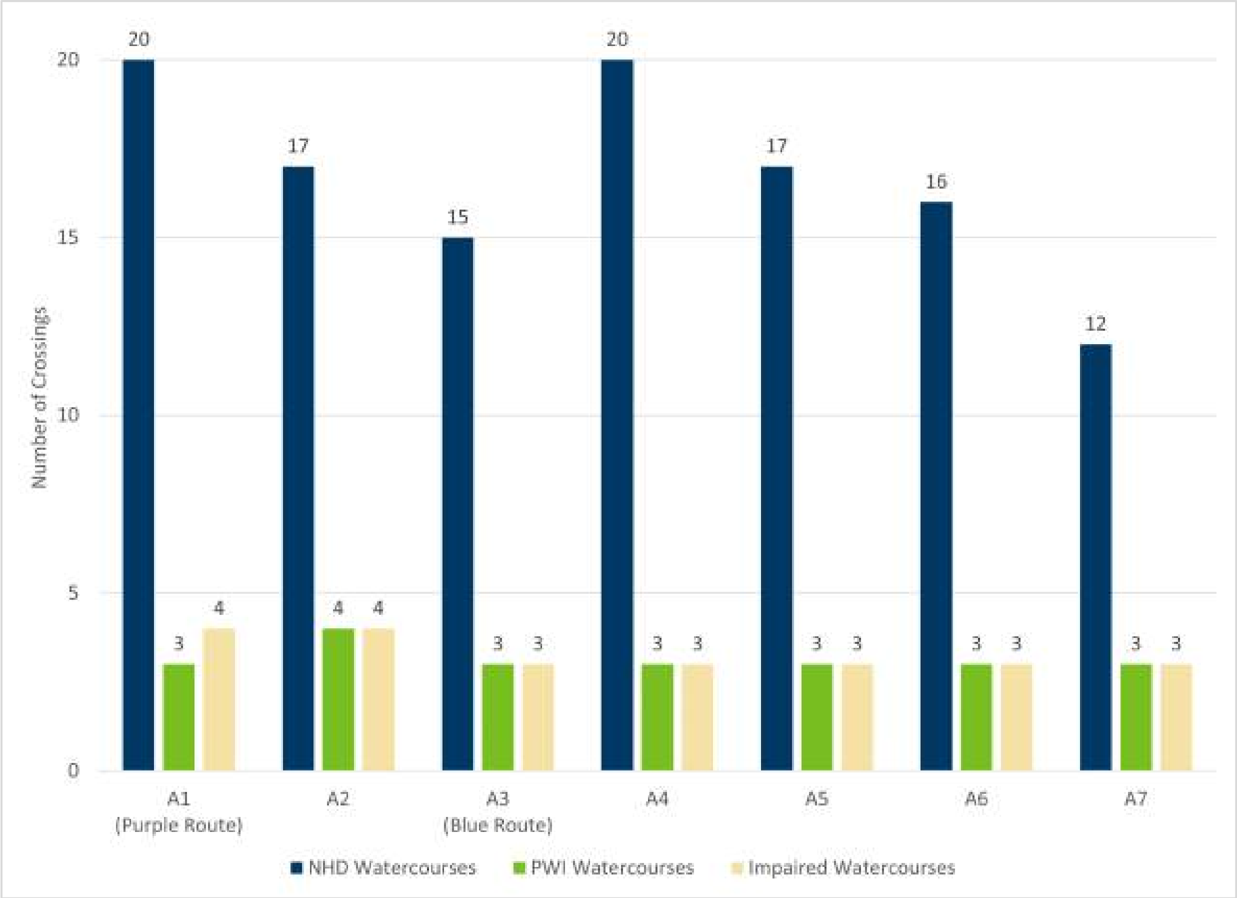
Map 14 shows the waterbodies and watercourses across the region. There are no trout streams, state-designated outstanding resource value waters, or state and federal wild and scenic and recreational rivers crossed by the route segments in Region A.

Route Segment A2 is the only route segment that does not contain any waterbodies within its route width. Of the waterbodies present in Region A, only one is designated as a PWI basin. The PWI basin is within the route width of Route Segment A4 but is not crossed by its anticipated alignment (Map N.20).

The total count of watercourse crossings by the anticipated alignments of route segments in Region A varies between 12 and 20 (Figure 6-6); most of the watercourses crossed are intermittent streams. Route Segment A7 crosses the fewest watercourses while Route Segment A1 (Purple Route) and Route Segment A4 crosses the most watercourses.

The route segments cross a similar number of PWI watercourses and impaired watercourses (between three and four each). PWI watercourses crossed in Region A include the Cottonwood River, Meadow Creek, and three unnamed streams. One unnamed stream reach (connected to Lake Marshall, a public water basin) parallels Route Segments A1 (Purple Route) and A2 (Map N.8). If the anticipated alignment parallels this stream, the potential for impacts (such as erosion or sedimentation) during construction could increase.

Figure 6-6 Region A, Route Segments, Number of Watercourse Crossings by Type



6.6.10 Vegetation

The ROI for vegetation is the ROW. Potential construction and operation-related impacts to vegetation are discussed in Section 5.6.10.2**. 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. 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, as described in Section** 5.6.10.3**.**

Map 7 provides an overview of landcover types across Region A, and Table 6-10 summarizes the landcover types within the ROW of each route segment in Region A. Agricultural vegetation, particularly cultivated cropland, represents the dominant vegetative landcover type within the ROW of each route segment in Region A. Small amounts of upland and wetland herbaceous landcover are also present in the ROW of each route segment. A minimal amount of forested landcover, primarily consisting of upland deciduous forest and forested wetlands, is present in the ROW Route Segment A3 (Blue Route) through A7, with Route Segments A3 (Blue Route) and A4 having slightly more forested landcover than the other route segments.

As discussed in Section 5.6.10.2, the applicant would clear forested vegetation from the ROW during construction, and the ROW would be maintained with low-growing vegetation during operations to minimize potential interference with the transmission line. Although Route Segments A1 (Purple Route) and A2 would minimize impacts to forested vegetation, given the small amount of forested vegetation in the ROW for the other route segments, impacts are anticipated to be minimal for all route segments in Region A.

Table 6-10 Region A, Route Segments, Landcover Types in the ROW

Landcover Type	A1 (Purple Route)	A2	A3 (Blue Route)	A4	A5	A6	A7
Agricultural (cultivated crops and hay/pasture) (acres in ROW [% of ROW])	197 (62%)	193 (60%)	219 (82%)	259 (79%)	218 (79%)	185 (70%)	177 (67%)
Forest (upland and wetland) (acres in ROW [% of ROW])	0 (0%)	0 (0%)	5 (2%)	5 (1%)	1 (1%)	3 (1%)	3 (1%)
Herbaceous (upland and wetland) (acres in ROW [% of ROW])	12 (4%)	14 (4%)	2 (1%)	6 (2%)	12 (4%)	4 (1%)	2 (1%)
Developed (low-high intensity; open space) (acres in ROW [% of ROW])	110 (34%)	113 (35%)	39 (15%)	60 (18%)	43 (16%)	73 (28%)	83 (31%)

Source: NLCD (Appendix C)
Totals might not sum to 100 percent due to rounding.

Potential impacts to agricultural vegetation and wetlands are discussed Section 5.4.2 and 5.6.11.2, respectively.

6.6.11 Wetlands

The ROI for wetlands is the route width. Short-term and long-term potential impacts to wetlands are discussed in Section 5.6.11.2. Impacts to wetland 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 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.

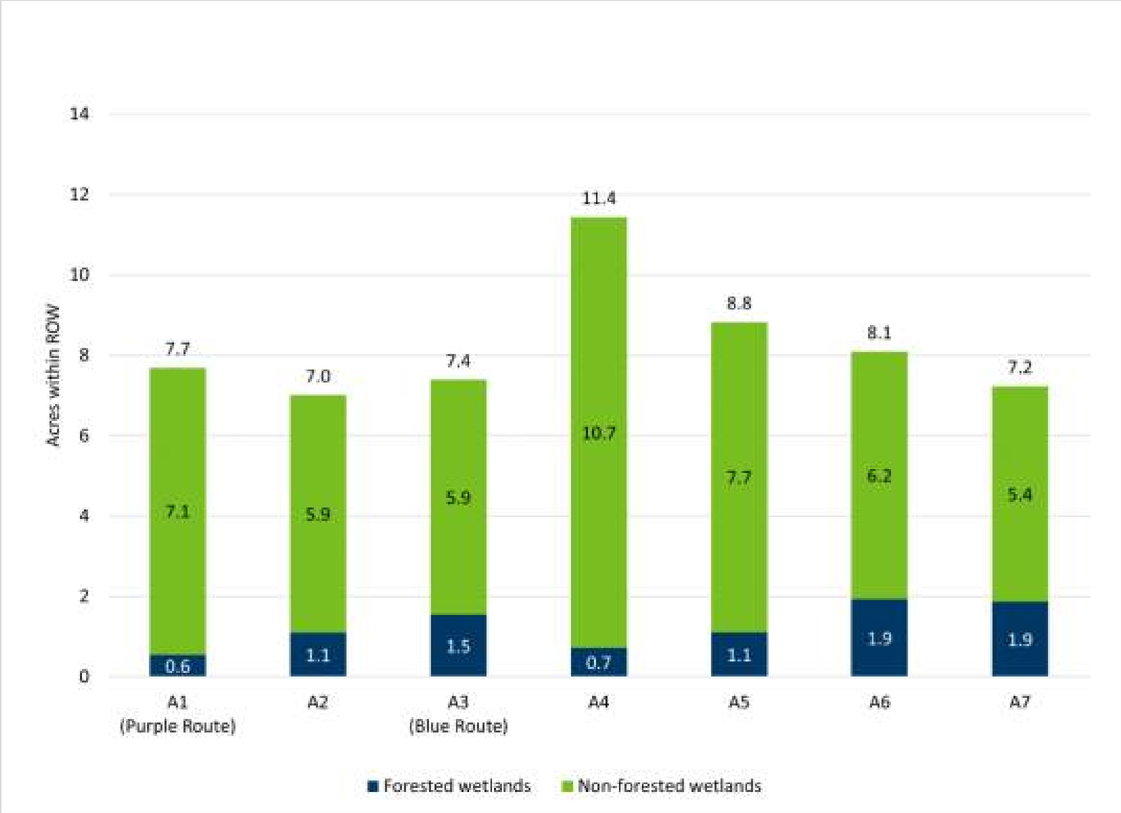
Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width. Wetland impacts would be regulated as described in 5.6.11.1.1. Additional details regarding potential impacts to wetlands, including those provided in the DNR's Natural Heritage Review response, and potential mitigation measures is provided in Section 5.6.11.3.

Map 14 shows the mapped wetlands within the ROI. Direct wetland impacts would occur within the construction workspace (within or adjacent to the ROW); not all wetland areas within the ROI would be subject to direct impacts as most could be spanned. Wetlands in the Region A ROI consist mainly of emergent and forested wetlands but also scrub-shrub, unconsolidated bottom, and riverine wetlands. Total acres of wetlands within the route widths of the route segments are provided in Appendix E.

The route width of Route Segment A3 (Blue Route), the shortest route segment, would include the least wetland area (54.9 acres). The route width of Route Segment A4, the longest route segment, would include the most wetland area (103.8 acres). Route Segment A4 would also include a wetland crossing longer than 1,000 feet that would be adjacent to Meadow Creek (a PWI watercourse with no existing crossing). No PWI wetlands are mapped within the route width of any of the Region A route segments.

Forested wetlands subject to permanent impacts due to their conversion would be contained within the ROW. All route segments have a minimal amount of forested wetland in the ROW (0.6 to 1.9 acres; Figure 6-7).

Figure 6-7 Region A, Route Segments, Acres of Wetland by Type within ROW



6.6.12 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. Potential construction and operation-related impacts to wildlife and wildlife habitat are discussed in Section 5.6.12.2. Potential short-term, localized impacts could occur from displacement during construction or maintenance activities. Potential long-term impacts could occur as a result to 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, as described in Section 5.6.12.3.

Map 16 provides an overview of resources across Region A, and Table 6-11 summarizes the wildlife resources within the route width of each route segment in Region A.

The White Prairie Wildlife Management Area is located within the local vicinity of Route Segments A1 (Purple Route) and A2 and slightly overlaps with their route widths (Map N.9). The Amiret Wildlife Management Area is located within the route width of Route Segment A4 and its ROW runs parallel to but does not overlap the Wildlife Management Area (Map N.20). The subpart of Route Segment A4 that runs parallel to the Wildlife Management Area is the one of the applicant’s proposed route connectors. The applicant indicated that they would avoid these areas to the extent possible, and it is therefore likely that the ROW would not extend into the Wildlife Management Area. In their scoping letter, the DNR indicated that this area serves as an access trail for the Wildlife Management Area and could impact visitors recreating in the Wildlife Management Area (Section 6.6.6).

Grassland Bird Conservation Areas are located within the local vicinity of all route segments in Region A (Map 16). The route widths of Route Segments A3 (Blue Route), A6, and A7 would not intersect any Grassland Bird Conservation Areas, while Route Segment A1 (Purple Route) would intersect the most acres of Grassland Bird Conservation Areas. The anticipated alignments of Route Segments A1 (Purple Route), A2, A4, and A5 would cross Grassland Bird Conservation Areas.

DNR-identified shallow wildlife lakes are located within the local vicinity of Route Segments A1 (Purple Route), A2, and A4. Route Segment A4 is the only route segment with a shallow wildlife lake located within its route width (Map 16); however, its anticipated alignment would not cross the shallow wildlife lake.

Wildlife Action Network corridors are located within the route width and local vicinity of all route segments in Region A (Map 16), and all of their anticipated alignments would cross a corridor. The route width of Route Segments A1 (Purple Route) and A2 would intersect the most acreage, while the route width of Route Segment A6 would intersect the least acreage.

The route segments in Region A would parallel little to no existing transmission line ROW; as such, traversing wildlife areas along new transmission line corridors could increase potential impacts to avian species traveling through these areas. As discussed in Section 5.6.12.3, avian impacts can be minimized through use of bird flight diverters. All route segments in Region A would minimize potential impacts associated with habitat fragmentation and/or edge effects by paralleling existing road rights-of-way, with Route Segment A2 paralleling the most (89 percent of its length) and Route Segment A3 (Blue Route) paralleling the least (38 percent of its length).

Table 6-11 Region A, Route Segments, Wildlife Management and Conservation Areas within Route Width

Resource Area	Unit	A1 (Purple Route)	A2	A3 (Blue Route)	A4	A5	A6	A7
Wildlife Management Areas	Acres	1	1	0	25	0	0	0
Grassland Bird Conservation Areas	Acres	540	282	0	439	404	0	0
Shallow Wildlife Lakes	Count	0	0	0	1	0	0	0
Wildlife Action Network corridors	High or medium-high rank (acres)	39	39	37	35	35	54	55
	Medium rank (acres)	4	4	225	224	155	229	231
	Low or medium-low rank (acres)	1,529	1,288	830	777	822	684	715
	Total acres	1,572	1,332	1,092	1,037	1,011	967	1,001

Totals might not sum to 100 percent due to rounding.

6.7 Costs that are Dependent on Design and Route

Costs of the route segments are generally proportional to length with the exception of the additional factors described in Section 5.9. Costs for route segments in Region A are included in Section 6.8 and in Appendix O.

6.8 Relative Merits of the Route Segments in Region A

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 Route Segments A1 through A7 with the exception of some elements of resource categories that are considered to have minimal impacts that might not vary significantly throughout the regions and/or the routing factors are not applicable. These include:

- Impacts on human settlements (factor A)— cultural values, environmental justice, land use and zoning, 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 land-based economies (factor C)— forestry and tourism.
- Impacts on the natural environment (factor E) – air quality, climate, geology and topography, floodplains, and groundwater.

With respect to routing factor G, it is assumed that all route alternatives are equal with regard to maximizing energy efficiencies and accommodating expansion of transmission capacity. With respect to environmental impacts, the examination of such impacts suggested by routing factor G is included in the discussion of other routing factors and elements that more specifically address an environmental impact (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 15.

A relative merits analysis was completed to compare Route Segments A1 through A7 using these routing factors. The analysis uses graphics (Table 6-12) 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 6-13 summarizes the relative merits analysis of Route Segments A1 through A7 for the routing factors that are anticipated to vary amongst route alternatives.

Table 6-12 Guide to Relative Merits Analysis

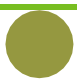
Consistency with Routing Factor or Anticipated Impacts	Symbol
Route alternative is consistent with the routing factor OR Impacts are anticipated to be negligible to minimal or the impact is positive	
Route alternative is consistent with routing factor but less so than the other options OR Impacts are 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 alternative 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	

Table 6-13 Relative Merits of Route Segments A1 through A7

Routing Factor / Resource	A1 (Purple Route)	A2	A3 (Blue Route	A4	A5	A6	A7	Summary
Factor A Human Settlement								
Aesthetics	◒	◒	◒	◒	◒	◒	◒	Aesthetic impacts are anticipated to be moderate for Route Segments A1 through A7. Route Segments A3 (Blue Route) and A4 have the least residences and non-residential structures within the local vicinity (12 and 15, respectively). Route Segments A3 (Blue Route) and A4 also parallel the least amount of ROW with existing infrastructure. Route Segment A2 parallels the most ROW with existing infrastructure (15.6 miles and 89% of its length), followed by Route Segment A1 (Purple Route) (13 miles and 74% of its length). Route Segment A5 parallels the most transmission line (24%). Route Segments A1 (Purple Route), A2, and A4 also parallel ROW with an existing transmission line (6-8% each).
Displacement	●	●	●	●	◒	●	●	Route Segment A5 has two non-residential structures within the ROW that could be subject to displacement. The other options in Region A do not.
Recreation	●	●	●	◒	●	●	●	Route Segment A4 includes public lands and the Amiret Wildlife Management Area with an access point to the area directly parallel to the anticipated alignment. Other recreational resources in Region A include snowmobile trails and impacts are anticipated to be minimal.
Factor C Land-Based Economies								
Agriculture	●	●	●	●	●	●	●	Most land is agricultural, and impacts cannot be avoided, but can be mitigated. Prudent routing (paralleling existing infrastructure and/or paralleling division lines) could help minimize impacts. Route Segment A3 (Blue Route) parallels the least infrastructure.
Mining	●	●	●	●	●	●	●	No active gravel pits were identified within the ROI (the route width) for Region A; therefore, impacts to mining are anticipated to be minimal and independent of the route segment selected.
Factor D Archaeological and Historic Resources								
Archaeological	◒	◒	◒	◒	◒	◒	◒	Route Segments A3, A4 and A6 contain one unevaluated archaeological site within their route widths. Route Segments A1 (Purple Route) and A5 contain two unevaluated archeological sites within their route widths. Route Segments A2 and A7 contain three unevaluated archaeological sites within their route widths. Survey efforts would be completed by the applicant and would inform potential impacts; impacts could be avoided and/or mitigated.

Routing Factor / Resource	A1 (Purple Route)	A2	A3 (Blue Route	A4	A5	A6	A7	Summary
Historic								Route Segments A3 (Blue Route) and A4 do not have eligible or unevaluated resources within the route width. Route Segments A1 (Purple Route), A2 and A5 contain one unevaluated resource in the route width and Route Segments A6 and A7 contain two unevaluated resources within the route widths. Survey efforts would be completed by the applicant and would inform potential impacts.
Factor E Natural Resources								
Public and Designated Lands								Route Segment A4 includes a total of 13 acres of RIM reserve land, and its anticipated alignment crosses the designated land. Designated lands are present elsewhere (CREP within all but Route Segment A4, native prairie bank within Route Segment A5) but not crossed; these easements could be avoided during final design. Wildlife Management Areas are present but assessed in wildlife.
Soils								Nearly all the soils in the region have a moderate or severe rutting hazard rating. Impacts could be minimized with BMPs or mitigated if long-term re-vegetation impacts extend beyond construction. Impacts to soils would be independent of the route selected.
Surface Water								The total count of watercourse crossings by the anticipated alignments of route segments in Region A varies between 12 and 20. All route segments cross three to four PWI watercourses including the Cottonwood River, Meadow Creek, and three unnamed streams. Route Segments A1 (Purple Route) and A2 parallel an unnamed stream reach (connected to Lake Marshall, a public water basin) on the eastern edge of the route width (Map N.8). No in-water work would occur.
Vegetation								Forested vegetation is minimal for all route segments in Region A, ranging from none (Route Segments A1 [Purple Route] and A2) to 5 acres (Route Segment A4).
Wetlands								All route segments have two acres or less of forested wetlands. Route Segment A4 contains the most wetlands and crosses one wetland >1,000 feet in width adjacent to Meadow Creek (a PWI watercourse with no existing crossing); spanning at this crossing is not expected to be feasible.

Routing Factor / Resource	A1 (Purple Route)	A2	A3 (Blue Route	A4	A5	A6	A7	Summary
Wildlife and Wildlife Habitat	●	●	●	◓	●	●	●	The route width of Route Segment A4 would intersect the most Wildlife Management Area acres and is the only route segment with a shallow wildlife lake in its route width (anticipated alignment would not cross it). Route widths and anticipated alignments of Route Segments A1 (Purple Route), A2, A4, and A5 would cross Grassland Bird Conservation Areas, A3 (Blue Route), A6, and A7 would not. All route widths and anticipated alignments would cross Wildlife Action Network polygons, with the route widths of Route Segments A1 (Purple Route) and A2 intersecting the most and A6 intersecting the least.
Factor F Rare and Unique Natural Resources								
Rare and Unique Natural Resources	◓	●	◓	◓	◓	◓	◓	The route width of all route segments intersect Sites of Biodiversity Significance and native plant communities, but the anticipated alignments of Route Segments A1 (Purple Route) and A3 (Blue Route) would have the most crossings greater than 1,000 feet. Route Segment A2 is the only route segment that could span all sensitive ecological resources it would cross. The route width of Route Segment A5 intersects the most Sites of Biodiversity Significance, native plant communities, and is the only one to intersect a prairie bank easement. All route segments have one documented record of a threatened/endangered species within a mile and several route segments have record of Poweshiek skipperling in the ROW but as explained in Section 6.6.7.1, it is unlikely to be found.
Minnesota Statute § 216E.03 - subdivision 7 (15e) (transmission lines)								
Paralleling Existing Transmission Line [1]	●	●	○	●	●	○	○	Route Segment A5 parallels the most existing transmission lines (3.7 miles and 24% of its length). Route Segments A1 (Purple Route), A2, and A4 parallel existing transmission lines for one mile or more (6 to 8% of their length). The other Route Segments do not parallel existing transmission line.
Minnesota Statute § 216E.03 - Subdivision 7 (8) (roads/railroads)								
Paralleling Roads and Railroads	◓	●	○	○	◓	◓	◓	Route Segment A2 parallels the most existing road ROW (15.6 miles, 89% of its length). Route Segments A1 (Purple Route), A5, A6 and A7 parallel existing road for between 55% and 75% of their lengths. The remaining route segments parallel existing road ROW for 38% of their length or less.
Factor H Paralleling Division Lines								
Paralleling existing survey lines, natural division lines, and agricultural field boundaries	●	●	●	●	●	●	●	All route segments parallel existing division lines for 92% or more of their lengths.

Routing Factor / Resource	A1 (Purple Route)	A2	A3 (Blue Route	A4	A5	A6	A7	Summary
				Factor J Paralleling Existing Infrastructure				
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.								Route Segment A2 parallels existing transmission lines for one mile and the most existing road ROW (15.6 miles, 89% of its length). Route Segment A3 (Blue Route) parallels the least existing infrastructure (4 miles, 27% of its length) and does not parallel existing transmission line.
				Factor L Costs				
Costs Dependent on Design and Route	$79,024,000	$79,511,000	$62,932,000	$81,913,000	$65,179,000	$62,774,000	$63,081,000	As noted in Section 6.7, costs generally coincide with the length of the line. Route Segments A1 (Purple Route), A2, and A4 are anticipated to cost 25% or more than other route segments but they are also the longest. The remaining costs estimates are within one another's margin of error.

[1] Minnesota Statute § 216E.03 - Subdivision 7 (15e) requires the Commission to consider locating a route for a high-voltage transmission line on an existing high-voltage transmission route. The summary here indicates where ROW paralleling to existing transmission lines occurs but does not distinguish between HVTLs and other transmission lines that might not meet the definition of an HVTL (for example, distribution lines). Highways are included in the assessment provided for Minnesota Statute § 216E.03 - Subdivision 7 (8).

6.9 Potential Refinements

A refinement is a route segment that was included in the scoping decision but not included within A1 through A8. For purposes of analysis, refinements are considered in standalone comparisons against Purple Route or Blue Route equivalents. Table 6-14 summarizes the refinements in Region A and indicates which alternative the refinement would replace. Map 3.1 and Map 3.2 provide the locations of the refinements in Region A. Data tables for the refinements are provided in Appendix E.

Table 6-14 Region A Refinements Summary

Route Segment	A1 (Purple Route)	A2	A3 (Blue Route)	A4	A5	A6	A7	A8
Route Segment 204	X	X						
Route Segment 206	X							
Route Segment 207				X				
Route Segment 208				X				

6.9.1 Route Segment 204

Route Segment 204 departs the Purple Route by traversing further west on U.S. Highway 14. Halfway into T109N, R41W, S16, it turns north until it rejoins the Purple Route (Map N.1 and Map N.2). It was proposed as an alternative to avoid dwellings. Table 6-15 summarizes differences in potential impacts of Route Segment 204 compared to its equivalent.

Table 6-15 Route Segment 204 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	The equivalent to Route Segment 204 parallels more existing infrastructure ROW (1.5 miles [of which 0.05 miles are paralleling existing transmission lines] or 100%) compared to Route Segment 204 (0.5 miles [of which 0.5 miles are paralleling existing transmission lines] or 37%). Neither Route Segment 204 nor its equivalent have any length that do not parallel division lines.
Human Settlement	Route Segment 204 has less residences within 500 feet of the anticipated alignment (zero total) and within the route width (zero total) when compared to its equivalent (one within 500 feet and one within the 500 to 1,600 feet).
Natural Environment – Surface Waters and Wetlands	Route Segment 204's equivalent does not cross any watercourses or waterbodies and does not include any NWI wetlands. Route Segment 204 does not cross any watercourses or waterbodies and has 1 acre of NWI wetlands (0 acres of which are forested wetlands).
Natural Environment – Wildlife and Wildlife Habitat	The route widths of Route Segment 204 and its equivalent intersect a Grassland Bird Conservation Area, with Route Segment 204 intersecting more acreage (159 acres versus 103 acres). The anticipated alignments of both route segments cross the Grassland Bird Conservation Area. The route widths of Route Segment 204 and its equivalent intersect similar acreages of Wildlife Action Network corridors (195 and 196 acres, respectively). The anticipated alignments of both route segments would cross Wildlife Action Network corridors.

6.9.2 Route Segment 206

Route Segment 206 departs the Purple Route at CR 67 and traverses north to 220th Street. From here, it turns east until it rejoins the Purple Route (Map N.8). It was proposed to avoid impacts to an area the landowner planted native grasses on to alleviate erosion issues on his property. The erosion issues were especially relevant given topography north of his property and what the commentor noted was a spring-fed watercourse. Table 6-16 summarizes differences in potential impacts of Route Segment 204 compared against its equivalent.

Table 6-16 Route Segment 206 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 206 parallels more existing infrastructure ROW (2.0 miles or 100%) compared to its equivalent (0.5 miles or 26%). Neither Route Segment 206 nor its equivalent have any length that do not parallel division lines.
Human Settlement	The equivalent to Route Segment 206 has fewer residences within 500 feet (2) when compared to Route Segment 206 (4 within 500 feet). The equivalent to Route Segment 206 also has fewer residences within 500 to 1,600 feet (4) when compared to Route Segment 206 (6).
Natural Environment – Surface Waters and Wetlands	Route Segment 206's equivalent crosses three watercourses and no waterbodies; it also includes 2 acres of NWI wetlands (<1 of which are forested). Route Segment 204 crosses five watercourses and no waterbodies and has 1 acre of NWI wetlands (<1 acre of which is forested wetlands).
Natural Environment - Vegetation	Approximately 7 acres of native plant communities are in the route width of the Route Segment 206 equivalent and its anticipated alignment would cross native plant communities. Route Segment 206 would avoid native plant communities. According to the NLCD, neither Route Segment 206 nor its equivalent intersects forested landcover; however, based on aerial photographs, the ROW for both route segments intersect small areas of forested land associated with streams/wetlands.
Natural Environment – Wildlife and Wildlife Habitat	The route widths of Route Segment 206 and its equivalent intersect a Grassland Bird Conservation Area and Wildlife Action Network corridors, with the route width of Route Segment 206 intersecting more acreage (111 acres versus 47 acres for the Grassland Bird Conservation Area and 261 acres versus 196 acres for Wildlife Action Network corridors). The anticipated alignments of both route segments would cross these resources.
Rare and Unique Natural Resources	The route width of Route segment 206 and its equivalent intersect Sites of Biodiversity Significance, with the equivalent intersecting significantly more acreage (54 acres versus 4 acres). The anticipated alignment and ROW for Route Segment 206 avoids this resource, while anticipated alignment and ROW for the equivalent intersects Sites of Biodiversity Significance.

6.9.3 Route Segment 207

Route Segment 207 departs the Blue Route and traverses north on the eastern border of T110N, R40W, S17 until it joins Route Connector 101 (Map N.17). Route Segment 207 was proposed to avoid potential impacts of stray voltage, property values, tree removal and noise. Table 6-17 summarizes differences in potential impacts of Route Segment 207 compared against its equivalent.

Table 6-17 Route Segment 207 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	The equivalent to Route Segment 207 parallels more existing infrastructure ROW (0.5 miles or 50%) compared to Route Segment 207 (0 miles). Route Segment 207 does not have any length that does not parallel division lines; the equivalent to Route Segment 207 includes a total of 0.1 mile that does not parallel existing infrastructure or division lines.
Human Settlement	Route Segment 207 does not have any residences within 0 to 1,600 feet, while its equivalent has one residence within 75 to 250 feet; no other residences are located with 1,600 feet of the equivalent.
Natural Environment – Surface Waters and Wetlands	Route Segment 207's equivalent crosses two watercourses and no waterbodies; it does not include any NWI wetlands. Route Segment 207 crosses two watercourses and no waterbodies and has 1 acre of NWI wetlands (<1 acre of which is forested wetlands).
Natural Environment - Vegetation	According to the NLCD, neither Route Segment 207 nor its equivalent intersects forested landcover; however, based on aerial photographs, the ROW for both route segments would intersect small areas of forested land.
Natural Environment – Wildlife and Wildlife Habitat	The route width of the Route Segment 207 equivalent intersects 1 acre of a Grassland Bird Conservation Area, while Route Segment 207 does not. However, the anticipated alignment of the Route Segment 207 equivalent does not cross it. The route width of Route Segment 207 intersects approximately 2 acres of a Wildlife Action Network corridor, which is also a Site of Biodiversity Significance ranked moderate. The anticipated alignment for Route Segment 207 crosses the western edge of these resources. The Route Segment 207 equivalent avoids these resources.

6.9.4 Route Segment 208

Route Segment 208 departs Route Connector 101 at 230th Street and traverses west. It turns north at 310th Avenue until it rejoins Route Connector 101 (Map N.21 and Map N.22). Route Segment 208 was proposed to avoid agricultural lands. Table 6-18 summarizes differences in potential impacts of Route Segment 208 compared against its equivalent.

Table 6-18 Route Segment 208 vs Its Equivalent Impacts Summary

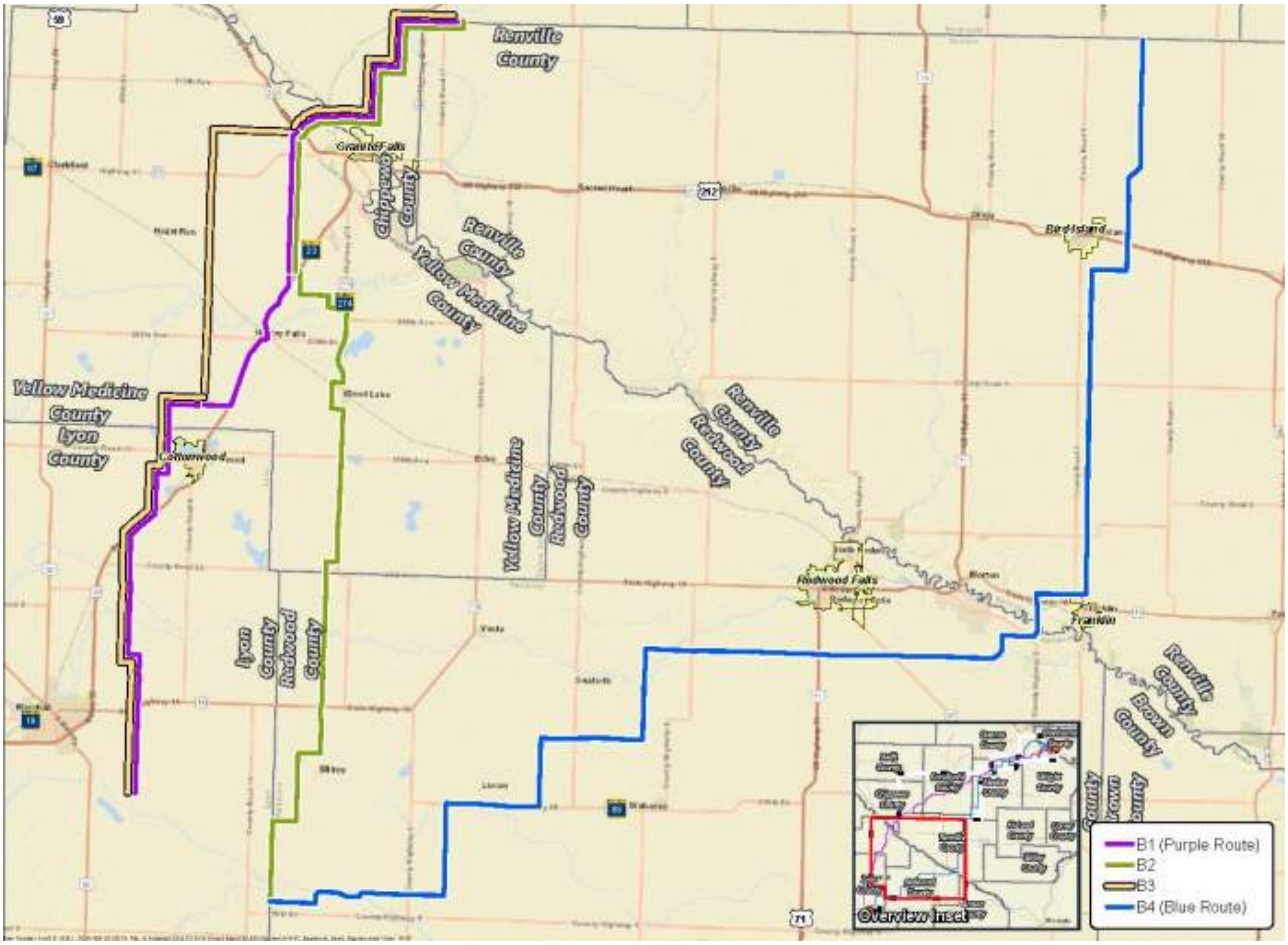
Resource	Summary
Paralleling Existing Infrastructure	Route Segment 208 parallels more existing infrastructure ROW (1.5 miles [of which 1 mile is paralleling existing transmission lines] or 100%) compared to its equivalent (0 miles). Route Segment 208 does not have any length that does not parallel division lines; the equivalent to Route Segment 208 includes a total of 0.5 miles that does not parallel existing infrastructure or division lines.
Human Settlement	Route Segment 208 has three residences within 250 to 500 feet, while its equivalent does not have any. The equivalent to Route Segment 208 has three residences within 500 to 1,600 feet, while Route Segment 208 has two.
Natural Environment – Surface Waters and Wetlands	Both Route Segment 208 and its equivalent cross two watercourses; no other surface waters are crossed, and no wetlands are present within the route widths.
Natural Environment – Wildlife and Wildlife Habitat	The route widths of Route Segment 208 and its equivalent intersect a Grassland Bird Conservation Area, with Route Segment 208 intersecting more acreage (153 acres versus 92 acres). The anticipated alignments of both route segments cross the Grassland Bird Conservation Area.

7 Region B - Potential Impacts and Mitigation

Chapter 7 describes potential impacts in Region B, which is the second southern-most region and is in Lyon, Redwood, Yellow Medicine, Redwood, and Renville Counties (Map 2). The four route segments in Region B are shown in Figure 7-1 and described below.

- Route Segment B1 is the applicant's proposed Purple Route. It is 45.4 miles long.
- Route Segment B2 is a variation of the Blue Route to Purple Route. It is 51 miles long. It departs the applicant's proposed Blue Route at the beginning of this region. It includes Route Connector 102 and a portion of the applicant's proposed Purple Route. Route Connector 102 was proposed as an alternative to alleviate congestion of existing high voltage transmission lines near the Purple Route, reduce the number of crossings through biodiverse areas, and reduce the number of total homes in close proximity.
- Route Segment B3 is a variation of the Purple Route. It is 46.9 miles long. It includes Route Segment 209 which was proposed as an alternative to minimize potential impacts to farmland by more closely following county roads, and air traffic by moving the path further away from Granite Falls Airport.
- Route Segment B4 is the applicant's proposed Blue Route. It is 75.3 miles long.

Figure 7-1 Region B Route Segments



7.1 Environmental Setting

Region B is dominated by agricultural land use, with rural residential and commercial development (Map 6). Major waterways crossed by the route alternatives within Region B include Minnesota River, Yellow Medicine River, Redwood River, Cottonwood River, Threemile Creek, Hawk Creek, Chetomba Creek, Clear Creek, Wood Lake Creek, Meadow Creek, Sleepy Eye Creek, and Buffalo Creek (Map 14).

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. Under this classification system, Region B is in the Prairie Parkland Province (Map 15). These sections are further broken down into subsections, including the Minnesota River Prairie Subsection. This subsection is used below to classify the environmental setting of the project.

The Minnesota River Prairie Subsection comprises most of Region B. This area is characterized by large till plains that are bisected by the broad valley of the Minnesota River. Topography is steepest along the Minnesota River and the Big Stone Moraine, which has steep kames and broad slopes, while topography outside of the river valley consists of level to gently rolling ground moraine. Glacial drift generally ranges between 100 and 400 feet throughout this subsection. Soils are mostly well to moderately well-drained loams formed in gray calcareous till with some localized inclusions of clay, sand, and gravel soils. Wetlands were common within this subsection prior to pre-European contact, and most have been drained to establish usable cropland (reference (188)).

Region B is in Lyon County, Redwood County, Yellow Medicine County, Redwood County, and Renville County Minnesota (Map 2). Communities nearest the route alternatives include Marshall, Milroy, Lucan, Cottonwood, Granite Falls, and Bird Island; Wood Lake, Franklin, and Hanley Falls are crossed by the route alternatives (Map 2). Existing transmission lines are prevalent throughout the region. Federal Highways within the project area include U.S. Highway 212, U.S. Highway 71, and nearby state highways include State Highway 68, State Highway 19, State Highway 23, State Highway 67, State Highway 274. County and Township roads are also present within the region (Map 9). Most state highways are concentrated on the northwest side of the region, near Granite Falls.

7.2 Human Settlement

7.2.1 Aesthetics

The ROI for aesthetics is the local vicinity. Transmission lines alter a viewshed (Section 5.2.1.2). Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes. 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, and 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. Additional details regarding potential impacts to aesthetics and potential mitigation measures is provided in Section 5.2.1.

The Redwood River is crossed by all the route segments in Region B and is classified as a state water trail. Route Segments B1 (Purple Route), B2, and B3 cross the river in Stanley Township in Lyon County (Map 5.3). Where Route Segment B1 (Purple Route) crosses the river, existing forested vegetation would require clearing; there is no existing development in this area (Map N.58). Where Route Segment B2 crosses the river, existing forested vegetation would also require clearing (Map N.58 and Map N.59). Unlike Route Segment B1 (Purple Route) where there is no existing infrastructure present, the anticipated alignment for Route Segment B2 is parallel to an existing bridge. Aesthetic impacts to the Redwood River would be significant for these two crossings.

Route Segment B4 (Blue Route) crosses the Redwood River twice in Redwood County (Map 5.2). At both crossing locations, the anticipated alignment would be parallel to an existing road and/or transmission line infrastructure (Map N.83, Map N.84, and Map N.85).

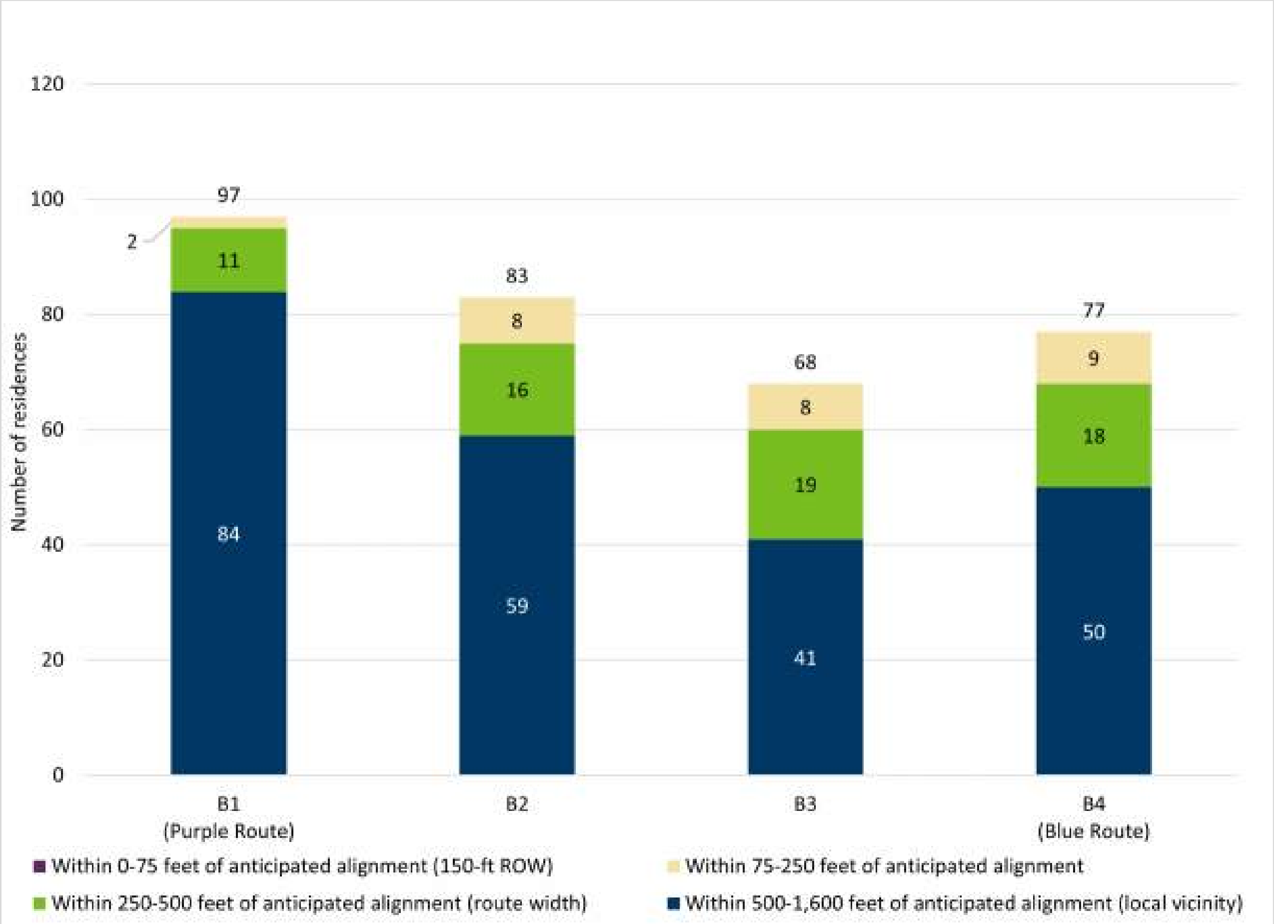
The Minnesota River Valley Scenic Byway follows the Minnesota River through central Minnesota between Big Stone Lake and Belle Plaine (reference (198); Map 5.2). Route Segments B1 (Purple Route), B2, and B3 would cross the scenic byway in Yellow Medicine County after crossing the Minnesota River, just north of the city of Granite Falls (Map N.48). The Minnesota River is a designated state water trail, which promotes water recreation (Minnesota Statutes § 85.31), and a wild and scenic river (Minnesota Statutes § 103F.305), which falls under certain protections put in place in Minnesota's 1973 Wild and Scenic Rivers Act. Route Segment B4 (Blue Route) would cross the Minnesota River in Renville County, then head north to cross the scenic byway (County Road [CR] 51) by the city of Franklin (Map N.93).

At both scenic byway crossing locations there are existing transmission lines and mowed grass beneath the existing lines. Route Segments B1 [Purple Route], B2, and B3 cross the scenic byway more than a mile from the Minnesota River and in a developed area with multiple homes and a residence. Route Segment B4 (Blue Route) crosses at a point where the roadway is less developed, but still has the presence of existing transmission lines at the crossing location and an existing railroad line is present approximately 140 feet from the scenic byway. Impacts to the scenic byway at both crossing locations would be minimal given the existing environment at the crossing locations.

Appendix N shows human settlement features (for example, residences and nursing homes) in the local vicinity of the route segments. The proximity of residential structures (homes) and non-residential structures to route segments at various distances is shown in Figure 7-2 and Table 7-1, respectively. Route Segment B3 would have the least number of residences (68) within the local vicinity. Route Segment B1 (Purple Route) has the most residences within the local vicinity (97) but also has the least number of residences within 500 feet and within the route width (11).

Generally, the route segments have a similar number of total non-residential structures within the local vicinity (between 423 and 474); however, Route Segments B1 (Purple Route), B2, and B3 have non-residential structures within the ROW.

Figure 7-2 Region B, Route Segments, Proximity of Residential Structures



For total count of residential structures within the route width, combine residential structures within 75-250 feet and residential structures within 250 and 500 feet.
For total count of residential structures within the local vicinity, combine residential structures within each distance; this number is also stated at the top of each bar.

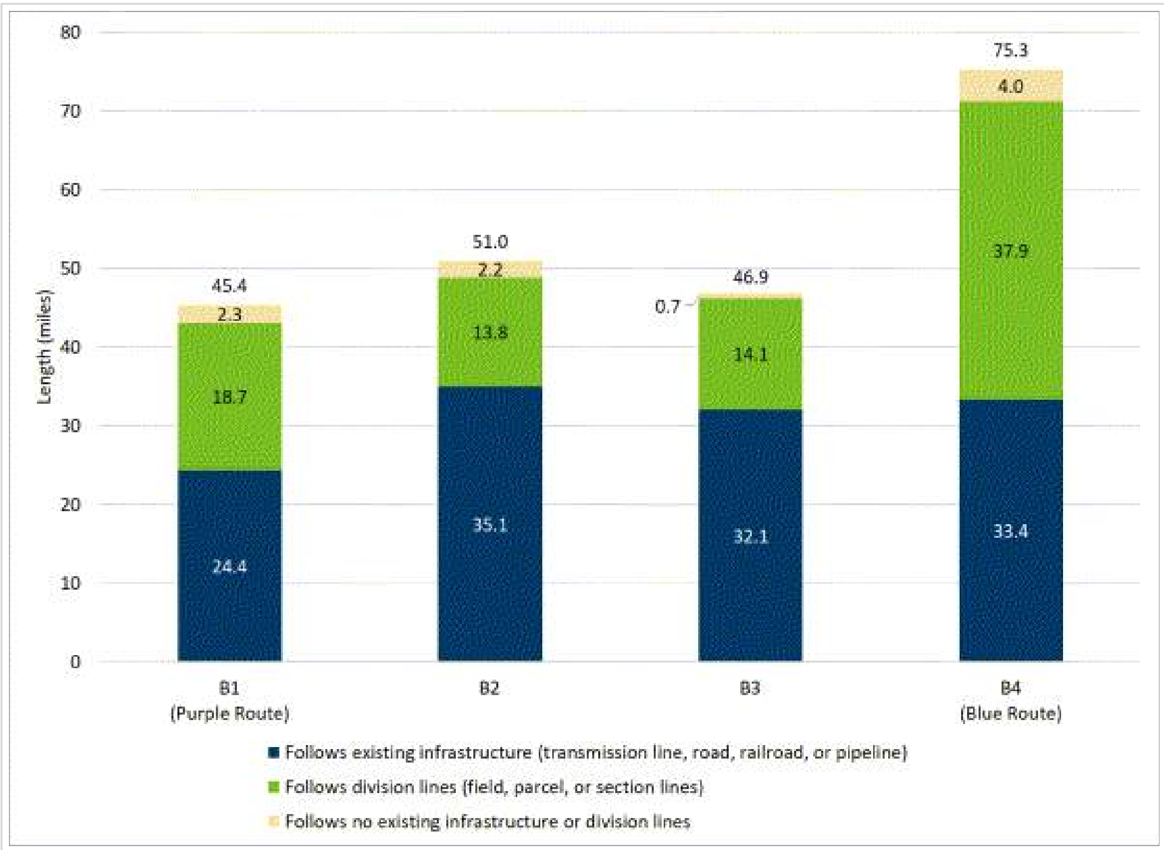
Table 7-1 Region B, Route Segments, Proximity of Non-residential Structures

Distances from Anticipated Alignment	Route Segments			
	B1 (Purple Route)	B2	B3	B4 (Blue Route)
0-75 feet (150-foot-ROW)	4	3	5	0
75-250 feet	14	27	21	21
250-500 feet (generally route width)	50	115	100	86
500-1,600 feet (local vicinity)	377	311	297	367
Total	445	456	423	474

Non-residential structures include churches, schools (public and private), daycares/child-care centers/pre-schools, hospitals, nursing homes, and commercial and non-residential structures.

Each route segment would parallel with existing infrastructure or division lines as shown in Figure 7-3 and Table 7-2. In some cases, portions of a route segment might parallel ROW with more than one of these existing features at the same time. Map 9 illustrates where ROW paralleling occurs and shows existing infrastructure and division lines in the region. All route segments parallel a portion of their routes with existing transmission line. Route Segments B2 and B3 parallel the largest proportion of their lengths with existing infrastructure ROW (35.1 miles and 69 percent of its length, and 32.1 miles and 69 percent of its length, respectively). Route Segment B3 has the highest proportion of its length that follows existing infrastructure or division lines.

Figure 7-3 Region B, Route Segments, ROW Paralleling of Existing Infrastructure and/or Division Lines Summary



The total mileage at the top of each route segment represents that route segment's total length. Numbers may not sum due to rounding.

Table 7-2 Region B, Route Segments, Route Segments, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

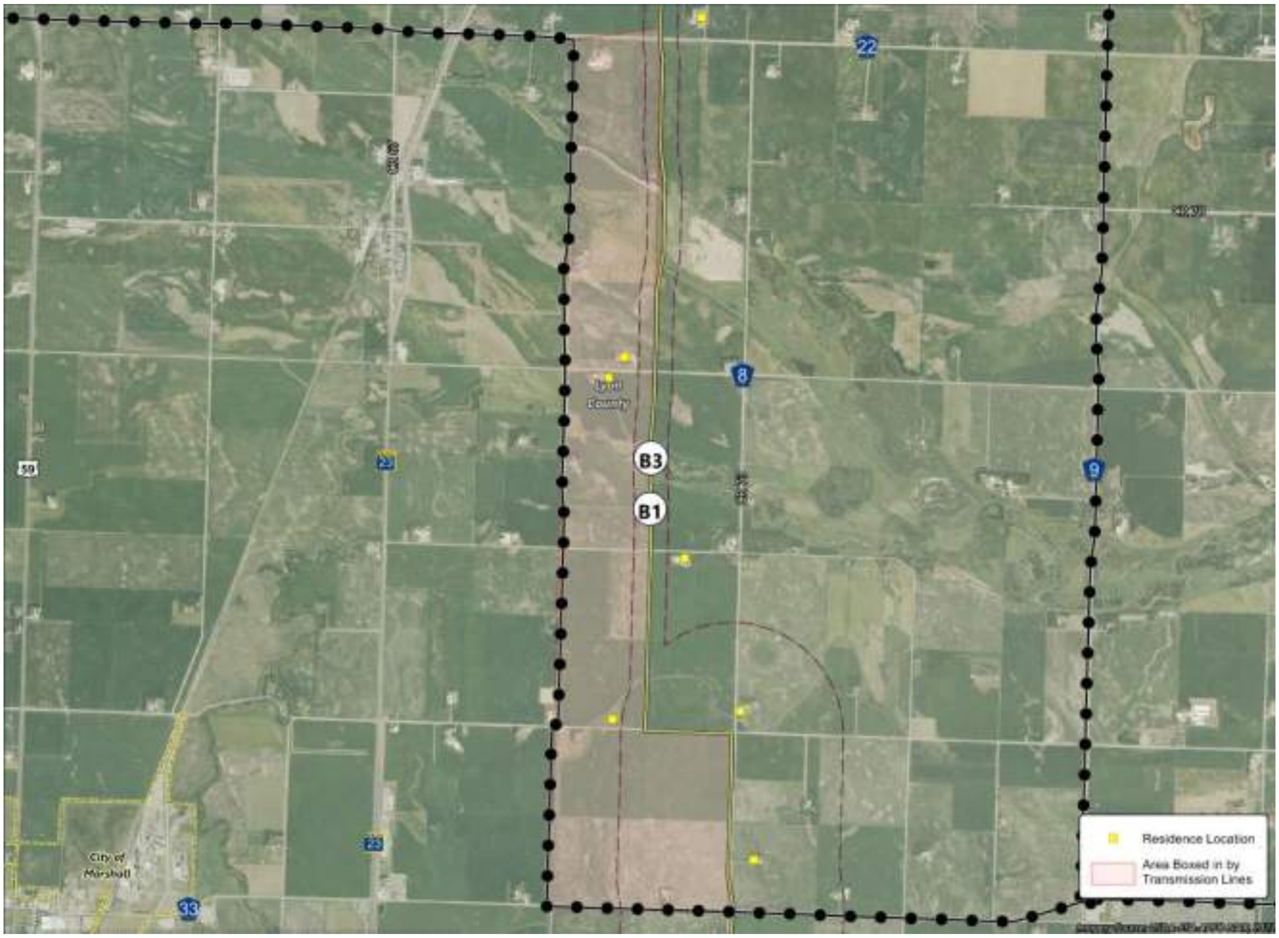
Infrastructure	Route Segments			
	B1 (Purple Route)	B2	B3	B4 (Blue Route)
Follows existing transmission line (miles, %)	6.0 (13)	5.5 (11)	5.5 (12)	14.7 (20)
Follows existing roads (miles, %)	18.3 (40)	30.6 (60)	26.6 (57)	29.0 (39)
Follows existing railroad (miles, %)	0 (0)	0 (0)	0 (0)	0 (0)
Follows existing pipelines (miles, %)	0 (0)	0 (0)	0.1 (<1)	0 (0)
Total ROW paralleling (w/transmission line, road, and railroad) (miles, %)	24.4 (54)	35.1 (69)	32.1 (69)	33.4 (44)
Follows Field, parcel, and Section Lines (miles, %)	40.7 (54)	46.6 (91)	44.3 (94)	71.0 (94)
Total- All (miles, %) [1]	43.1 (95)	48.9 (96)	46.2 (99)	71.3 (95)

Totals might not sum to 100 percent due to rounding.
[1] This total is indicative of the full length of the route segment that parallels existing infrastructure ROW and/or division lines. For Region B, there is some linear feet that parallel existing infrastructure that was not also deemed as following existing division lines. Therefore, the total for this row sums the total linear length that follows existing infrastructure and division lines.

There are two areas in Region B where the proposed transmission line would box in parcels with existing HVTLs. In Yellow Medicine County, Route Segments B1 (Purple Route) and Route Segment B2 would box in parcels as shown in Figure 7-4. In Lyon County, Route Segments B2 and B3 would box in parcels as shown in Figure 7-5. The residences within these areas would be subject to a greater intensity of aesthetic impacts that would be significant.

Figure 7-4 Route Segments B1 (Purple Route) and B2 Boxed-in Area

Figure 7-5 Route Segments B1 (Purple Route) and B3 Boxed-in Area



7.2.2 Cultural Values

Potential impacts to cultural values are discussed for the entire project in Section 5.2.2. The assessment was completed for the project as a whole because existing conditions are better understood at a broader scale than the regional level. Impacts to cultural values are independent of the route selected.

7.2.3 Displacement

The ROI for displacement is the ROW. Displacement occurs when a residence or building is required to be removed for construction of the project. Residential buildings within the ROI would require removal, whereas non-residential buildings could stay within the ROI if the activities taking place in these buildings are compatible with the safe operation of the line. Additional details regarding displacement and potential mitigation measures are provided in Section 5.2.3.

There are no residences within the ROI for the route segments within Region B. Route Segment B1 (Purple Route) includes four, Route Segment B2 includes three, and Route Segment B3 includes five non-residential structures in their ROWs, all of the structures are agricultural buildings (Table 7-1). The non-residential structures are shown in Map N.32, Map N.42, Map N.52, Map N.53, Map N.65, Map N.90, and Map N.102.

7.2.4 Environmental Justice

Census tract 7501, crossed by Route Segment B4 (Blue Route), was identified as a potential area of concern for environmental justice. Section 5.2.4 discusses the census tract and potential impacts.

7.2.5 Land Use and Zoning

Potential impacts to land use and zoning are discussed in Section 5.2.5. The assessment for land use and zoning was completed for the project as a whole because existing conditions are determined by jurisdictional areas (counties) and do not coincide with the project's regional boundaries.

7.2.6 Noise

Potential impacts from noise are discussed for the entire project in Section 5.2.6. The assessment for noise was completed for the project as a whole because there is limited variability in the potential for noise across the route alternatives.

7.2.7 Property Values

Potential impacts to property values are discussed for the entire project in Section 5.2.7. The assessment for property values was completed for the project as a whole because there is limited variability in the potential for property value impacts across the route alternatives.

7.2.8 Recreation

The ROI for recreation is the route width. 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 5.2.8.2**). 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 likely vary based on individual perspectives and experiences. Impacts to recreation are assessed through identification of recreational resources within the ROI. The project is not anticipated to directly impede recreational activities within the ROI such as snowmobiling, golfing, canoeing, hunting, or fishing. Additional details regarding potential impacts to recreation and potential mitigation measures for the project is provided in Section** 5.2.8**.**

State water trails, a wild and scenic river, a scenic byway, and snowmobile trails are present within Region B (Map 5; Table 7-3). Route segments in Region B do not cross any public land-based trails.

The Redwood River is designated as a state water trail as described in Section 5.2.8 and is crossed by each of the route segments in Region B. Aesthetic impacts related to the watercourse crossings are discussed in Section 7.2.1.

The Minnesota River is designated as a state water trail and a wild and scenic river, as described in Section 5.2.8 and is crossed by each of the route segments in Region B. Aesthetic impacts related to the watercourse crossings are discussed in Section 7.2.1.

The Minnesota River Valley Scenic Byway (U.S. Highway 212) is located north and south of the Minnesota River and is crossed by all the route segment in Region B. Aesthetic impacts related to the scenic byway crossings are discussed in Section 7.2.1.

Multiple snowmobile trails are present in Region B including Cross Country Trail Blazer Trails, Lyon County Trail, Redwood County Trails, Renville County Drift Runner Trails, Snow-Drifters of Montevideo Trails. Route Segment B4 (Blue Route) has the most snowmobile trails crossings (29) and linear feet (over 20.5 miles).

Public lands, including Waterfowl Production Areas and Wildlife Management Areas, are publicly accessible and can be used for recreational purposes. Public lands used for wildlife management (Waterfowl Production Areas and Wildlife Management Areas) are discussed in Section 7.6.12.

Table 7-3 Region B, Route Segments, Recreational Resources within Route Width

Recreational Resource	Unit	Route Segments			
		B1 (Purple Route)	B2	B3	B4 (Blue Route)
Redwood River State Water Trail	Crossings (linear feet)	1 (1,427)	1 (1,146)	1 (1,427)	2 (2,073)
Minnesota River State Water Trail and Wild and Scenic River	Crossings (linear feet) [1]	1 (1,137)	1 (1,137)	1 (1,137)	1 (1,523)
Minnesota River Valley Scenic Byway	Crossings (linear feet)	1(1,005)	1 (1,005)	1 (1,005)	1 (1,191)
Snowmobile Trail [2]	Crossings (miles)	5 (4.0)	3 (0.6)	7 (4.2)	29 (20.5)

[1] Linear feet totals are taken from the DNR Minnesota State Water Trails Dataset

[2] Snowmobile trails within Region B include: Cross Country Trail Blazer Trails, Lyon County Trail, Redwood County Trails, Renville County Drift Runner Trails, Snow-Drifters of Montevideo Trails

7.2.9 Socioeconomics

Potential impacts to socioeconomics are discussed for the entire project in Section 5.2.9 This is because the assessment was completed at the county-level which does not always align with regional boundaries.

7.2.10 Transportation and Public Services

Potential impacts to transportation and public services are discussed for the entire project in Section 5.2.10. The assessment was completed for the project as a whole and not carried forward at the regional level because there is limited variability in across the route alternatives. Potential impacts to private airstrips are discussed in land-based economies.

7.3 Human Health and Safety

The impacts to human health and safety are discussed generally for the entire project in Section 5.3. The assessment was completed for the project as a whole and not carried forward at the regional level because there is limited variability across the route alternatives and generally impacts would be minimized by appropriate placement and adhering to applicable transmission line standards and codes**.**

7.4 Land-based Economies

Land-based economies are assessed by considering four elements: agriculture, forestry, mining, and tourism (Section 5.4). Impacts to two elements of land-based economies are anticipated to be minimal and independent of the route segment selected in Region B. These elements are:

- **Forestry –** No known forestry operations were identified within the ROI (the route width) for Region B.
- **Tourism –** Recreational resources, including a state water trail and scenic byways, are present within the ROI. However, the project is not anticipated to adversely affect the recreational resources. Therefore, any direct impacts to the recreation that would cause an indirect impact to tourism-based economies are anticipated to be negligible (Section 5.4.2.4).

7.4.1 Agriculture

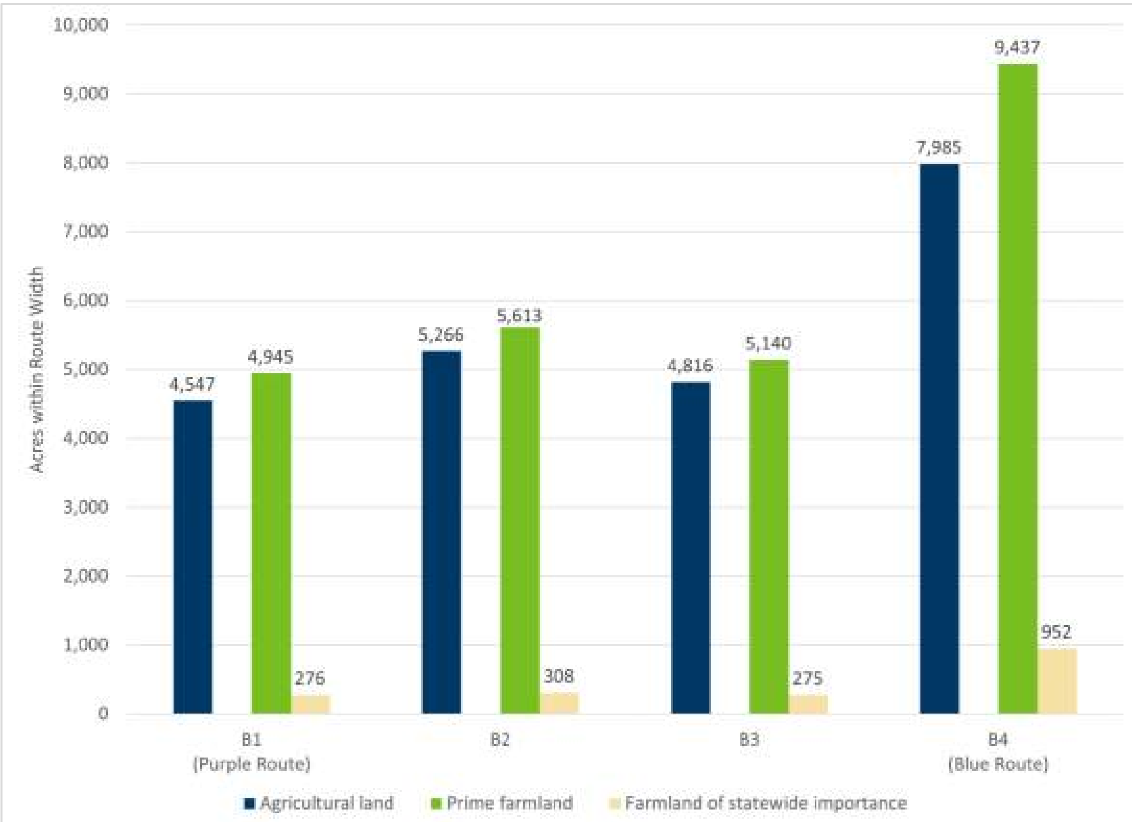
The ROI for the land-based economy of agriculture is the route width. Construction and operation of a HVTL impacts agriculture (Section 5.4.2.1). During construction, impacts would include the limited use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Permanent impacts would also occur when the footprint of the HVTL structures directly impedes agricultural production and/or impedes efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields.

Prudent routing (paralleling existing infrastructure and/or paralleling division lines) could help minimize potential impacts. Implementation of the AIMP (Appendix K), would minimize and mitigate impacts to agriculture. Additional details regarding potential impacts to agriculture and potential mitigation measures is provided in Section 5.4**.**

Figure 7-6 summarizes the total acres within the route widths of Region B route segments that are designated as agricultural land use, as well as prime farmland and farmland of statewide importance. Most land (more than 70 percent) within the route widths of the route segments in Region B is designated as agricultural land use (cultivated crops and hay/pasture; see Section 7.6.10). Route Segment B4 (Blue Route) has the most prime farmland and is the longest route segment (75.3 miles). The other route segments have similar amounts prime farmland and are similar lengths (45.4 to 51.0 miles).

As noted in Table 7-2, Route Segments B2 and B3 parallel the most existing infrastructure as a percentage of their length (69 percent of their lengths) and Route Segment B4 (Blue Route) parallels the least amount as a percentage of its length (44 percent of its total length). Route Segment B4 (Blue Route) also has the greatest distance that does not follow existing infrastructure or division lines at 4.0 miles (Figure 7-3), while the other segments have 2.3 miles or less that do not follow existing infrastructure or division lines.

Figure 7-6 Region B Route Segments, Acres of Agricultural Lands and Prime Farmland within Route Widths



Source: Agricultural land, NLCD and prime farmland/farmland of statewide importance, SSURGO (Appendix C)

The RIM/CREP program provides financial incentives to farmers to remove land from production (Section 5.6.6.1). The anticipated alignments of all the route segments cross a portion of RIM/CREP land (Map N.27, Map N.48, Map N.90, Map N.91, and Map N.96). Route Segment B4 (Blue Route) crosses the highest number of acres (403 acres; Section 7.6.1). The applicant committed to working with the landowners if/when easements are present to avoid and/or minimize impacts (Section 5.6.6.3.2). Impacts can be mitigated by compensating individual landowners through negotiated easement agreements.

7.4.2 Mining

The ROI for the mining land-based economy is the route width. Impacts to aggregate mining could include interference with access to aggregate resources or the ability to successfully mine these reserves (Section 5.4.2.3). If future geophysical surveys are planned, the surveying technology could also be impacted. Potential impacts are assessed through identification of known, existing and prospective mining operations and assessing potential impacts to those current or potential future operations. If the

potential for impacts to mining operations would occur, the applicant would be required to coordinate those impacts with the mining operator (Section 5.4.3**).**

One prospect gravel pit (MNDOT ASIS Number 64037) is present with the route width of Route Segment B4 (Blue Route) (Map N.69). The anticipated alignment is north of the prospective gravel pit. Access to a potential grave pit would be unlikely to come from the north given the presence of the Cottonwood River; therefore, impacts are anticipated to be negligible. No other active or prospect mines were identified in Region B.

7.5 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 (Section 5.5.2). 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. Indirect 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. Additional details concerning potential impacts and mitigation for archaeological and historic resources are provided in Section 5.5.3.

Documented archaeological and historic resources within Region B are summarized in the following tables.

- Table 7-4 summarizes the number of archaeological and historic resources within the project area (which is within one mile of the anticipated alignments).
- Table 7-5 summarizes the number of archaeological and historic resources within the ROI (route width) for each of the Region B, route segments.
- Table 7-6 provides descriptions of the resources located within the route widths.

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

Table 7-4 Region B, Route Segments, Number of Archaeological and Historic Resources within the Project Area

Route Segment	Archaeological Resources	Historic Architectural Resources	Historic Cemeteries
B1 (Purple Route)	22	124	11
B2	22	133	12
B3	23	95	14
B4 (Blue Route)	27	58	17

Table 7-5 Region B, Route Segments, Number of Archaeological and Historic Resources Route Width

Route Segment	Archaeological Resources	Historic Architectural Resources	Historic Cemeteries
B1 (Purple Route)	3	16	2
B2	5	18	2
B3	2	16	5
B4 (Blue Route)	3	16	5

Table 7-6 Region B, Route Segments, Archaeological and Historic Resources within the Route Width Summary

Route Segment(s)	Site / Resource Number	Resource Type	Resource Name/Description	NRHP Status	Description
B1 (Purple Route), B2, B3	21CP0011	Archaeological Site	Mortuary (three Native American burial mounds / possibly destroyed)	Unevaluated	Site 21CP0011 is a pre-contact, Native American burial mound site, consisting of three mounds, two of which are elongated. (reference (199)). This site may have been destroyed due to previous disturbance.
B1 (Purple Route), B2, B3	21CPa	Archaeological Site (Alpha site)	Mortuary (Stanley Minsaas III)	Unevaluated	Site 21CPa is an alpha site. Site 21CPa is also a mortuary site, characterized as the Stanley Minsaas III mortuary site, located just north of Granite Falls (reference (200)).
B4 (Blue Route)	21Rnad	Archaeological Site (Alpha site)	Unnamed Trading Post	Unevaluated	Site 21RNad is an alpha site consisting of a historic, unnamed trading post (reference (201)).
B4 (Blue Route)	21RW0001	Archaeological Site (Alpha site)	Mortuary (one Native American burial mound / possibly destroyed)	Unevaluated	Site 21RW0001 is a Native American burial mound site consisting of one mound. The site is reported to have been destroyed by the development of a house complex and gravel pit (reference (202)) and is located south of Franklin along the Mississippi River.
B2	21RW0032	Archaeological Site	Pre-contact Lithic Scatter	Unevaluated	Site 21RW0032 is a pre-contact lithic scatter consisting of a retouched cutting tool, lithic flakes, and three possible depressions filled in by the landowner (reference (203)).
B4 (Blue Route)	21RW0072	Archaeological Site	Pre-contact Lithic Scatter	Unevaluated	Site 21RW0072 is a pre-contact lithic scatter consisting of three lithic flakes (reference (204)).
B2	21RWj	Archaeological Site (Alpha site)	Ceresco Ghost Town	Unevaluated	Sit 21RWj is an alpha site consisting of a historic ghost town (reference (205)).
B1 (Purple Route)	21YM0074	Archaeological Site	Pre-contact Lithic Scatter	Unevaluated	Site 21YM0074 is pre-contact lithic scatter consisting of a projectile point, an unfinished projectile point, a knife fragment and debitage (reference (206)).

Route Segment(s)	Site / Resource Number	Resource Type	Resource Name/Description	NRHP Status	Description
B2	21YMx	Archaeological Site (Alpha site)	Tyson's Grove Ghost Town	Unevaluated	Site 21YMx is an alpha site consisting of a historic ghost town (reference (207)).
B1 (Purple Route), B2, B3	CP-GRT-00055	Historic Architecture	Julia Knudson Farm	Not Eligible	-
B1 (Purple Route), B2, B3	CP-STO-00008	Historic Architecture	Bridge 12503	Unevaluated	-
B4 (Blue Route)	Crest Lawn Memorial Gardens	Historic Cemetery	Crest Lawn Memorial Gardens (mapped at PLS forty level)	N/A	-
B4 (Blue Route)	Curtin Burial	Historic Cemetery	Curtin Burial (mapped at Section level)	N/A	-
B1 (Purple Route)	East Cemetery	Historic Cemetery	East Cemetery (mapped at PLS forty level)	N/A	-
B1 (Purple Route), B3	English Cemetery	Historic Cemetery	English Cemetery (mapped at PLS forty level)	N/A	-
B2	John Carney Burial	Historic Cemetery	John Carney Burial (mapped at Section level)	N/A	-
B4 (Blue Route)	Linneman Burial	Historic Cemetery	Linneman Burial (mapped at Section level)	N/A	-
B3	Maes Cemetery	Historic Cemetery	Maes Cemetery (mapped at Township level)	N/A	-
B4 (Blue Route)	Marjory Helon Kicks Burial / Steven Palmer Hick Burial	Historic Cemetery	Marjory Helon Kicks and Steven Palmer Hick Burials (mapped at Section level)	N/A	-
B2	Milroy Public Cemetery	Historic Cemetery	Milroy Public Cemetery (mapped at Section level)	N/A	-
B4 (Blue Route)	Newtons Cemetery	Historic Cemetery	Newtons Cemetery (mapped at PLS forty level)	N/A	-
B4 (Blue Route)	RW-GAL-00006	Historic Architecture	Bridge 89876	Unevaluated	-

Route Segment(s)	Site / Resource Number	Resource Type	Resource Name/Description	NRHP Status	Description
B4 (Blue Route)	RW-GAL-00013	Historic Architecture	Bridge 64553	Not Eligible	-
B4 (Blue Route)	RW-GAL-00021	Historic Architecture	Bridge 89875	Not Eligible	-
B4 (Blue Route)	RW-GAL-00022	Historic Architecture	Bridge L6896	Not Eligible	-
B4 (Blue Route)	RW-GRK-00001	Historic Architecture	Granite Quarry	Unevaluated	-
B4 (Blue Route)	RW-SHR-00005	Historic Architecture	Bridge 89888	Unevaluated	-
B4 (Blue Route)	RW-SHR-00007	Historic Architecture	Bridge 64516	Not Eligible	-
B2	RW-UND-00004	Historic Architecture	Bridge 64529	Not Eligible	-
B3	Stony Run Church	Historic Cemetery	Stony Run Church Cemetery (mapped at Section level)	N/A	-
B3	Unknown Cemetery	Historic Cemetery	Name of cemetery unknown (mapped at PLS forty level)	N/A	-
B3	West Cemetery	Historic Cemetery	West Cemetery (mapped at Section level)	N/A	-
B1 (Purple Route), B2, B3, B4 (Blue Route)	XX-ROD-00039	Historic Architecture	Trunk Highway 212	Not Eligible	-
B1 (Purple Route), B2, B3, B4-Blue	XX-ROD-00041	Historic Architecture	Trunk Highway 19	Not Eligible	-
B1 (Purple Route), B2, B3, B4 (Blue Route)	XX-ROD-00076	Historic Architecture	Trunk Highway 68	Not Eligible	-
B1 (Purple Route), B2, B3, B4 (Blue Route)	XX-ROD-00077	Historic Architecture	Trunk Highway 67	Not Eligible	-

Route Segment(s)	Site / Resource Number	Resource Type	Resource Name/Description	NRHP Status	Description
B2	XX-ROD-00136	Historic Architecture	Trunk Highway 274	Not Eligible	-
B1 (Purple Route), B2, B3	XX-ROD-00152	Historic Architecture	Trunk Highway 23	Not Eligible	-
B4 (Blue Route)	XX-ROD-00163	Historic Architecture	Trunk Highway 71	Not Eligible	-
B1 (Purple Route), B2, B3	XX-RRD-CNW016	Historic Architecture	Wisconsin Minnesota and Pacific Railway Company/Minneapolis and St. Louis Railway Company/Chicago and Northwestern Railway Company (extant)	Unevaluated	-
B1 (Purple Route), B2, B3, B4 (Blue Route)	XX-RRD-CNW017	Historic Architecture	Minneapolis and St. Louis Railway Company/Chicago and Northwestern Railway Company: Pacific Division (extant)	Unevaluated	-
B4 (Blue Route)	XX-RRD-CNW018	Historic Architecture	Minneapolis and St. Louis Railway-Pacific Extension/Minneapolis and St. Louis Railway Company/Chicago and Northwestern Railway Company (extant)	Unevaluated	-
B1 (Purple Route), B2, B3, B4 (Blue Route)	XX-RRD-CSP010	Historic Architecture	Chicago Milwaukee and St. Paul Railway Company: Hastings and Dakota Division Main Line (extant)	Eligible	-
B1 (Purple Route), B2, B3, B4 (Blue Route)	XX-RRD-CSP012	Historic Architecture	Hastings and Dakota Railway Company: Main Line Extension (extant)	Unevaluated	-
B1 (Purple Route), B2, B3	XX-RVR-00008	Historic Architecture	Minnesota River Channel northwest of Granite Falls	Eligible (also within an NRHP-eligible district xx-hdt-00003)	-

Route Segment(s)	Site / Resource Number	Resource Type	Resource Name/Description	NRHP Status	Description
B3	YM-HRT-00012	Historic Architecture	Bridge 87528	Not Eligible	-
B1 (Purple Route), B2	YM-MNF-00056	Historic Architecture	Bridge 8092	Not Eligible	-
B2	YM-POS-00005	Historic Architecture	Posen Township Hall	Unevaluated	-
B1 (Purple Route), B3	YM-SND-00005	Historic Architecture	Bridge 92457	Unevaluated	-
B1 (Purple Route)	YM-SND-00009	Historic Architecture	Bridge 87010	Not Eligible	-
B3	YM-SND-00012	Historic Architecture	Bridge 87519	Not Eligible	-
B1 (Purple Route), B2, B3	YM-SYR-00018	Historic Architecture	Douglas Peterson House	Not Eligible	-
B2	YM-WLC-00015	Historic Architecture	Culvert 93408	Not Eligible	-

7.5.1 Archaeological Resources

Nine archaeological sites, none of which have been evaluated for listing on the NRHP, and two of which are Native American burial mound sites (which may have been destroyed due to previous disturbance), are present within the route widths of one or more of the route segments (Table 7-6). Based on the Minnesota Department of Transportation's predictive model, the highest potential for the presence of archaeological sites is along the Minnesota River (reference (208)), and this is where most of the documented sites within this region are concentrated.

Route Segment B3 contains two unevaluated archaeological sites within its route width. Route Segments B1 (Purple Route) and B4 (Blue Route) contain three unevaluated archaeological sites within their route widths. Route Segment B2 contains five unevaluated archaeological sites within its route width.

7.5.2 Historic Architectural Resources

Thirty-one historic architectural resources are present within the route widths of the route segments in Region B. These include two eligible resources, 19 ineligible resources, and ten unevaluated resources (Table 7-6).

Route Segment B1 (Purple Route) contains two eligible resources and five unevaluated resources. Route Segment B2 contains two eligible resources and five unevaluated resources. Route Segment B3 contains two eligible resources and five unevaluated resources, and Route Segment B4 (Blue Route) contains one eligible resource and six unevaluated resources.

7.6 Natural Environment

7.6.1 Air Quality

Potential impacts to air quality are expected to be similar to those discussed for the entire project in Section 5.6.1. The assessment for air quality was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

7.6.2 Climate

Potential impacts to climate are expected to be similar to those discussed for the entire project in Section 5.6.2. The assessment for climate was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

7.6.3 Geology and Topography

Potential impacts to geology and topography are expected to be similar to those discussed for the entire project in Section 5.6.3. The assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

7.6.4 Greenhouse Gases

Potential impacts to greenhouse gases are expected to be similar to those discussed for the entire project in Section 5.6.4. The assessment for greenhouse gases was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected given their similar lengths.

7.6.5 Groundwater

Potential impacts to groundwater are expected to be similar to those discussed for the entire project in Section 5.6.5. The assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

7.6.6 Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands often involve unique resources intended for protection and/or preservation and would be subject to short and long-term impacts depending upon their use (Section 5.6.6.2**). Public and designated lands within the ROI are first identified and then further reviewed to better understand potential impacts such as vegetation clearing. Occupying public and designated lands would require coordination with the landowner (Section 5.6.6.3).**

There are no state game refuges in the ROI of Region B. There are Wildlife Management Areas in Region B within the ROIs of all route segments. There is a Waterfowl Production Area in Region B within the ROIs of Route Segments B1 (Purple Route), B2, and B3. These are discussed in Section 7.6.12.

Designated lands with existing easements located within the route widths are summarized in Table 7-7 and shown in Map N.27, Map N.28, Map N.35, Map N.42, Map N.48, Map N.51, Map N.52, Map N.58, Map N.60, Map N.63, Map N.66, Map N.67, Map N.69, Map N.71, Map N.73, Map N.74, Map N.85, Map N.90, Map N.91, Map N.92, Map N.93, Map N.94, Map N.96, and Map N.98). There are at least 96 acres of CREP easements within the ROIs of all route segments with the most acres (384) in Route Segment B4 (Blue Route). The anticipated alignments of all route segments in Region B cross at least one CREP easement. Impacts to the CREP easements would include vegetation clearing.

There are at least 10 acres of RIM Reserve Land within the ROIs of all route segments. The anticipated alignments of all route segments cross a portion of those acres with Route Segment B4 (Blue Route) crossing the highest number of acres(Map N.48, Map N.85, Map N.90, Map N.91, Map N.92, and Map N.96); coordination with the landowner would be required. As discussed in Section 7.10.1, Alternative Alignment 1 was proposed during scoping to avoid the easement areas present on Map N.91.

There are 122 acres of native prairie banks and 4 acres of water bank within the ROI of Route Segment B4 (Blue Route) (Map N.90, Map N.91, and Map N.92). The water bank is not crossed by the anticipated alignment and its associated ROW, thus is anticipated be avoided during final design.

Table 7-7 Region B, Route Segments, Designated Lands within Route Width

Designated Land Type	Unit	Route Segments			
		B1 (Purple Route)	B2	B3	B4 (Blue Route)
Conservation Reserve Enhancement Program (CREP)	Acres	101	96	101	371
Reinvest in Minnesota (RIM) Reserve Partnership Easement	Acres	15	10	15	32
Native Prairie Bank	Acres	0	0	0	122
Water Bank	Acres	0	0	0	4

7.6.7 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 construction and operation-related impacts to protected species and sensitive ecological resources are discussed in Section 5.6.7.4. 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. 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.

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 that 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, are described in Section 5.6.7.5.

Sensitive ecological resources within Region B are shown on Map 12. To protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on maps.

7.6.7.1 Protected Species

According to the NHIS database, between three and nine protected species have been documented within 1 mile of each route segment in Region B; these are summarized in Table 7-8. Some of these protected species could have been documented within the route width or ROW; that information is discussed below and provided in Appendix M. In addition, several state special concern species have been documented within 1 mile of the route segments in Region B; these are summarized in Appendix M.

Table 7-8 **Region B, Route Segments, Natural Heritage Information System Database Documented Records of Protected Species within One Mile**

Scientific Name	Common Name	Type	State / Federal Status [1]	Route Segments			
				B1 (Purple Route)	B2	B3	B4 (Blue Route)
Lampsilis teres	Yellow sandshell	Mussel	Endangered/not listed	X	X	X	
Rallus elegans	King rail	Bird	Endangered/not listed	X		X	
Simpsonaias ambigua	Salamander mussel	Mussel	Endangered/not listed	X	X	X	
Actinonaias ligamentina	Mucket	Mussel	Threatened/not listed	X	X	X	X
Alasmidonta marginata	Elktoe	Mussel	Threatened/not listed	X	X	X	
Asclepias sullivantii	Sullivant's milkweed	Vascular plant	Threatened/not listed	X	X	X	
Bacopa rotundifolia	Waterhyssop	Vascular plant	Threatened/not listed	X	X	X	
Eurynia dilatata	Spike	Mussel	Threatened/not listed	X	X	X	
Lasmigona costata	Fluted-shell	Mussel	Threatened/not listed	X	X	X	
Lespedeza leptostachya	Prairie bush clover	Vascular plant	Threatened/threatened				X
Quadrula nodulata	Wartyback	Mussel	Threatened/not listed				X

[1] The status of the species is provided at the state level prior to the dash and the status of the species is provided at the federal level after the dash.

Several protected mussel species have been documented within the ROW or route width of Route Segments B1 (Purple Route), B2, and B3; however, as discussed in Section 5.6.7.4, direct impacts to mussels are not anticipated, as waterbodies and watercourses would be spanned. A state protected bird, the king rail, has been documented within the ROW of Route Segments B1 (Purple Route) and B3. Protected vascular plant species have been documented within 1 mile of all route segments in Region B; however, none of them have been documented in the ROW.

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 ROW or route width of the route segments. Prior to construction, the applicant could be required to conduct field surveys in coordination with the USFWS and/or DNR for the potential presence of protected species.

7.6.7.2 Sensitive Ecological Resources

The route width of all route segments in Region B would intersect sensitive ecological resources (Table 7-9; Map 12). The route widths of all route segments in Region B would intersect Sites of Biodiversity Significance, with Route Segment B4 (Blue Route) intersecting the most acres of Sites of

Biodiversity Significance. The anticipated alignments of all route segments in Region B would cross Sites of Biodiversity Significance and would likely require the placement of one or more structures within them, with Route Segment B4 (Blue Route) having the most crossings over 1,000 feet.

The route width of all route segments in Region B would intersect native plant communities, with Route Segment B1 (Purple Route) intersecting the most acreage. The anticipated alignments of all route segments in Region B would cross native plant communities; however, given these crossings are less than 1,000 feet, all would likely be spannable. With the exception of Route Segment B2, the route widths of all route segments in Region B would intersect railroad rights-of-way prairies. These prairies, which are often in the same location or adjacent to prairie native plant communities, would be crossed and spanned by the anticipated alignments.

The route width of Route Segment B4 (Blue Route) is the only route segment that would intersect a prairie bank conservation easement. The anticipated alignment of Route Segment B4 (Blue Route) would run along the northern and western edges of the easement and given the crossing distance, one or more structures might need to be placed within it.

The route width of Route Segment B2 would intersect two DNR Lakes of Biological Significance, one ranked high and one ranked moderate. The anticipated alignment for Route Segment B2 would not cross the Lake of Biological Significance ranked high (Map N.60); however, it would cross and span the one ranked moderate and would do so while paralleling an existing road ROW (Map N.63).

Table 7-9 Region B, Route Segments, Sensitive Ecological Resources within Route Width

Resource	Units	Route Segment			
		B1 (Purple Route)	B2	B3	B4 (Blue Route)
Sites of Biodiversity Significance	Moderate rank (acres)	189	134	134	371
	Below rank (acres)	80	6	80	342
	Total acres	269	140	214	713
Native Plant Communities	Total acres; all have Conservation Status S1 (community is critically imperiled) or S2 (community is imperiled	65	10	10	23
Railroad Rights-of-way Prairie	Total feet	15,005	0	3,159	1,025
Prairie Bank Easements	Acres	0	0	0	46
Lakes of Biological Significance	Count	0	2 (one ranked high and one ranked moderate)	0	0

7.6.8 Soils

The ROI for soils is the ROW. Common soil impacts include rutting, compaction, and erosion (Section 5.6.8.2**). Potential impacts would be short-term during construction and localized. Impacts 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 vehicles trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored a suitable location. Disturbed areas would be promptly seeded after construction. Additional details regarding potential impacts to soils and potential mitigation measures is provided in Section 5.6.8.

Map 13 shows the surface soil textures across the region. Soil types within the ROW were reviewed to identify soil characteristics that could be more prone to impacts in some areas versus others (Table 7-10). A third or less of the soils within the ROW of the route segments in Region B are soils prone to compaction, soils susceptible to erosion, or hydric soils. Less than 3 percent of soils within the ROW are soils with revegetation concerns. Most soils within the ROW of the route segments of Region B have a moderate or severe rutting hazard rating.

Table 7-10 Region B, Route Segments, NRCS Mapped Soils Within ROW

Soil Data	Unit	Route Segments			
		B1 (Purple Route)	B2	B3	B4 (Blue Route)
Area within Route Segment ROW	Acres	825	927	853	1,368
Hydric Soils [1]	Acres	98	144	110	360
Compaction Prone [2]	Acres	426	458	411	510
Rutting Hazard [3]	Acres	821	920	847	1,359
Erosion Hazard (Off-Road, Off-Trail) [4]	Acres	71	141	68	233
Revegetation Concerns [5]	Acres	25	25	25	0

[1] Hydric soil include hydric soils (100%) and predominantly hydric soils (67-99%).
[2] Soils considered to be Compaction Prone soils include those with a rating of "Medium" or higher.
[3] Soils considered susceptible to Rutting Hazard include those with a rating of "Moderate" or "Severe".
[4] Soils considered susceptible to erosion hazard soils include those with a rating of "Medium", "Severe", or "Very Severe".
[5] Soils considered to have revegetation concerns include soils with a non-irrigated land capability classification of 3 or greater.

7.6.9 Surface Water

The ROI for surface water is the route width. Potential impacts to surface waters are discussed in Section 5.6.9.2. Direct impacts caused by structures placed in surface waters would be avoided by spanning the 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 or waterbodies and/or special or impaired waters.

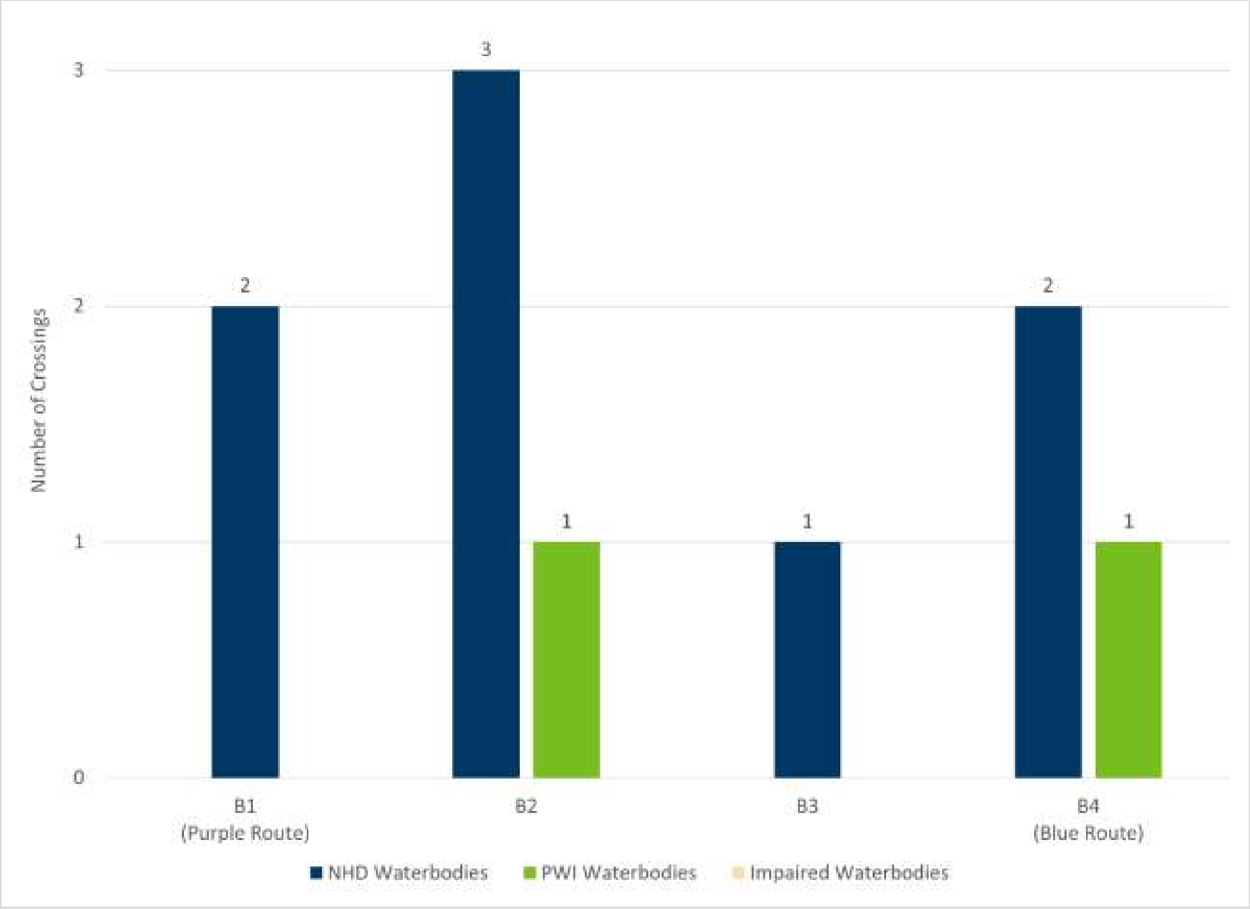
Impacts would be mitigated by using BMPs. Crossing PWI waters would require a DNR license to cross public waters and work near special or impaired waters would require additional BMPs as detailed in the construction stormwater permit. Additional details regarding potential impacts to surface waters and potential mitigation measures, including those provided in the DNR's Natural Heritage Review response, is provided in Section 5.6.8.3.

Map 14 shows the waterbodies and watercourses across the region. There are no trout streams crossed by the route segments in Region B.

All route segments cross the Minnesota River which is a state-designated outstanding resource value water and a state-designated wild and scenic river (Map N.48 and Map N.93). As noted in Section 7.2.1, the route alternatives all cross the watercourse at a location where existing transmission lines are present. Both crossing locations (the western crossing for Route Segments B1 [Purple Route], B2, and B3) and the eastern crossing (Route Segment B4 [Blue Route]) would be parallel to existing transmission lines but would likely require additional tree clearing.

Each route segment has between one and three waterbodies within their route width (Figure 7-7). Of the waterbodies present in Region B, only two are designated as PWI basins. The PWI basins are within the route width of Route Segment B2 (Tyson Lake) and Route Segment B4 (Blue Route) (Doubs Lake) and are crossed by the anticipated alignments (Map N.63 and Map N.81).

Figure 7-7 **Region B, Route Segments, Number of Waterbody Crossings by Type**



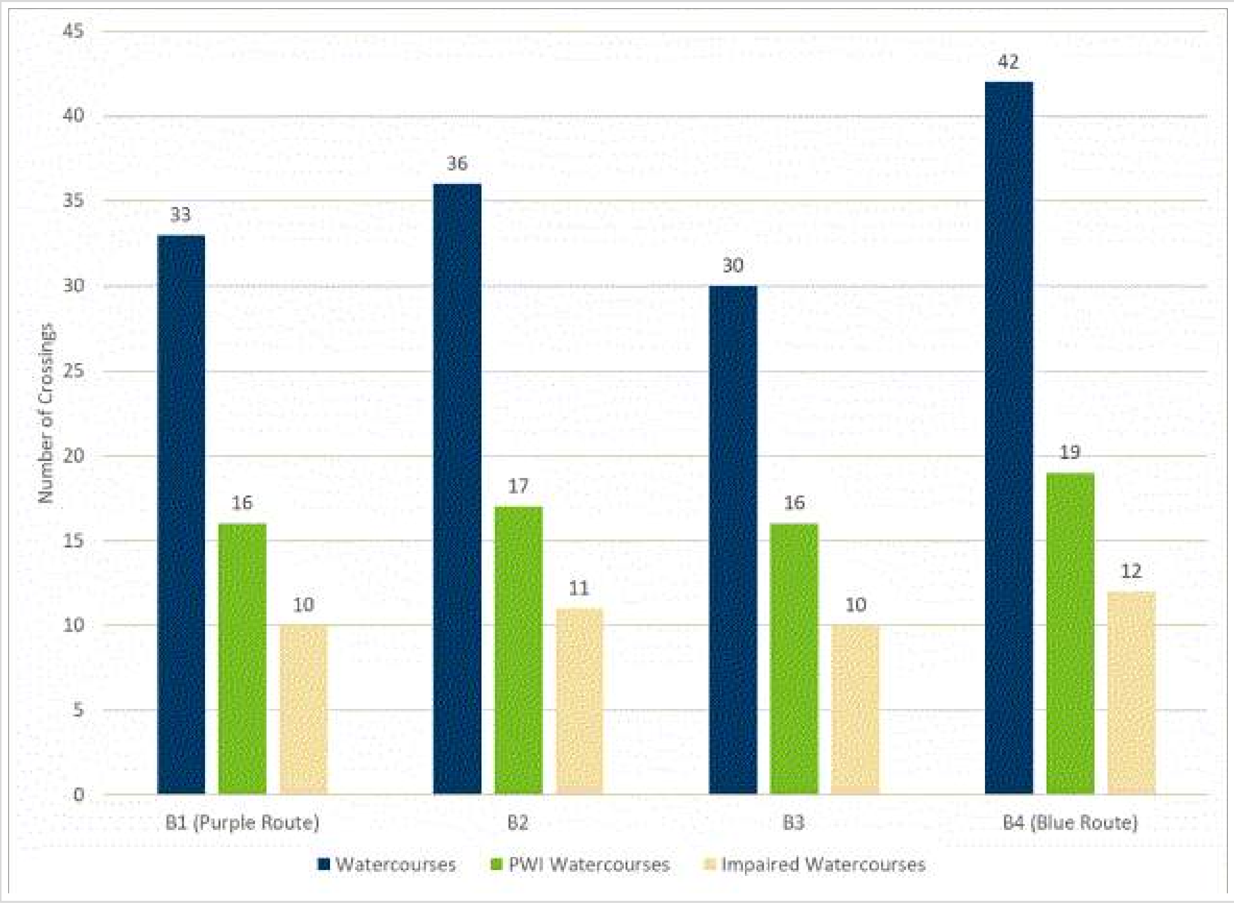
The total count of watercourse crossings by the anticipated alignments of route segments in Region B varies between 30 and 42 (Figure 7-8); most of the watercourses crossed are ephemeral streams. Route Segment B3 has the fewest watercourse crossings while Route Segment B4 (Blue Route) has the most watercourse crossings. However, Route Segment B4 (Blue Route) is also the longest of the route segments by approximately 60 to 68 percent.

The route segments have a similar number of PWI watercourses crossings (between 16 and 19 each) and impaired watercourse crossings (between 10 to 12 each). PWI watercourses crossed in Region B include:

- Minnesota River
- Cottonwood River
- Yellow Medicine River
- Redwood River
- Various creeks, county ditches, and unnamed streams

Wabasha Creek, a PWI watercourse, parallels Route Segment B4 (Blue Route) (Map N.90 and Map N.91). If the route segment parallels this stream, the potential for impacts (such as erosion or sedimentation) during construction could increase.

Figure 7-8 Region B, Route Segments, Number of Watercourse Crossings by Type



7.6.10 Vegetation

The ROI for vegetation is the ROW. Potential construction and operation-related impacts to vegetation are discussed in Section 5.6.10.2. 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. 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, as described in Section 5.6.10.3.

Map 7 provides an overview of landcover types across Region B, and Table 7-11 summarizes the landcover types within the ROW of each route segment in Region B. Agricultural vegetation, particularly cultivated cropland, represents the dominant vegetative landcover type within the ROW of each route segment in Region B. Up to 50 acres of upland and wetland herbaceous landcover is present in the ROW of each route segment. A small amount of forested landcover (1 percent or less) is present in the ROW of all route segments in Region B.

As discussed in Section 5.6.10.2, the applicant would clear forested vegetation from the ROW during construction, and the ROW would be maintained with low-growing vegetation during operations to minimize potential interference with the transmission line. Although Route Segments B1 (Purple Route), B2, and B3 would minimize impacts to forested vegetation, forested vegetation still only represents 1 percent (7 acres) of the ROW for Route Segment B4 (Blue Route); as such, impacts would be minimal for all route segments in Region B.

Table 7-11 Region B, Route Segments, Landcover Types in the ROW

Landcover Type	Route Segments			
	B1 (Purple Route)	B2	B3	B4 (Blue Route)
Agricultural (cultivated crops and hay/pasture) (acres in ROW [%of ROW])	665 (81%)	695 (75%)	615 (72%)	1082 (79%)
Herbaceous (upland and wetland) (acres in ROW [%of ROW])	30 (4%)	24 (3%)	27 (3%)	50 (4%)
Forest (upland and wetland) (acres in ROW [%of ROW])	2 (<1%)	1 (<1%)	2 (<1%)	7 (1%)
Open water (acres in ROW [%of ROW])	1 (<1%)	4 (<1%)	1 (<1%)	3 (<1%)
Developed (low-high intensity; open space) (acres in ROW [%of ROW])	127 (15%)	203 (22%)	208 (24%)	225 (16%)

Source: NLCD (Appendix C)
Totals might not sum to 100 percent due to rounding.

Potential impacts to agricultural vegetation and wetlands are discussed Section 5.4.2 and 5.6.11.2, respectively.

7.6.11 Wetlands

The ROI for wetlands is the route width. Short-term and long-term potential impacts to wetlands are discussed in Section 5.6.11.2. Impacts to wetland 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 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. 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. Wetland impacts would be regulated as described in

Section 5.6.11.1.1. Additional details regarding potential impacts to wetlands, including those provided in the DNR's Natural Heritage Review response, and potential mitigation measures is provided in Section 5.6.11.3.

Map 14 shows the mapped wetland within the ROI. Direct wetland impacts would occur within the construction workspace (within or adjacent to the ROW); not all wetland areas within the ROI would be subject to direct impacts as most could be spanned. Wetlands in the Region B ROI consist mainly of emergent wetlands but also lake, aquatic bed, forested, scrub-shrub, unconsolidated bottom, and riverine wetlands. Total acres of wetlands within the route widths of the route segments are provided in Appendix E.

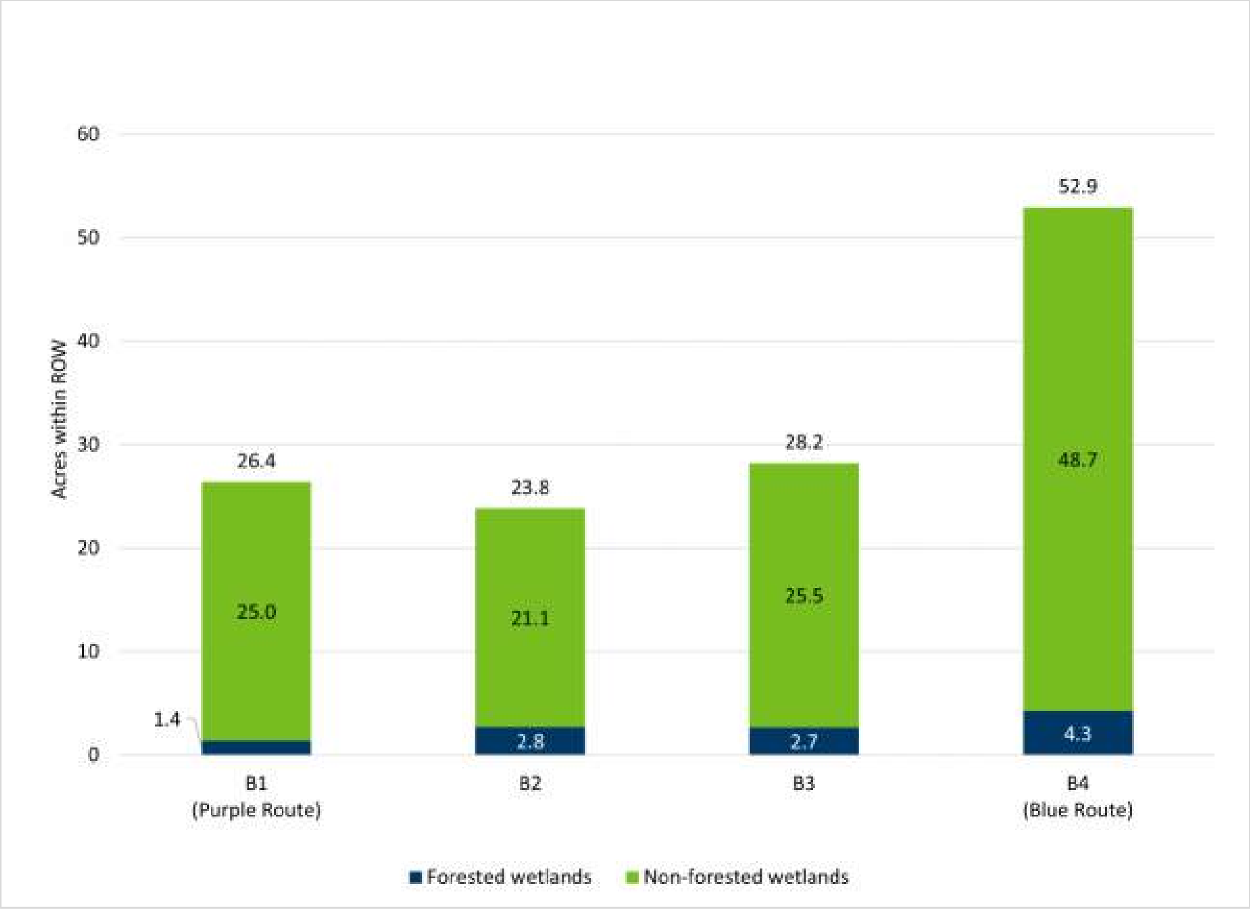
The route width of Route Segment B3, a shorter route segment, would include the least wetland area (211.4 acres). The route width of Route Segment B4 (Blue Route), the longest route segment, would include the most wetland area (499.0 acres). Route Segment B4 (Blue Route) would include wetland crossings longer than 1,000 feet that would be adjacent to:

- Cottonwood River (a PWI watercourse with no existing crossings; Map N.69),
- Doubs Lake (a PWI basin with no existing crossing; Map N.81), and
- Minnesota River (a PWI watercourse; Map N.92).

Route Segments B1 (Purple Route) and B3 would also include a wetland crossing longer than 1,000 feet that would drain east toward an unnamed lake (not a public water). One PWI wetland is mapped within the route width of Route Segment B4 (Blue Route).

Forested wetlands subject to permanent impacts due to their conversion would be contained within the ROW. Forested wetland in the ROW is relatively minimal for all route segments in Region B (Figure 7-9). Route Segment B1 (Purple Route) has the least amount of forested wetland (1.4 acres) and Route Segment B4 (Blue Route) has the most (4.3 acres).

Figure 7-9 Region B Route Segments, Acres of Wetland by Type within ROW



7.6.12 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. Potential construction and operation-related impacts to wildlife and wildlife habitat are discussed in Section 5.6.12.2. Potential short-term, localized impacts could occur from displacement during construction or maintenance activities. Potential long-term impacts could occur as a result to 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, as described in Section 5.6.12.3.

Map 16 provides an overview of resources across Region B and Table 7-12 summarizes the wildlife resources within the route width of each route segment in Region B.

Wildlife Management Areas are located within the route width and local vicinity of all route segments in Region B. The route widths of Route Segments B1 (Purple Route) and B3 would intersect the most acres of Wildlife Management Area, while Route Segment B2 would intersect the least. None of the anticipated alignments would cross a Wildlife Management Area; however, Route Segments B1 (Purple Route) and B3 would run along the western edge of the Clifton Wildlife Management Area.

The route width and local vicinity of Route Segments B1 (Purple Route), B2, and B3 would all intersect a Waterfowl Production Area in the same location, while Route Segment B4 (Blue Route) would avoid the Waterfowl Production Area. None of the anticipated alignments would cross a Waterfowl Production Area.

Grassland Bird Conservation Areas and Important Bird Areas are located within the route width and local vicinity of all route segments in Region B and the anticipated alignments of all route segments would cross through these resources. The route width of Route Segment B4 (Blue Route) would intersect the most acres of Grassland Bird Conservation Areas and for the most part, would not parallel an existing transmission line ROW though them. The route width of Route Segment B2 would intersect the least acres of Grassland Bird Conservation Areas, and its anticipated alignment would parallel an existing transmission line ROW through only a portion of it, while the anticipated alignments of Route Segments B1 (Purple Route) and B3 would parallel an existing transmission line ROW through all of the Grassland Bird Conservation Areas their anticipated alignments intersect.

The route widths of Route Segments B1 (Purple Route), B2, and B3 would intersect similar acres of Important Bird Areas, and their anticipated alignments would parallel an existing transmission line ROW through them. The route width of Route Segment B4 (Blue Route) would intersect slightly less acres of Important Bird Areas; however, its anticipated alignment would only parallel an existing transmission line ROW through a portion of it.

DNR-identified shallow wildlife lakes are located within the local vicinity of all route segments in Region B. Route Segments B2 and B4 (Blue Route) are the only route segments with shallow wildlife lakes located within their route width, with Route Segment B2 having four shallow wildlife lakes within its route width and Route Segment B4 (Blue Route) having one shallow wildlife lake within its route width. The anticipated alignments for Route Segments B2 and B4 (Blue Route) would require crossing a shallow wildlife lake; both would cross it while paralleling an existing road ROW.

Wildlife Action Network corridors are located within the route width and local vicinity of all route segments in Region B; the route width of Route Segment B2 would intersect nearly twice the acreage as the other route segments. All of the anticipated alignments for the route segments in Region B would cross Wildlife Action Network corridors.

The route segments in Region B would parallel existing transmission line rights-of-way for a portion of their lengths, with Route Segments B1 (Purple Route), B2, and B3 paralleling similar proportions of their lengths (11-13 percent and Route Segment B4 (Blue Route) paralleling 20 percent of its length; however, Route Segment B4 (Blue Route) is more than twice as long as the other route segments. Traversing wildlife areas along new transmission line corridors could increase potential impacts to avian species traveling through these areas. As discussed in Section 5.6.12.3, avian impacts can be minimized through use of bird flight diverters. All route segments in Region B would minimize potential impacts associated with habitat fragmentation and/or edge effects by paralleling existing road rights-of-way, with Route Segments B2 and B3 paralleling the most (60 percent and 57 percent of their lengths, respectively) and Route Segments B1

(Purple Route) and B4 (Blue Route) paralleling the least (40 percent and 39 percent of their lengths, respectively).

Table 7-12 Region B, Route Segments, Wildlife Management and Conservation Areas within Route Width

Resource Area	Unit	Route Segments			
		B1 (Purple Route)	B2	B3	B4 (Blue Route)
Wildlife Management Areas	Acres	43	3	43	19
Waterfowl Production Areas	Acres	7	7	7	0
Grassland Bird Conservation Areas	Acres	753	484	686	2692
Important Bird Areas	Acres	523	523	526	432
Shallow Wildlife Lakes	Count	0	4	0	1
Wildlife Action Network corridors	High or medium-high rank (acres)	30	30	30	74
	Medium rank (acres)	217	320	218	160
	Low or medium-low rank (acres)	75	267	81	79
	Total acres	322	617	328	313

Totals might not sum to 100 percent due to rounding.

7.7 Costs that are Dependent on Design and Route

Costs of the route segments are generally proportional to length with the exception of the additional factors described in Section 5.9. Costs for route segments in Region B are included in Section 7.8 and are also provided in Appendix O.

7.8 Relative Merits of Route Segments

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 Route Segments B1 through B4 with the exception of some elements of resource categories that are considered to have minimal impacts that might not vary significantly throughout the regions and/or the routing factors are not applicable. These include:

- Impacts on human settlements (factor A)— cultural values, environmental justice, land use and zoning, 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 land-based economies (factor C)— forestry and tourism.
- Impacts on the natural environment (factor E) – air quality, climate, geology and topography, floodplains, and groundwater.

With respect to routing factor G, it is assumed that all route alternatives are equal with regard to maximizing energy efficiencies and accommodating expansion of transmission capacity. With respect to environmental impacts, the examination of such impacts suggested by routing factor G is included in the discussion of other routing factors and elements that more specifically address an environmental impact (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 15.

A relative merits analysis was completed to compare Route Segments B1 through B4 using these routing factors. The analysis uses graphics (Table 7-13) 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 7-14 summarizes the relative merits analysis of Route Segments B1 through B4 for the routing factors that are anticipated to vary amongst route alternatives.

Table 7-13 Guide to Relative Merits Analysis

Consistency with Routing Factor or Anticipated Impacts	Symbol
Route alternative is consistent with the routing factor OR Impacts are anticipated to be negligible to minimal or the impact is positive	
Route alternative 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 alternative 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	

Table 7-14 Relative Merits of Route Segments B1 through B4

Routing Factor / Resource	Route Segments				Summary
	B1 (Purple Route)	B2	B3	B4 (Blue Route)	
Factor A Human Settlement					
Aesthetics	○	○	○	◓	Route Segment B3 has the least number of residential structures in the local vicinity (68) and a large percentage of it parallels existing infrastructure ROW (68%). There are five non-residential structures within 75 feet of this segment. All route segments parallel a portion of their routes with existing transmission line. Route Segments B2 and B3 parallel the largest amount of ROW with existing infrastructure (35.1 miles and 69% of its length, and 32.1 miles and 69% of its length, respectively). Route Segment B1 (Purple Route) and Route Segment B2 would result in aesthetic impacts to the Redwood River Crossing (a state water trail) as it would introduce new infrastructure in an undeveloped area. In two select locations, some residents along Route Segments B1 (Purple Route), B2, and B3 would be subject to significant aesthetic impacts where the residence would be boxed in by the proposed HVTL and existing HVTLs.
Displacement	◓	◓	◓	●	Route Segment B3 has the most non-residential structures (5) within the ROW. Route Segment B1 (Purple Route) has four non-residential structures, and B2 has three non-residential structures that might be subject to displacement. Route Segment B4 (Blue Route) does not have any non-residential structures within its ROW.
Recreation	◓	◓	◓	◓	Route Segments in Region B do not cross any land-based public trails. All Route Segments cross Redwood River, a state water trail. All route segments cross the Minnesota River, which is a state water trail and a wild and scenic river. The Minnesota River Valley Scenic Byway is crossed by all of the route segments. Other recreational resources in Region B include snowmobile trails and impacts are anticipated to be minimal. Waterfowl Production Areas and Wildlife Management Areas are discussed in wildlife.
Factor C Land-Based Economies					
Agriculture	●	●	●	◓	Most land is agricultural, and impacts cannot be avoided, but can be mitigated. Prudent routing (parallelling existing infrastructure and/or paralleling division lines) could help minimize impacts. Route Segment B4 (Blue Route) parallels the least amount of infrastructure and has the most CREP lands.
Mining	●	●	●	●	There is one prospect gravel pit that is present within the route width of Route Segment B4 (Blue Route). Impacts are anticipated to be negligible. No other prospect or active gravel pits were identified within the ROI (the route width) for Region B; therefore, impacts to mining are anticipated to be minimal and independent of the route segment selected.
Factor D Archaeological and Historic Resources					
Archaeological	◓	◓	◓	◓	All of the route segments contain one Native American burial mound site within their route widths. Route Segment B3 contains two archaeological sites within the route width, B1 (Purple Route) and B4 (Blue Route) have three within the route widths, and B2 has five archaeological sites within the route width. All of these sites are unevaluated for the NRHP.
Historic	◓	◓	◓	◓	Route Segment B4 (Blue Route) contains one NRHP-eligible resource within the route with and six unevaluated resources. Route Segment B1 (Purple Route), B2, and B3 all contain two eligible resource and five unevaluated resources within the route widths.
Factor E Natural Resources					
Public and Designated Lands	●	●	●	◓	There are CREP easements within the ROIs of all Route Segments, however Route Segment B2 crosses the fewest number of acres. All anticipated alignments would cross a portion of RIM Reserve Land. Route Segment B2 would cross the least amount of Rim Reserve Land. Route Segment B4 (Blue Route) would cross 122 acres of Native Prairie Bank. Wildlife Management Areas are present but assessed in wildlife.
Soils	●	●	●	●	Nearly all of the soils in the region have a moderate or severe rutting hazard rating. Impacts could be minimized with BMPs or mitigated if long-term re-vegetation impacts extend beyond construction. Impacts to soils would be independent of the route selected.

Routing Factor / Resource	Route Segments				Summary
	B1 (Purple Route)	B2	B3	B4 (Blue Route)	
Surface Water	●	●	●	◒	The total count of watercourse crossings by the anticipated alignments of route segments in Region B varies between 30 and 42, most of which are classified as ephemeral streams. All route segments cross the Minnesota River, a state-designated outstanding resource value water and state water trail. The route segments all cross a similar number of PWI watercourses (between 16 and 19 each), including the Minnesota River, Cottonwood River, Yellow Medicine River, and Redwood River. Route Segments B2 and B4 (Blue Route) cross a PWI basin: Tyson Lake or Doubs Lake and would span the waterbodies. Route Segment B4 (Blue Route) crosses more perennial watercourses (8), more PWI watercourses (19), a PWI basin (Doubs Lake), and more total waterways (42). Also, Wabasha Creek, a PWI watercourse, parallels Route Segment B4 (Blue Route). All waterbodies and watercourses could be spanned by the project. No in-water work would occur.
Vegetation	●	●	●	●	Forested vegetation is minimal for all route segments in Region B, ranging from 1 acre for Route Segment B2 (Purple Route) to 7 acres for Route Segment B4 (Blue Route).
Wetlands	●	●	●	◒	All route segments have less than 5 acres of forested wetlands. Route Segment B4 (Blue Route) is the longest route in length and spans the most wetland acres, forested wetland acres (double the others), includes three wetland crossings >1,000 feet adjacent to PWI crossings.
Wildlife and Wildlife Habitat	● ◒	● ◒	● ◒	● ◒	Route widths of Route Segments B1 (Purple Route) and B3 would intersect the most acres of Wildlife Management Areas and B2 would intersect the least - none of the anticipated alignments would cross a Wildlife Management Area. Route widths of Route Segments B1 (Purple Route), B2, and B3 would intersect a Waterfowl Production Area, while Route Segment B4 (Blue Route) would avoid it (none of the anticipated alignments would cross it). Alignments of all route segments would cross Grassland Bird Conservation areas; Route Segment B4 (Blue Route) would intersect the most acreage. Shallow wildlife lakes are in the route widths of Route Segments B2 (four lakes) and B4 (Blue Route) (one lake) and their anticipated alignments would cross a shallow wildlife lake. Wildlife Action Network corridors are in the route width of all route segments and all anticipated alignments would cross them. Route width of Route Segment B2 would intersect nearly twice as much acreage as the others.
Factor F Rare and Unique Natural Resources					
Rare and Unique Natural Resources	◒	◒	◒	◒	Route Segment B4 (Blue Route) has the least number of documented records of threatened/endangered species within a mile (3) and none are in the ROW or route width. All other route segments have between eight and nine documented records of threatened/endangered species and a few have been documented within ROW or route width but they are mostly mussels so impacts would be avoided. The route width of Route Segment B4 (Blue Route) would intersect the most Sites of Biodiversity Significance acres and its alignment would have the most crossings >1,000 feet (8 versus 2-3 crossings for the other route segments). Its alignment also crosses a prairie bank easement. The route width of Route Segment B1 (Purple Route) would intersect the most acres of native plant communities (65 acres versus 10-23 acres for the others). The route width of Route Segment B2 is the only one that does not intersect railroad prairies, but it is also the only one that does intersect Lakes of Biological Significance. Additionally, its alignment would crosses one of these lakes.
Minnesota Statute 216E.03 - Subpart 7 (15e) *(transmission lines)*					
Paralleling Existing Transmission Line [1]	◒	◒	◒	◒	All Route Segments parallel existing transmission line. Route Segment B3 (Blue Route) parallels the most existing transmission lines (14.7 miles and 20% of its length). Route Segments B1 (Purple Route), B2, and B3 parallel existing transmission lines for five miles or more (11 to 13% of their length).

Routing Factor / Resource	Route Segments				Summary
	B1 (Purple Route)	B2	B3	B4 (Blue Route)	
Minnesota Statute 216E.03 - Subpart 7 (8) *(roads/railroads)*					
Paralleling Roads and Railroads					Route Segment B2 parallels the most existing road ROW (30.6 miles, 60% of its length). Route Segments B1 (Purple Route), B3, B4 (Blue Route) parallel existing road for between 39% and 57% of their lengths. None of the Route Segments parallel existing railroads.
Factor H Paralleling Division Lines					
Paralleling existing survey lines, natural division lines, and agricultural field boundaries					All Route Segments parallel existing division lines for 91% or more of their lengths, except for Route Segment B1 (Purple Route) (54%).
Factor J Paralleling Existing Infrastructure					
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.					Route Segment B2 and B3 parallel existing transmission lines for five and half miles and the most existing road ROW. B2 for 35.1 miles and 69% and B3 for 32.1 miles and 69%. Route Segment B4 (Blue Route) parallels the most existing transmission line (14.7 miles and 20% of its length), and the least existing infrastructure (33.4 miles, 44% of its length).
Factor L Costs					
Costs Dependent on Design and Route	$205,172,000	$229,338,000	$210,517,000	$324,626,000	As noted in Section 7.7, costs generally coincide with the length of the line. Route Segment B4 (Blue Route) has higher costs but its within the other's margin of error when considered as a length per mile.

[1] Minnesota Statute 216E.03 - Subpart 7 (15e) requires the Commission to consider locating a route for a high-voltage transmission line on an existing high-voltage transmission route. The summarized here indicates where ROW paralleling to existing transmission lines occurs but does not distinguish between HVTLs and other transmission lines that might not meet the definition of a HVTL (for example, distribution lines). Highways are included in the assessment provided for Minnesota Statute 216E.03 - Subpart 7 (8).

7.9 Potential Refinements

A refinement is a route segment that was included in the scoping decision but not included within route segments B1 through B4. For purposes of analysis, refinements are considered in standalone comparisons against Purple Route or Blue Route equivalents. Table 7-15 summarizes the refinements in Region B and indicates which alternative the refinement would replace. Data tables for the refinements are provided in Appendix E.

Table 7-15 Region B Refinements Summary

Refinement	Route Segments			
	B1 (Purple Route)	B2	B3	B4 (Blue Route)
Route Segment 210	X			
Route Segment 221	X			
Route Segment 211				X
Route Segment 219				X
Route Segment 212				X
Route Segment 213				X
Route Segment 214				X
Route Segment 215				X
Route Segment 220				X
Route Segment 216				X
Route Segment 217				X
Route Segment 218				X

7.9.1 Route Segment 210

Route Segment 210 departs the Purple Route continuing north on State Highway 23 following the curve of the highway until it rejoins the Purple Route (Map N.35). This route segment was proposed to minimize impact to the adjacent farm's current practices and associated required large equipment. Table 7-16 summarizes differences in potential impacts of Route Segment 210 compared against its equivalent.

Table 7-16 Route Segment 210 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 210 parallels more existing infrastructure ROW (0.5 miles or 100%) compared to its equivalent (0.2 miles or 39%). Route Segment 210 does not have any length that does not parallel division lines; the equivalent of Route Segment 210 includes a total of 0.3 miles that does not parallel existing infrastructure or division lines.
Natural Environment - Vegetation	According to the NLCD, neither Route Segment 210 nor its equivalent intersects forested landcover; however, based on aerial photographs, Route Segment 210 would require removal of a few trees, while the equivalent avoids trees.

7.9.2 Route Segment 221

Route Segment 221 departs the Purple Route at 260th Avenue and traverses west. It turns north at 520th Street, continues east at State Highway 67, and continues north a quarter of the way into T116N, R39W, S31 (Map 3.3, Map N.38, and Map N.39). It turns east a quarter of the way into the section until it rejoins the Purple Route. This route segment was proposed to minimize the impact there would be on farming operations and to avoid overcrowding the area with power lines. Table 7-17 summarizes differences in potential impacts of Route Segment 221 compared against its equivalent.

Table 7-17 Route Segment 221 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 221 parallels more existing infrastructure ROW (3.2 miles or 100%) compared to its equivalent (0 miles). Route Segment 221 does not have any length that does not parallel division lines; the equivalent to Route Segment 221 includes a total of 0.5 miles that does not parallel existing infrastructure or division lines.
Human Settlement	Route Segment 221 has three residences within 250 to 500 feet, while its equivalent does not have any residences within 250 to 500 feet. Both route segments have and three residences within 500 to 1,600 feet.
Natural Environment – Surface Waters and Wetlands	Route Segment 221's equivalent crosses three watercourses; it also includes 1 acre of NWI wetlands. Route Segment 221 crosses five watercourses and has 1 acre of NWI wetlands.
Natural Environment – Wildlife and Wildlife Habitat	The route widths of Route Segment 221 and its equivalent intersect a Grassland Bird Conservation Area, with the Route Segment 221 equivalent intersecting more acreage (95 acres versus 58 acres). The anticipated alignments of both route segments would cross the Grassland Bird Conservation Area.

7.9.3 Route Segments 211 and 219

Route Segment 211 departs the Blue Route at CR 8 and traverses south. It turns east at CR 4 and continues north at Duncan Avenue until it rejoins the Blue Route. This route segment was proposed to avoid drainage infrastructure, environmental areas, Native American artifacts, and native prairies.

Route Segment 219 departs the Blue Route at CR 8 and traverses south. It turns east at CR 4, and continues north halfway into T110N, R38W, S17 until it rejoins the Blue Route. This route segment was proposed to avoid drainage infrastructure, environmental areas, Native American artifacts, and native prairies. Table 7-18 summarizes differences in potential impacts of Route Segment 211 and 219 compared against its equivalent and they are shown on Map 3.3 and Map N.71 through Map N.79.

Table 7-18 Route 211 and 219 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segments 211 and 219 parallel more existing infrastructure ROW (7.0 and 6.1 miles, respectively or 100% and 86%, respectively) compared to its equivalent (3.8 miles or 61%). Route Segments 211 and 219 do not have any length that does not parallel division lines; the equivalent to Route Segment 211 includes a total of 0.7 miles that does not parallel existing infrastructure or division lines.
Human Settlement	The equivalent to Route Segments 211 and 219 has one residence within 75 to 250 feet, while Route Segment 211 and 219 do not have any residences at this distance. Route Segments 211 and 219 have one less residence (6) within 0 to 1,600 feet than their equivalent, which has 7.
Natural Environment – Designated Lands	Route Segments 211 and 219 includes less acres of RIM and CREP conservation easements (26 acres and 36 acres, respectively) than their equivalent (57 acres). Refer to Map N.71.
Natural Environment – Surface Waters and Wetlands	Route Segments 211 and 219 cross four watercourses; they also includes six acres of NWI wetlands (<1 of which are forested). The equivalent to Route Segment 211 and 219 crosses four watercourses; it also includes 24 acres of NWI wetlands (1 of which are forested).
Natural Environment - Vegetation	According to the NLCD, the ROW of Route Segments 211 and 219 would traverse less than an acre of forested landcover, while the equivalent would not intersect any forested land cover.
Natural Environment – Wildlife and Wildlife Habitat	The route widths of Route Segments 211, 219, and their equivalent intersect a Grassland Bird Conservation Area, with Route Segment 211 intersecting the most acreage (774 acres) and the equivalent intersecting the least (596 acres[1]). The anticipated alignments of both route segments and their equivalent cross Grassland Bird Conservation Area.
Rare and Unique Natural Resources	The route widths of Route Segments 211, 219, and their equivalent intersect Sites of Biodiversity Significance, with the equivalent intersecting the most acreage (230 acres versus 74 acres for Route Segments 211 and 219). The anticipated alignments of both route segments and the equivalent would cross Sites of Biodiversity Significance. The route widths of Route Segments 211, 219, and their equivalent intersect native plant communities, with the equivalent intersecting the most acreage (10 acres versus <1 acre for Route Segments 211 and 219).

[1] A 1,000-foot-wide route width was assumed for this number The total number within the requested route width is greater given that the applicant requested additional route width at this location. An assumed 1,000-foot-wide ROW is used for purposes of comparison and because the reason the applicant requested additional route width in this area was to avoid the easement area.

7.9.4 Route Segment 212

Route Segment 212 departs the Blue Route by continuing east on 240th Street (Map N.78, Map N.79, and Map N.80). It turns north at County Highway 7 until it rejoins the Blue Route. This route segment was proposed to avoid stray voltage impacts to nearby cattle and minimize impacts on farming operations. Table 7-19 summarizes differences in potential impacts of Route Segment 212 compared against its equivalent.

Table 7-19 Route Segment 212 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 212 parallels more existing infrastructure ROW (4.5 miles or 100%) compared to its equivalent (1.5 miles or 33%). Neither Route Segment 212 not its equivalent has any length that does not parallel division lines.
Human Settlement	The equivalent to Route Segment 212 has a residence within 75 to 250 feet, while Route Segment 12 does not have any residences at this distance. Route Segment 212 has more residences between 250 to 500 feet (3) and 50 to 1,600 feet (6) of its anticipated alignment compared to the equivalent, which has one residence between 250 to 500 feet and three residences between 500 and 1,600 feet of its alignment.
Natural Environment – Surface Waters and Wetlands	Route Segment 212 crosses one watercourse and one waterbody; it does not include any NWI wetlands. Route Segment 212's equivalent crosses two watercourses and no waterbodies; it does not include any NWI wetlands.

7.9.5 Route Segment 213

Route Segment 213 departs the Blue Route by continuing north on Ideal Avenue. It turns east halfway into T112N, R37W, S14, and continues south at Kenwood Avenue until it rejoins the Blue Route (Map N.84, Map N.85, and Map N.86). This route segment was proposed to avoid nearby dwellings, minimize impacts to farming operations. Table 7-20 summarizes differences in potential impacts of Route Segment 213 compared against its equivalent.

Table 7-20 Route Segment 213 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	The equivalent to Route Segment 213 parallels more existing infrastructure ROW (4.0 miles or 100%) compared to Route Segment 213 (1.0 miles or 20%). Neither Route Segment 213 not its equivalent has any length that does not parallel division lines.
Human Settlement	Route Segment 213 has one residence within 250 feet and two additional residences within the 500 to 1,600 feet. Its equivalent has three residences within 250 feet, four residences within 250 to 500 feet, and two residences within 500 to 1,600 feet.
Natural Environment – Designated Lands	Route Segment 213's equivalent does not contain any conservation easements while Route Segment 213 includes 11 acres of CREP conservation easement; however, the anticipated alignment does not cross conservation easements.
Natural Environment – Surface Waters and Wetlands	Route Segment 213's equivalent crosses two watercourses; it also includes <1 acres of NWI wetlands. Route Segment 213 crosses two watercourses and has three acres of NWI wetlands.
Natural Environment - Vegetation	According to the NLCD, the ROW of Route Segment 213 would intersect approximately 2 acres of forested landcover primarily associated with the Redwood River, while its equivalent would avoid forested landcover.
Natural Environment – Wildlife and Wildlife Habitat	The route widths of Route Segment 213 and its equivalent intersect a similar amount of a Grassland Bird Conservation Area, and both of their anticipated alignments would cross it. The route width of Route Segment 213 would intersect a Wildlife Management Area; however, its anticipated alignment would not cross the Wildlife Management Area. The equivalent of Route Segment 213 avoids the Wildlife Management Area.
Rare and Unique Natural Resources	The route widths of Route Segment 213 and its equivalent intersect a Site of Biodiversity Significance, with Route Segment 213 intersecting more acreage (78 acres versus 55 acres). However, the rights-of-way of both Route Segment 213 and its equivalent intersect a similar acreage of the Site of Biodiversity Significance.

7.9.6 Route Segment 214

Route Segment 214 departs the Blue Route at Porter Avenue and traverses north. It turns east at 320th Street until it rejoins the Blue Route (Map N.90, Map N.91, and Map N.92). This route segment was proposed to follow an existing transmission line corridor. Table 7-21 summarizes differences in potential impacts of Route Segment 214 compared against its equivalent.

Table 7-21 Route Segment 214 vs Its Equivalent Impact Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 214 parallels more existing infrastructure ROW (2.2 miles [of which 2.2 miles are paralleling existing transmission lines] or 100%) compared to its equivalent (0.6 miles [of which 0.6 miles are paralleling existing transmission lines] or 31%). Route Segment 214 does not have any length that does not parallel division lines; the equivalent to Route Segment 214 includes a total of 0.7 miles that does not parallel existing infrastructure of division lines.
Human Settlement	Route Segment 214 has two residences within 250 feet of its anticipated alignment, while its equivalent does not have any residences within this distance. Route Segment 214 and its equivalent have three and four residences, respectively, within 500 and 1,600 feet of their anticipated alignments.
Natural Environment – Designated Lands	Route Segment 214 has slightly less acres (59) of conservation easements than its equivalent (61). The route width of the equivalent to Route segment 216 intersects a prairie bank conservation easement and its anticipated alignment crosses the western edge of it. Route Segment 216 intersects a corner of the easement but otherwise avoids it.
Natural Environment – Surface Waters and Wetlands	Route Segment 214 and its equivalent both cross two watercourses and have 1 acre of NWI wetlands.
Natural Environment - Vegetation	According to the NLCD, neither Route Segment 214 nor its equivalent intersects forested landcover; however, based on aerial photographs, the ROW for both route segments intersects small areas of forested land associated with streams/wetlands.
Natural Environment – Wildlife and Wildlife Habitat	The route widths of Route Segment 214 and its equivalent intersect a Grassland Bird Conservation Area, with the route width of Route Segment 214 intersecting more acreage (167 acres versus 39 acres). The anticipated alignments of both route segments would cross Grassland Bird Conservation Areas; however, the equivalent to Route Segment 214 only crosses a corner of it, while Route Segment crosses it for most of its length. The route widths of Route Segment 214 and its equivalent intersect the edge of a Wildlife Action Network corridor. The route width of Route Segment 214 intersects more acreage; however, the anticipated alignments of both cross along the edge of the polygon.
Rare and Unique Natural Resources	The route width and anticipated alignment of the equivalent to Route Segment 214 intersect a Site of Biodiversity Significance, while Route Segment 214 avoids this resource. The route width of Route Segment 214 intersects a native plant community, and its ROW intersects a small portion of it (1 acre). The equivalent to Route Segment 214 avoids the native plant community.

7.9.7 Route Segment 215 and 220

Route Segment 215 departs the Blue Route at Highway 19 and traverses east. It turns north halfway into T112, R34W, S2 until it rejoins the Blue Route (Map N.93 and Map N.94). This route segment was proposed to avoid stray voltage impact on livestock and avoids dwellings. Route Segment 220 departs the Blue Route at State Highway 19 and traverses east. It turns north halfway into T112, R34W, S3 until it rejoins the Blue Route (Map N.93 and Map N.94). This route segment was proposed to avoid dwellings. Table 7-22 summarizes differences in potential impacts of Route Segment 215 and 220 compared against its equivalent.

Table 7-22 Route Segment 215 and 220 vs Its Equivalent Impact Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 215 parallels more existing infrastructure ROW (2.4 miles or 100% [of which 1.2 parallels existing transmission lines]) compared to Route Segment 220 and the equivalent (2.0 miles, or 86% [1.5 and 1.8 miles of which parallel existing transmission lines]). Neither Route Segment 215, 220, nor its equivalent have any length of the HVTL that do not parallel division lines.
Human Settlement	Route Segment 215 has the most residences within 500 to 1,600 feet (11), compared to one residence for Route Segment 220 and the equivalent.
Natural Environment – Designated Lands	Route Segment 215 and 220's equivalent does not contain any conservation easements, while Route Segment 215 and 220 includes 19 and 13 acres of CREP, respectively.
Natural Environment - Vegetation	According to the NLCD, Route Segments 215, 220, and their equivalent would not traverse forested landcover. However, based on aerial photography, Route Segment 215 would likely require some tree clearing associated with a stream crossing.
Natural Environment – Wildlife and Wildlife Habitat	The route widths of Route Segments 215, 220, and their equivalent intersect an Important Bird Area, with Route Segment 215 intersecting the most acreage (71 acres) and the equivalent intersecting the least (15 acres). None of their anticipated alignments cross the Important Bird Area. The route widths of Route Segments 215, 220, and their equivalent intersect Wildlife Action Network corridors, with Route Segment 215 intersecting the most acreage (96 acres) and the equivalent intersecting the least (27 acres). Only the anticipated alignment of Route Segment 215 would cross Wildlife Action Network corridors.
Rare and Unique Natural Resources	The route widths of Route Segments 215, 220, and their equivalent intersect Sites of Biodiversity Significance, with Route Segment 215 intersecting the most acreage (5 acres) and the equivalent intersecting the least (3 acres). The route width of Route Segment 215 would also intersect 1 acres of a native plant community. None of their anticipated alignments cross Sites of Biodiversity Significance or native plant communities.

7.9.8 Route Segment 216

Route Segment 216 departs the Blue Route halfway into T115N, R34W, S25 traverses east. It turns north at the eastern border of T115, R33W, S30 until it rejoins the Blue Route (Map N.101 and Map N.102). This route segment was proposed to avoid dwellings, negative impacts on farming operations, unwanted noise, and electronic interference.

Table 7-23 Route Segment 216 vs Its Equivalent Impact Summary

Resource	Summary
Human Settlement	Route Segment 216 does not have any residences within 75 to 250 feet, while its equivalent has one. Route Segment 216 and its equivalent have the same number of residences (2) within 500 feet to 1,600 feet.
Natural Environment – Surface Waters and Wetlands	Route Segment 216's equivalent crosses one watercourse; Route Segment 216 crosses two watercourses.

7.9.9 Route Segment 217 and 218

Route Segment 217 departs from the Blue Route near the top of the eastern border of T115N, R33W, S6 and traverses' northwest. It turns west at CR 70 continues north at CR 57 then continues east at the northern border of T116N, R33W, S31 until it rejoins the Blue Route (Map N.104, Map N.105, and Map N.106). This route segment was proposed to avoid negative impacts on farming operations and to avoid dwellings.

Route Segment 218 departs from the Blue Route near the top of the eastern border of T115N, R33W, S6 and traverses' northwest. It turns west at CR 70 and continues north at CR 57, then continues east at the northern border of T116N, R33W, S30 until it rejoins the Blue Route (Map N.104, Map N.105, and Map N.106). This route segment was proposed to avoid negative impacts on farming operations and avoids dwellings.

Table 7-24 Route Segment 217 and 218 vs Its Equivalent Impact Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segments 217 and 218 parallel existing transmission line, the equivalent does not ((Map N.104).
Human Settlement	Route Segment 217, 218 and their equivalent have one residence within 250 to 500 feet. Route Segment 218 has two residences within 500 to 1,600 feet while Route Segment 217 and the equivalent only have one.
Natural Environment – Surface Waters and Wetlands	Route Segment 217 crosses one watercourse; it also includes <1 acres of NWI wetlands. Route Segment 218 crosses three watercourses and has <1 acres of NWI wetlands. Route Segment 217, 218's equivalent crosses two watercourses; it also includes <1 acres of NWI wetlands.

7.10 Alternative Alignments

There are two proposed alternative alignments in Region B. Alternative Alignment 1 and Alternative Alignment 4 that provide an alternative placement to the applicant's proposed alignment. Data tables for the alternative alignments are provided in Appendix E.

7.10.1 Alternative Alignment 1

Alternative Alignment 1 is in Redwood County (Map N.90 and Map N.91). Alternative Alignment 1 was proposed in a scoping comment from Mr. Tom Haak. The alternative alignment was proposed to avoid crossing RIM easements that are located on his property. Alternative Alignment 1 would avoid crossing the RIM easement with the anticipated alignment, but the RIM easement would still be in the route width of Alternative Alignment 1. A CREP easement would be in the route width of Alternative Alignment 1, along with more residences within the route width compared to its equivalent.

7.10.2 Alternative Alignment 4

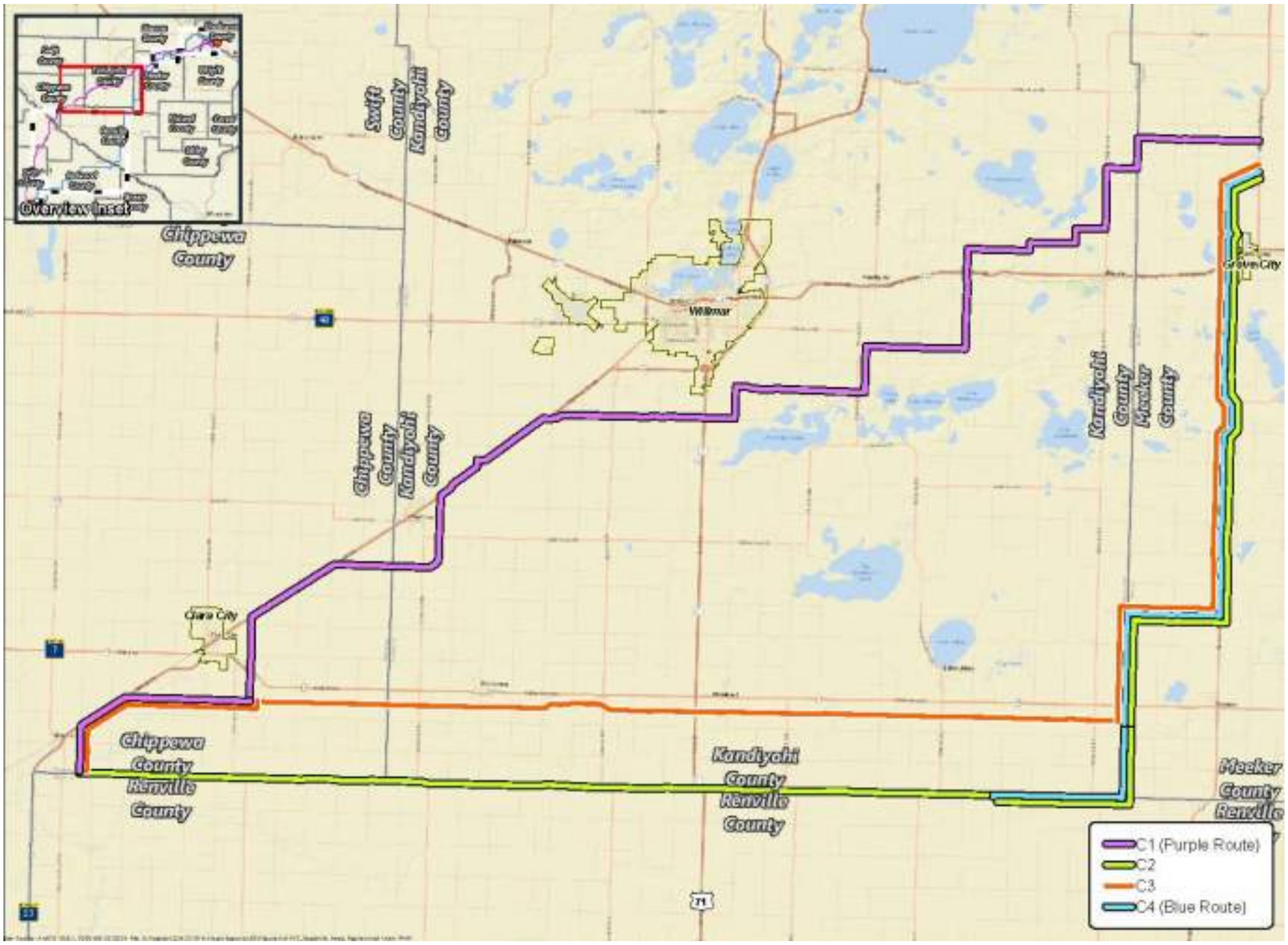
Alternative Alignment 4 is in Yellow Medicine County (Map N.35 and Map N.36). Alternative Alignment 4 was proposed in a scoping comment from Mr. John Welckle. The alternative alignment was proposed to minimize impacts to farming activities, specifically to minimize impediment to maneuvering large machinery. Alternative Alignment 4 would effectively avoid cutting through agricultural land and would instead follow Highway 23.

8 Region C - Potential Impacts and Mitigation

Chapter 8 describes potential impacts in Region C, which is a centrally located region and is in Chippewa, Kandiyohi, Renville and Meeker Counties (Map 2). The four route segments in Region C are shown Figure 8-1 and described below.

- Route Segment C1 is the applicant's proposed Purple Route. It is 56 miles long.
- Route Segment C2 is a variation of the Purple Route to Blue Route. It is 58.5 miles long. It departs the applicant's proposed Purple Route at the beginning of this region. It includes Route Connector 103 and a portion of the applicant's proposed Blue Route. Route Connector 103 was proposed as an alternative to more closely follow parcel and fence lines.
- Route Segment C3 is a variation of the Purple Route to Blue Route. It is 57.9 miles long. It includes a portion of the applicant's proposed Purple Route, Route Connector 104 (proposed by the applicant as a means of shifting from one proposed route to the other), and a portion of the applicant's proposed Blue Route.
- Route Segment C4 is the applicant's proposed Blue Route. It is 28.6 miles long. Route Segment C4 is shorter than Route Segment C2 and C3 which include portions of the applicant-proposed Blue Route and a route connector.

Figure 8-1 Region C Route Segments



8.1 Environmental Setting

Region C is dominated by agricultural land use, with rural residential and commercial development (Map 6). Major waterways crossed by the route alternatives within Region C include the Crow River (South Fork), Hawk Creek, Chetomba Creek, and Belle Creek (Map 14).

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. Under this classification system, Region C is in the North Central Glaciated Plains section of the Prairie Parkland Province (Map 15). This section is further broken down into subsections, including the Minnesota River Prairie Subsection. This subsection is used below to classify the environmental setting of the project.

The Minnesota River Prairie Subsection most predominantly spans the route alternatives throughout the project, and is present in the on the northeastern portion of Region A. This area is characterized by large till plains that are bisected by the broad valley of the Minnesota River. Topography is steepest along the Minnesota River and the Big Stone Moraine, which has steep kames and broad slopes, while topography outside of the river valley consists of level to gently rolling ground moraine. Glacial drift generally ranges between 100 and 400 feet throughout this subsection. Soils are mostly well to moderately well-drained loams formed in gray calcareous till with some localized inclusions of clay, sand, and gravel soils. Wetlands were common within this subsection prior to pre-European contact, and most have been drained to establish usable cropland (reference (188)).

Region C is the central most region and is in Chippewa County, Kandiyohi County, Renville County, and Meeker County (Map 2). Major communities nearest the route alternatives include Maynard, Clara City, Raymond, Blomkest, Lake Lillian, Raymond, and Grove City; the city of Prinsburg is crossed by the route alternatives. Existing transmission lines are prevalent throughout the region. Two railroads also traverse the region. Region C is generally bounded by State Highway 7 to the south and State Highway 4 to the east. Region C intersects with State Highways 23, 40, 4, and 7, and U.S. Highways 12, 917A, and 71. Federal highways within the project area include U.S. Highway 12, U.S. Highway 71. State highways within the project area include State Highway 23 State Highway 7, and State Highway 4. County and Township roads are also present within the region (Map 9). Most of the highways are concentrated centrally within Region C surrounding the city of Willmar.

8.2 Human Settlement

8.2.1 Aesthetics

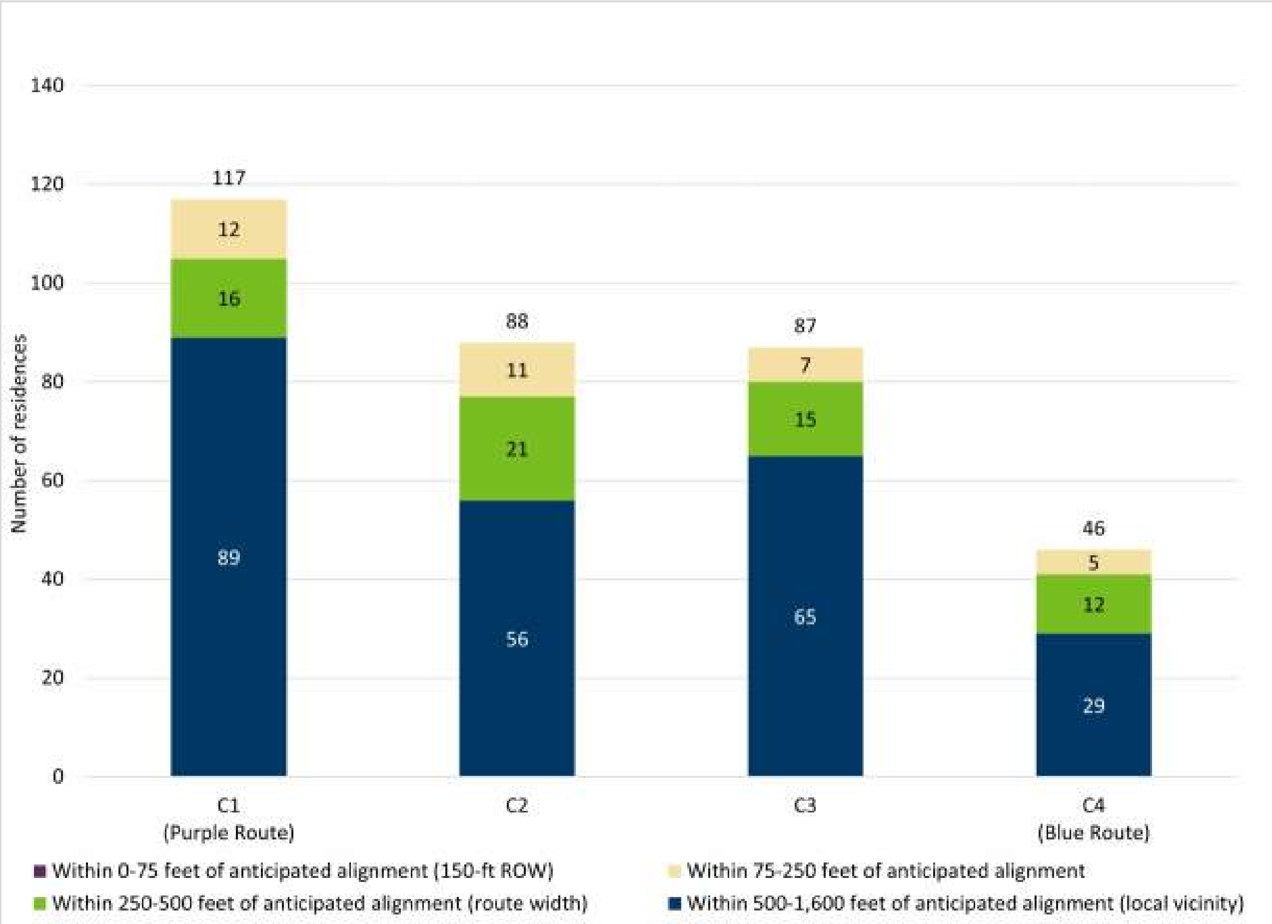
The ROI for aesthetics is the local vicinity. HVTLs alter a viewshed (Section 5.2.1.2**). Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes. 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, and 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. Additional details regarding potential impacts to aesthetics and potential mitigation measures is provided in Section 5.2.1**.**

Appendix N shows human settlement features (for example, residences and nursing homes) in the local vicinity of the route segments. No recreational resources where people might congregate were identified within the ROI (Section 8.2.8). The proximity of residential structures (homes) and non-residential structures to route segments at various distances is shown in Figure 8-2 and Table 8-1, respectively. Route segment C4 (Blue Route) has the least number of residences (46) and non-residential structures (319) within its local vicinity; this route segment is also the shortest route alternative. Route Segment C1 (Purple

Route) has the most residences within its local vicinity. Route Segment C2 has the most non-residential structures within its local vicinity.

Figure 8-2 Region C, Route Segments, Proximity of Residential Structures



For total count of residential structures within the route width, combine residential structures within 75-250 feet and residential structures within 250 and 500 feet.

For total count of residential structures within the local vicinity, combine residential structures within each distance; this number is also stated at the top of each bar.

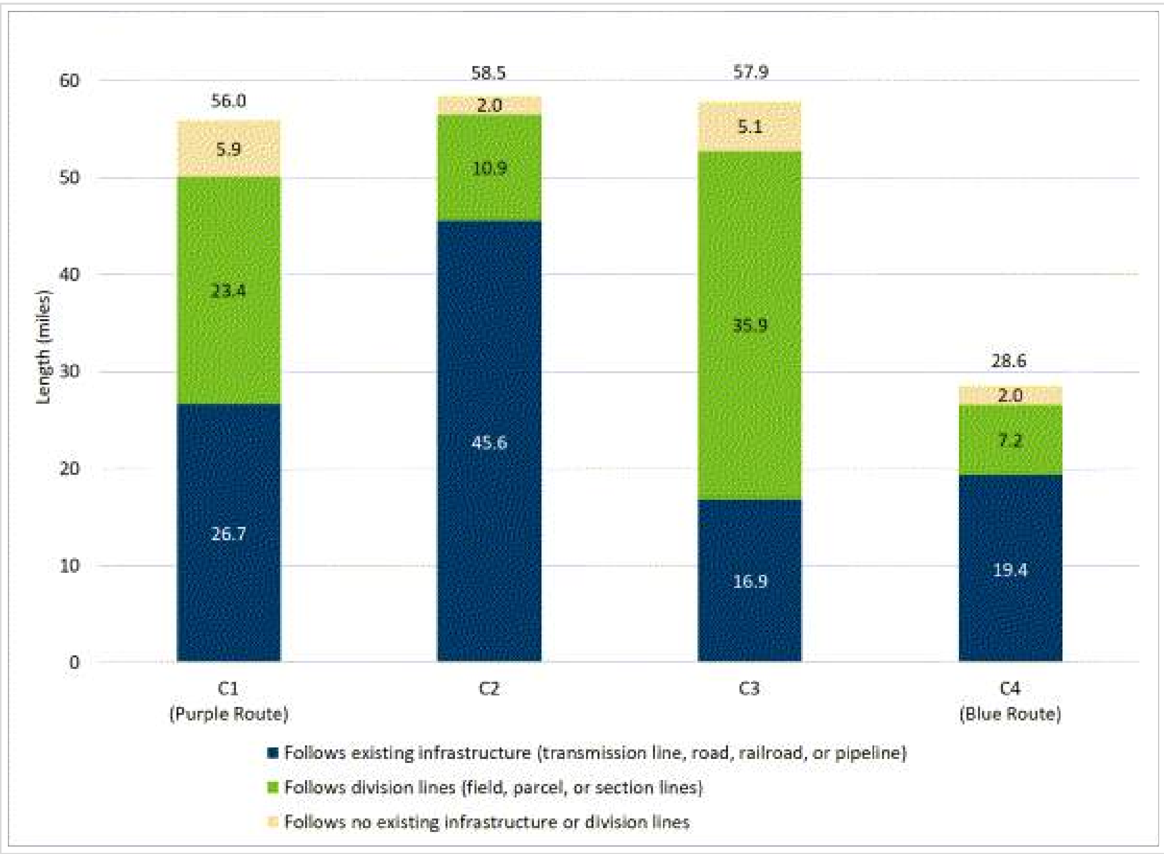
Table 8-1 Region C, Route Segments, Proximity of Non-Residential Structures

Non-Residential Structures	Route Segments			
Distances from Anticipated Alignment	C1 (Purple Route)	C2	C3	C4 (Blue Route)
0-75 feet (150-foot-ROW)	1	0	2	0
75-250 feet	26	21	31	8
250-500 feet (generally route width)	42	139	102	63
500-1,600 feet (local vicinity)	468	467	466	248
Total	537	627	601	319

Non-residential structures include churches, schools (public and private), daycares/child-care centers/pre-schools, hospitals, nursing homes, and commercial and non-residential structures.

Each route segment would parallel with existing infrastructure or division lines as shown in Figure 8-3 and Table 8-2. In some cases, portions of a route segment could parallel ROW with more than one of these existing features at the same time. Map 9 illustrates where ROW paralleling occurs and shows existing infrastructure and division lines in the region. Route Segment C1 (Purple Route) is the only one in Region C that parallels an existing transmission line (6.1 miles and 11 percent of its length). Route Segment C2 parallels the largest percentage of ROW with existing infrastructure (45.6 miles and 78 percent of its length).

Figure 8-3 Region C, Route Segments, ROW Paralleling of Existing Infrastructure and/or Division Lines Summary



The total mileage at the top of each route segment represents that route segment's total length. Numbers may not sum due to rounding.

Table 8-2 Region C, Route Segments, Route Segments, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

Infrastructure	Route Segments			
	C1 (Purple Route)	C2	C3	C4 (Blue Route)
Follows existing transmission line (miles, %)	6.1 (11)	0 (0)	0 (0)	0 (0)
Follows existing roads (miles, %)	23.0 (41)	45.6 (78)	16.8 (29)	19.3 (68)
Follows existing railroad (miles, %)	3.4 (6)	0 (0)	0 (0)	0 (0)
Follows existing pipeline (miles, %)	0.1 (<1)	1.7 (3)	1.7 (3)	1.7 (6)
Total ROW paralleling (w/transmission line, road, and railroad) (miles, %)	26.7 (48)	45.6 (78)	16.9 (29)	19.4 (68)
Follows Field, parcel, and Section Lines (miles, %)	49.6 (89)	56.5 (97)	52.8 (91)	26.6 (93)
Total- All (miles, %) [1]	50.1 (90)	56.5 (97)	52.8 (91)	26.6 (93)

Totals might not sum to 100 percent due to rounding.
[1] This total is indicative of the full length of the route segment that parallels existing infrastructure ROW and/or division lines. For Region C, the total presented here is the same as the total for following division lines because there is not any length that follows existing infrastructure that doesn't allow follow division lines.

8.2.2 Cultural Values

Potential impacts to cultural values are discussed for the entire project in Section 5.2.2. The assessment was completed for the project as a whole because existing conditions are better understood at a broader scale than the regional level. Impacts to cultural values are independent of the route selected.

8.2.3 Displacement

The ROI for displacement is the ROW. Displacement occurs when a residence or building is required to be removed for construction of the project. Residential buildings within the ROI would require removal, whereas non-residential buildings could stay within the ROI if the activities taking place in these buildings are compatible with the safe operation of the line. Additional details regarding displacement and potential mitigation measures are provided in Section 5.2.3**.**

There are no residences within the ROI for the route segments within Region C. Route Segment C1 (Purple Route) includes one non-residential structure, an agricultural building, in its ROW (Table 8-1). Route Segment C3 includes two non-residential structures - industrial buildings for Varicore Technologies in Prinsburg, Minnesota. The non-residential structures are shown in Map N.52, Map N.122, and Map N.130.

8.2.4 Environmental Justice

Census tract 9504, crossed by Route Segment C1 (Purple Route), C2, and C3, was identified as a potential area of concern for environmental justice. Section 5.2.4 discusses the census tract and potential impacts.

8.2.5 Land Use and Zoning

Potential impacts to land use and zoning are discussed in Section 5.2.5. The assessment for land use and zoning was completed for the project as a whole because existing conditions are determined by jurisdictional areas (counties) and do not coincide with the project's regional boundaries.

8.2.6 Noise

Potential impacts from noise are discussed for the entire project in Section 5.2.6. The assessment for noise was completed for the project as a whole because there is limited variability in the potential for noise across the route alternatives.

8.2.7 Property Values

Potential impacts to property values are discussed for the entire project in Section 5.2.7. The assessment for property values was completed for the project as a whole because there is limited variability in the potential for property value impacts across the route alternatives.

8.2.8 Recreation

The ROI for recreation is the route width. 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 5.2.8.2**). 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 likely vary based on individual perspectives and experiences. Impacts to recreation are assessed through identification of recreational resources within the ROI. The project is not anticipated to directly impede recreational activities within the ROI such as snowmobiling, golfing, canoeing, hunting, or fishing. Additional details regarding potential impacts to recreation and potential mitigation measures for the project is provided in Section** 5.2.8**.**

Route segments in Region C do not cross any land-based public trails, state water trails, Wild and Scenic rivers, or scenic byways. Snowmobile trails are present (Map 5). As summarized in Table 8-3, Region C includes the following snowmobile trails: Cross Country Trail Blazer Trails, Glacial Lakes Trail, Meeker County Trails, and Renville County Drift Runner Trails. Route Segment C1 (Purple Route) has the most snowmobile trail crossings (19) and 11.5 miles in length. Route Segment C4 (Blue Route) has the least crossings and least number of miles of snowmobile trail within the route width.

Table 8-3 Region C, Route Segments, Recreational Resources within Route Width

Recreational Resource	Unit	Route Segments			
		C1 (Purple Route)	C2	C3	C4 (Blue Route)
Snowmobile Trails	Crossings (miles)	19 (11.5)	7 (2.9)	7 (3.8)	3 (0.6)

Public lands, including Waterfowl Production Areas and Wildlife Management Areas, are publicly accessible and can be used for recreational purposes. Public lands used for wildlife management (Waterfowl Production Areas and Wildlife Management Areas) are discussed in Section 8.6.12.

8.2.9 Socioeconomics

Potential impacts to socioeconomics are discussed for the entire project in Section 5.2.9 This is because the assessment was completed at the county-level which does not always align with regional boundaries.

8.2.10 Transportation and Public Services

Potential impacts to transportation and public services are discussed for the entire project in Section 5.2.10. The assessment was completed for the project as a whole and not carried forward at the regional level because there is limited variability in across the route alternatives. Potential impacts to private airstrips are discussed in land-based economies.

8.3 Human Health and Safety

The impacts to human health and safety are discussed generally for the entire project in Section 5.3. The assessment was completed for the project as a whole and not carried forward at the regional level because there is limited variability across the route alternatives and generally impacts would be minimized by appropriate placement and adhering to applicable transmission line standards and codes**.**

8.4 Land-based Economies

Land-based economies are assessed by considering four elements: agriculture, forestry, mining, and tourism (Section 5.4). Impacts to three elements of land-based economies are anticipated to be minimal and independent of the route segment selected in Region C. These elements are:

- **Forestry –** No known forestry operations were identified within the ROI (the route width) for Region C.
- **Tourism –** Limited recreational resources are located within the ROI (local vicinity) for Region C (Section 8.2.8); therefore, any direct impacts to the recreation that would cause an indirect impact to tourism based economies are anticipated to be negligible (Section 5.4.2.4).

8.4.1 Agriculture

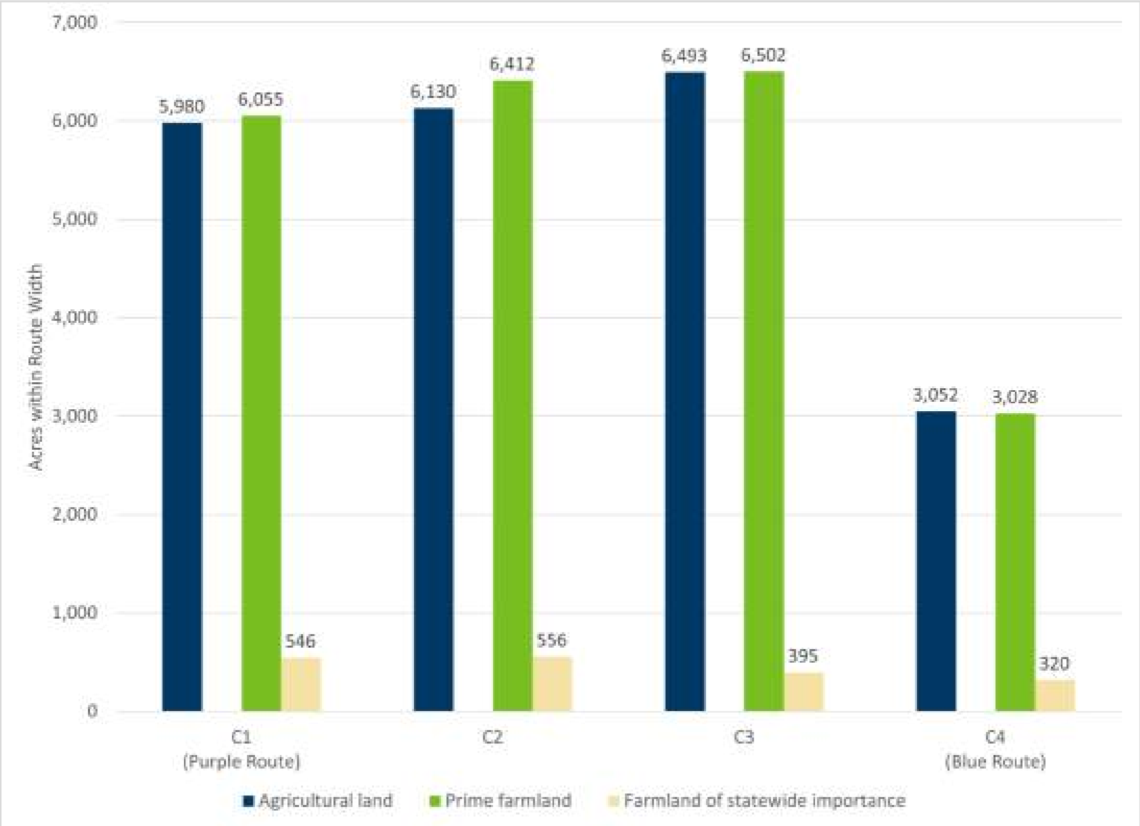
The ROI for the land-based economy of agriculture is the route width. Construction and operation of a HVTL impacts agriculture (Section 5.4.2.1). During construction, impacts would include the limited use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Permanent impacts would also occur when the footprint of the HVTL structures directly impedes agricultural production and/or impedes efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields.

Prudent routing (paralleling existing infrastructure and/or paralleling division lines) could help minimize potential impacts. Implementation of the AIMP (Appendix K), would minimize and mitigate impacts to agriculture. Additional details regarding potential impacts to agriculture and potential mitigation measures is provided in Section 5.4**.**

Figure 8-4 summarizes the total acres within the route widths of Region C route segments that are designated as agricultural land use, as well as soil classifications for prime farmland and farmland of statewide importance. Most land (more than 60 percent) within the route widths of the route segments in Region C is designated as agricultural land use (cultivated crops and hay/pasture; see Section 8.6.10). Route Segment C4 (Blue Route) has the least prime farmland; it is also the shortest route segment (28.6 miles). The total acres of prime farmland in Route Segments C1 (Purple Route), C2, and C3 are comparable (within 6 percent of one another) and their lengths are also comparable (56.0 to 58.5 miles).

As noted in Table 8-2, Route Segment C2 parallels the most existing infrastructure (78 percent of its total length) and Route Segment C3 parallels the least amount (29 percent of its total). Route Segment C1 (Purple Route) has the greatest distance that does not follow existing infrastructure or division lines at 5.9 miles (Figure 8-3), and Route Segments C2 and C4 (Blue Route) have the least amount that does not follow at 2 miles (Figure 8-3).

Figure 8-4 Region C Route Segments, Acres of Agricultural Lands and Prime Farmland within Route Widths



Source: Agricultural land, NLCD and prime farmland/farmland of statewide importance, SSURGO (Appendix C)

The Lux Strip Airport is a privately owned grass airstrip located within the route width adjacent and perpendicular to Route Segments C2, C3, and C4 (Blue Route) (Figure 8-5). It is used to support agricultural practices and crop production (reference (209)). The route width in this specific location is wider than the typically requested 1,000-feet to accommodate the potential siting of support substation Option B (Section 14.5.2). This airstrip is used as frequently as daily and at least weekly; it has been commercially operated by the same family for three generations and over 45 years. The HVTL would impact regular use of the airstrip, impacting the aerial spraying business (Section 5.4). HVTL structures could potentially affect the coverage and effectiveness of aerial spraying and when located near the airstrip and could also impact aircraft during takeoff and landing when located perpendicular to the landing strip. Impacts to the airstrip could be minimized by selecting Route Segment 223 (Section 8.9.3) as a refinement if Route Segment C2, C3, or C4 (Blue Route) is as part of the permitted route.

Figure 8-5 Lux Strip Airport Airstrip

Center pivot irrigation systems present in Region C are shown on Map 11.2, Map 11.3, and Map 11.4.

While not crossed by its anticipated alignment, there are two center pivot irrigation systems located within the route width of Route Segment C1 (Purple Route). The anticipated alignment avoids impacts to the center pivot irrigation systems because it is located west of Kandi Meeker Road NE where it traverses north and south and along a property line where it traverses west to east (Map 11.4).

The anticipated alignment of Route Segment C4 (Blue Route) crosses two center pivot irrigation systems near one another (Map 11.2). The northern of the two could likely not be avoided given the residence on the east side of the property line. The southern center pivot irrigation system could potentially be avoided during final design if the anticipated alignment were shifted slightly east within the route width. Route Segment C1 (Purple Route) is located immediately adjacent to center pivot irrigation systems (Map 11.4). As mapped, the circle used to represent the southern-most system appears to cross the anticipated alignment. However, based on an aerial review, it does not appear the anticipated alignment would cross the center pivot irrigation system.

The RIM/CREP program provides financial incentives to farmers to remove land from production (Section 5.6.6.1). Farmers within the route widths of the route segments in Region C participate within the CREP and RIM programs; however, no anticipated alignment in this region crosses an easement area (Section 8.6.1). It is anticipated the easement could be avoided during final design. Additional discussion regarding the potential to avoid the easement areas is provided in Section 8.6.1. Impacts can be mitigated by compensating individual landowners through negotiated easement agreements.

8.4.2 Mining

The ROI for the mining land-based economy is the route width. Impacts to aggregate mining could include interference with access to aggregate resources or the ability to successfully mine these reserves (Section 5.4.2.3). If future geophysical surveys are planned, the surveying technology could also be impacted. Potential impacts are assessed through identification of known, existing and prospective mining operations and assessing potential impacts to those current or potential future operations. If the potential for impacts to mining operations would occur, the applicant would be required to coordinate those impacts with the mining operator (Section 5.4.3).

One prospect gravel pit (MNDOT ASIS Number 34050) is present with the route width of Route Segment C1 (Purple Route) (Map N.134). The prospect mine is located near an existing residence on the south side of 45th Avenue SE. The anticipated alignment for Route Segment C1 (Purple Route) is on the north side of 45th Avenue SE. Impacts are anticipated to be negligible.

A second prospect gravel pit (MNDOT ASIS Number 34043) is present within the route width of Route Segment C2 (Map N.144). Plans to construct a gravel pit in this location were not identified. Therefore, impacts are anticipated to be negligible.

No other active or prospect mines were identified in Region C.

8.5 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 (Section 5.5.2). 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. Indirect 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. Additional details concerning potential impacts and mitigation for the project as a whole regarding archaeological and historic resources are provided in Section 5.5.3.

Documented archaeological and historic resources within Region C are summarized in the following tables.

- Table 8-4 summarizes the number of archaeological and historic resources within the project area (which is within one mile of the anticipated alignments).
- Table 8-5 summarizes the number of archaeological and historic resources within the ROI (route width) for each of the Region C, route segments.
- Table 8-6 provides descriptions of the resources located within the route widths.

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

Table 8-4 Region C, Route Segments, Number of Archaeological and Historic Resources within the Project Area

Route Segment	Archaeological Resources	Historic Architectural Resources	Historic Cemeteries	Historic Cemeteries (within 1/2 mile)
C1 (Purple Route)	12	47	11	5
C2	5	33	9	5
C3	6	64	12	4
C4 (Blue Route)	2	23	6	3

Table 8-5 Region C, Route Segments, Number of Archaeological and Historic Resources within the Route Width

Route Segment	Archaeological Resources	Historic Architectural Resources	Historic Cemeteries
C1 (Purple Route)	1	9	4
C2	1	7	3
C3	0	8	1
C4 (Blue Route)	0	4	1

Table 8-6 Region C, Route Segments, Archaeological and Historic Resources within the Route Width Summary

Route Segment(s)	Site/Resource Number	Resource Type	Resource Name/Description	NRHP Status	Description
C1 (Purple Route)	21KH0173	Archaeological Site	Mortuary (post-contact Euroamerican cemetery)	Unevaluated	Site 21KH0173 is a post-contact Euroamerican cemetery consisting of approximately 20-30 internments, a portion of which are marked with headstones with dates between 1859 and 1919 (reference (210)).
C2	21KHt	Archaeological Site (Alpha site)	Mortuary (Native American burial mound)	Unevaluated	Site 21HKt is an alpha site consisting of a Native American burial mound. Based on documentation, this site might have been destroyed by agricultural activity (reference (211)).
C1 (Purple Route)	CP-RHE-00008	Historic Architecture	Electric Short Line Railroad Corridor (Luce Line): Rheiderland Township Segment	Unevaluated	-
C1 (Purple Route)	Gibson Graves	Historic Cemetery	Gibson Graves (mapped at Section level)	N/A	-
C1 (Purple Route)	Immanuel Lutheran Cemetery	Historic Cemetery	Immanuel Lutheran Cemetery (mapped at PLS forty level)	N/A	-
C3	KH-HLT-00018	Historic Architecture	Bridge 94086	Not Eligible	-
C1 (Purple Route)	KH-XXX-00001	Historic Architecture	Trunk Highway 12/Former Trunk Highway 10	Not Eligible	-
C2	Lake Lillian Cemetery	Historic Cemetery	Lake Lillian Cemetery (mapped at Section level)	N/A	-
C2	Old Swedish Lutheran Cemetery	Historic Cemetery	Old Swedish Lutheran Cemetery (mapped at PLS forty level)	N/A	-
C2, C3, C4 (Blue Route)	Pearson Family Gravesite	Historic Cemetery	Pearson Family Gravesite (mapped at Township level)	N/A	-
C2	RN-CRO-00008	Historic Architecture	Bridge L8615	Unevaluated	-

Route Segment(s)	Site/Resource Number	Resource Type	Resource Name/Description	NRHP Status	Description
C1 (Purple Route)	Tripolis Church	Historic Cemetery	Tripolis Church Cemetery (mapped at PLS forty level)	N/A	-
C1 (Purple Route)	Unknown	Historic Cemetery	Name of cemetery unknown (mapped at PLS forty level)	N/A	-
C1 (Purple Route), C2, C3	XX-ROD-00026	Historic Architecture	Trunk Highway 26	Not Eligible	-
C1 (Purple Route), C2, C3, C4 (Blue Route)	XX-ROD-00111	Historic Architecture	Trunk Highway 12	Not Eligible	-
C1 (Purple Route), C2, C3, C4 (Blue Route)	XX-ROD-00151	Historic Architecture	Trunk Highway 7	Not Eligible	-
C1 (Purple Route), C3	XX-ROD-00152	Historic Architecture	Trunk Highway 23	Not Eligible	-
C1 (Purple Route), C2, C3	XX-ROD-00163	Historic Architecture	Trunk Highway 71	Not Eligible	-
C1 (Purple Route), C2, C3, C4 (Blue Route)	XX-RRD-CNW020	Historic Architecture	Electric Short Line Railway/Chicago and North Western Railway Company (extant)	Unevaluated	-
C1 (Purple Route), C2, C3, C4 (Blue Route)	XX-RRD-CNW021	Historic Architecture	Electric Short Line Railway/Chicago and North Western Railway Company: Hutchinson to Gluek (extant)	Unevaluated	-

8.5.1 Archaeological Resources

Based on the Minnesota Department of Transportation's predictive model, the highest potential for the presence of archaeological sites is along the lakeshores in this region which have been well surveyed (reference (208)).

Two sites, both mortuary sites, are present within the route widths of one or more of the route segments (Table 8-6). Neither of these sites have been evaluated for listing on the NRHP.

Route Segment C1 (Purple Route) and Route Segment C2 each contain one unevaluated archaeological site within their route widths.

8.5.2 Historic Architectural Resources

Eleven historic architectural resources are present within the route widths of the route segments in Region C (Table 8-6). These include seven ineligible resources and four unevaluated resources.

Route Segment C1 (Purple Route) and Route Segment C2 contain three unevaluated resources. Route Segments C2 and C4 (Blue Route) contain two unevaluated resources.

8.6 Natural Environment

8.6.1 Air Quality

Potential impacts to air quality are expected to be similar to those discussed for the entire project in Section 5.6.1. The assessment for air quality was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

8.6.2 Climate

Potential impacts to climate are expected to be similar to those discussed for the entire project in Section 5.6.2. The assessment for climate was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

8.6.3 Geology and Topography

Potential impacts to geology and topography are expected to be similar to those discussed for the entire project in Section 5.6.3. The assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

8.6.4 Greenhouse Gases

Potential impacts to greenhouse gases are expected to be similar to those discussed for the entire project in Section 5.6.4. The assessment for greenhouse gases was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected given their similar lengths.

8.6.5 Groundwater

Potential impacts to groundwater are expected to be similar to those discussed for the entire project in Section 5.6.5. The assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

8.6.6 Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands often involve unique resources intended for protection and/or preservation and would be subject to short and long-term impacts depending upon their use (Section 5.6.6.2). Public and designated lands within the ROI are first identified and then further reviewed to better understand potential impacts such as vegetation clearing. Occupying public and designated lands would require coordination with the landowner (Section 5.6.6.3).

There are no state game refuges in the ROI of Region C. There are Wildlife Management Areas in Region C within the ROIs of Route Segments C1 (Purple Route) and C3. There are Waterfowl Production Areas in Region C within the ROIs of all route segments. These are discussed in Section 8.6.12.

Designated lands with existing easements located within the route widths are summarized in Table 8-7 and shown in Map N.109, Map N.114, Map N.116, Map N.119, Map N.120, Map N.124, Map N.136, Map N.137, Map N.139, Map N.142, Map N.146, Map N.154, Map N.156, and Map N.157. There are at least 15 acres of CREP easements within the ROIs of all route segments except for Route Segment C4 (Blue Route). No CREP land is crossed by the anticipated alignments and their associated ROWs, and it is anticipated to be avoided during final design per the applicant's route permit application. For example, the anticipated alignment avoids the CREP as shown on Map N.142. RIM Reserve Land is present within the ROIs of Route Segment C1 (Purple Route) and C3 but is not crossed by the anticipated alignment.

The applicant requested additional route width (Section 3.3.1) adjacent to Route Segment C1 (Purple Route). The route permit application stated that the additional route width was requested "to allow for greater flexibility to avoid known conservation easements and their associated natural resources." It is assumed this means the final alignment could be on the outer edges of the route width where crossing the easements would be avoided.

Table 8-7 Region C, Route Segments, Designated Lands within Route Width

Designated Land Type	Unit	Route Segments			
		C1 (Purple Route)	C2	C3	C4 (Blue Route)
Conservation Reserve Enhancement Program (CREP)	Acres	32	91	15	0
Reinvest in Minnesota (RIM) Reserve Partnership Easement	Acres	10	0	13	0

8.6.7 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 construction and operation-related impacts to protected species and sensitive ecological resources are discussed in Section 5.6.7.4. 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. 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.

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 that 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, are described in Section 5.6.7.5.

Sensitive ecological resources within Region C are shown on Map 12. To protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on maps.

8.6.7.1 Protected Species

According to the NHIS database, no federally or state protected species have been documented within 1 mile of the route segments in Region C. Several state special concern species have been documented within 1 mile of the of the route segments in Region C; these are summarized in Appendix M.

Formal protected species surveys have not been conducted for the project; as such, it is possible that protected species could be present where suitable habitat is available within the ROW or route width of the route segments. Prior to construction, the applicant could be required to conduct field surveys in coordination with the USFWS and/or DNR for the potential presence of protected species.

8.6.7.2 Sensitive Ecological Resources

The route width of Route Segments C1 (Purple Route) and C3 would intersect Sites of Biodiversity Significance and native plant communities, with Route Segment C1 (Purple Route) also intersecting railroad ROW prairie (Table 8-8; Map 12). The acreage of Sites of Biodiversity Significance and native plant communities in the route width of Route Segment C3 is less than 1 acre and none of it is crossed by the anticipated alignment; as such, impacts to these resources are not anticipated from Route Segment C3.

The route width of Route Segment C1 (Purple Route) would intersect Sites of Biodiversity Significance ranked moderate and below; however, the anticipated alignment would only intersect the Site of Biodiversity Significance ranked "below". The anticipated alignment would cross an area greater than 1,000 feet and might require placement of a structure within it. The route width of Route Segment C1 (Purple Route) would also intersect a mesic prairie (southern) native plant community, a sliver of which (<0.1 acres) is located within the ROW; however, the anticipated alignment would not cross this native plant community. In the same general location as the native plant community, the DNR has mapped railroad rights-of-way prairies. These railroad rights-of-way prairies would parallel the anticipated alignment and would also be crossed by the anticipated alignment in two locations, both of which could be spanned.

Table 8-8 Region C, Route Segments, Sensitive Ecological Resources within Route Width

Resource	Units	Route Segments			
		C1 (Purple Route)	C2	C3	C4 (Blue Route)
Sites of Biodiversity Significance	Moderate rank (acres)	42	0	1	0
	Below rank (acres)	120	0	0	0
	Total acres	162	0	1	0
Native Plant Communities	Total acres; all have a Conservation Status S1 (community is critically imperiled) or S2 (community is imperiled	42	0	1	0
Railroad Rights-of-way Prairie	Total feet	40,986	0	0	0

8.6.8 Soils

The ROI for soils is the ROW. Common soil impacts include rutting, compaction, and erosion (Section 5.6.8.2**). Potential impacts would be short-term during construction and localized. Impacts 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 vehicles trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored a suitable location. Disturbed areas would be promptly seeded after construction. Additional details regarding potential impacts to soils and potential mitigation measures is provided in Section 5.6.8.

Map 13 shows the surface soil textures across the region. Soil types within the ROW were reviewed to identify soil characteristics that could be more prone to impacts in some areas versus others (Table 8-9).

Less than ten percent of soils within the ROW of the route segments of Region C are soils susceptible to erosion and soil with revegetation concerns, and less than one-third of the ROW was mapped as hydric. Between 19 to 43 percent of the ROW was mapped as soils prone to compaction. Most soils within the ROW of the route segments of Region C have a moderate or severe rutting hazard rating.

Table 8-9 Region C, Route Segments, NRCS Mapped Soils Within ROW

Soil Data	Unit	Route Segments			
		C1 (Purple Route)	C2	C3	C4 (Blue Route)
Area within Route Segment ROW	Acres	1018	1065	1053	521
Hydric Soils [1]	Acres	209	350	214	164
Compaction Prone [2]	Acres	435	286	323	99
Rutting Hazard [3]	Acres	1018	1064	1053	521
Erosion Hazard (Off-Road, Off-Trail) [4]	Acres	64	36	29	26
Revegetation Concerns [5]	Acres	51	12	29	0

[1] Hydric soil include hydric soils (100%) and predominantly hydric soils (67-99%).
[2] Soils considered to be Compaction Prone soils include those with a rating of "Medium" or higher.
[3] Soils considered susceptible to Rutting Hazard include those with a rating of "Moderate" or "Severe".
[4] Soils considered susceptible to erosion hazard soils include those with a rating of "Medium", "Severe", or "Very Severe".
[5] Soils considered to have revegetation concerns include soils with a non-irrigated land capability classification of 3 or greater.

8.6.9 Surface Water

The ROI for surface water is the route width. Potential impacts to surface waters are discussed in Section 5.6.9.2. Direct impacts caused by structures placed in surface waters would be avoided by spanning the 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 or waterbodies and/or special or impaired waters.

Impacts would be mitigated by using BMPs. 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. Additional details regarding potential impacts to surface waters and potential mitigation measures, including those provided in the DNR's Natural Heritage Review response, is provided in Section 5.6.8.3.

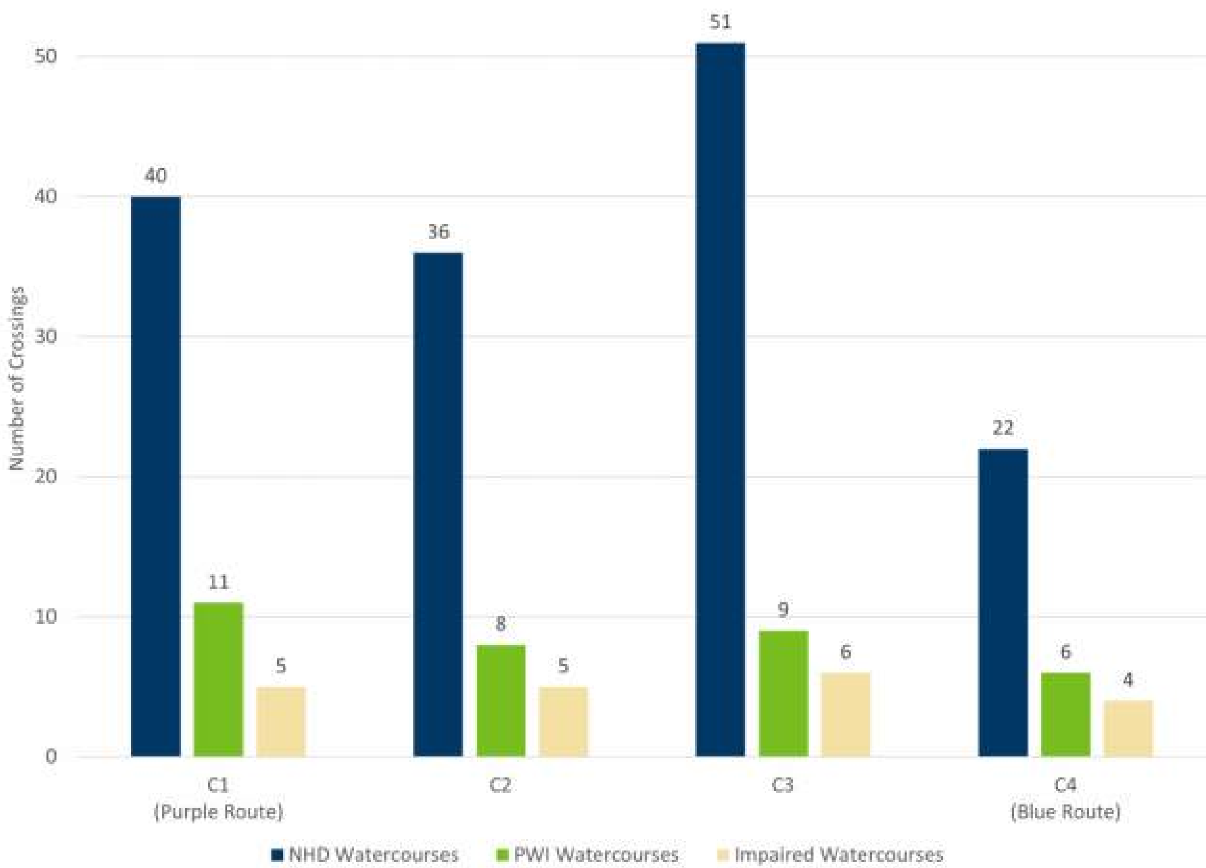
Map 14 shows the waterbodies and watercourses across the region. There are no trout streams, state-designated outstanding resource value waters, or state and federal wild and scenic and recreational rivers crossed by the route segments in Region C.

As discussed in Section 8.6.11, one waterbody is crossed by the anticipated alignments of Route Segments C2, C3, and C4 (Blue Route); this waterbody is considered a PWI wetland by the DNR (Map N.168). No additional waterbodies were identified within the ROI.

The total count of watercourse crossings by the anticipated alignments of the route segments in Region C varies between 22 and 51 (Figure 8-6); most of the watercourses crossed are ephemeral streams. Route Segment C4 (Blue Route) has the fewest watercourse crossings while Route Segment C3 has the most watercourse crossings.

The route segments in Region C have between six and eleven PWI watercourse crossings and between four and six impaired watercourse crossings (Figure 8-6). The major PWI watercourses crossed in Region C include the Crow River South Fork, Chetomba Creek, Hawk Creek, and Belle Creek. Two unnamed agricultural drainageways parallel Route Segment C3 (Map N.157 and Map N.158). If the anticipated alignment parallels the watercourses, the potential for impacts (such as erosion or sedimentation) during construction could increase.

Figure 8-6 Region C, Route Segments, Number of Watercourse Crossings by Type



8.6.10 Vegetation

The ROI for vegetation is the ROW. Potential construction and operation-related impacts to vegetation are discussed in Section 5.6.10.2. 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. 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, as described in Section 5.6.10.3.

Map 7 provides an overview of landcover types across Region C and Table 8-10 summarizes the landcover types within the ROW of each route segment in Region C. Agricultural vegetation, particularly cultivated cropland, represents the dominant vegetative landcover type within the ROW of each route segment in Region C. Small amounts of herbaceous landcover, primarily wetlands, are also present in the ROW of each route segment. A minimal amount of forested landcover (1 acre or less), primarily consisting of forested wetlands, is present in the ROW of all route segments.

As discussed in Section 5.6.10.2, the applicant would clear forested vegetation from the ROW during construction, and the ROW would be maintained with low-growing vegetation during operations to minimize potential interference with the HVTL. Given that a maximum of 1 acre of forested vegetation is in the ROW of all route segments in Region C, impacts are anticipated to be minimal.

Table 8-10 Region C, Route Segments, Landcover Types in the ROW

Landcover Type	Route Segments			
	C1 (Purple Route)	C2	C3	C4 (Blue Route)
Agricultural (cultivated crops and hay/pasture) (acres in ROW [% of ROW])	827 (81%)	740 (69%)	913 (87%)	354 (68%)
Herbaceous (upland and wetland) (acres in ROW [% of ROW])	8 (1%)	19 (2%)	5 (1%)	5 (1%)
Forest (upland and wetland) (acres in ROW [% of ROW])	<1 (<1%)	1 (<1%)	1 (<1%)	1 (1<%)
Developed (low-high intensity; open space) (acres in ROW [% of ROW])	183 (18%)	304 (29%)	133 (13%)	161 (31%)

Source: NLCD (Appendix C)
Totals might not sum to 100 percent due to rounding.

Potential impacts to agricultural vegetation and wetlands are discussed in Sections 5.4.2 and 5.6.11.2, respectively.

8.6.11 Wetlands

The ROI for wetlands is the route width. Short-term and long-term potential impacts to wetlands are discussed in Section 5.6.11.2. Impacts to wetland 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 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.

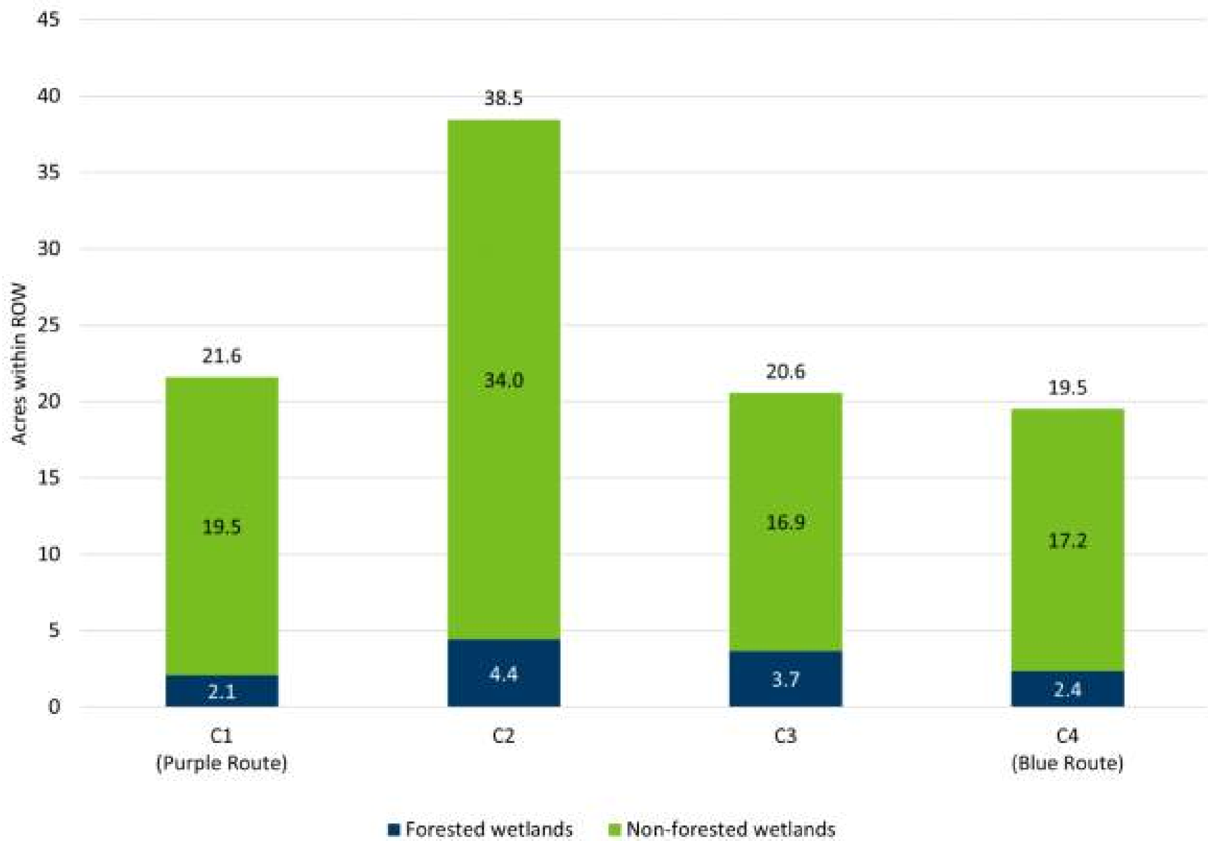
Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width. Wetland impacts would be regulated as described in 5.6.11.1.1. Additional details regarding potential impacts to wetlands, including those provided in the DNR's Natural Heritage Review response, and potential mitigation measures is provided in Section 5.6.11.3.

Map 14 shows the mapped wetlands within the ROI. Direct wetland impacts would occur within the construction workspace (within or adjacent to the ROW); not all wetland areas within the ROI would be subject to direct impacts as most could be spanned. Wetlands within the Region C ROI consist mainly of emergent wetlands but also aquatic bed, forested, scrub-shrub, unconsolidated bottom, and riverine wetlands. Total acres of wetlands within the route widths of the route segments are provided in Appendix E.

The route width of Route Segment C4 (Blue Route), the shortest route segment, would include the least wetland area (121.5 acres). The route width of Route Segment C2, the longest route segment, would include the most wetland area (234.4 acres). Route Segment C2 would include two wetland crossings longer than 1,000 feet. The route width of Route Segments C2, C3, and C4 (Blue Route) would each include three PWI wetlands. The route width of Route Segment C1 (Purple Route) would include one PWI wetland.

Forested wetlands subject to permanent impacts due to their conversion would be contained within the ROW. Forested wetland in the ROW is relatively minimal for all route segments in Region C (Figure 8-7). Route Segment C1 (Purple Route) has the least amount of forested wetland (2.1 acres) and Route Segment C2 has the most (4.4 acres).

Figure 8-7 Region C Route Segments, Acres of Wetland by Type within ROW



8.6.12 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. Potential construction and operation-related impacts to wildlife and wildlife habitat are discussed in Section 5.6.12.2. Potential short-term, localized impacts could occur from displacement during construction or maintenance activities. Potential long-term impacts could occur as a result to 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, as described in Section 5.6.12.3.

Map 16 provides an overview of resources across Region C, and Table 8-11 summarizes the wildlife resources within the route width of each route segment in Region C.

Wildlife Management Areas are located within the route width and local vicinity of Route Segments C1 (Purple Route) and C3; however, neither of the anticipated alignments for these route segments would cross a Wildlife Management Area.

Waterfowl Production Areas are located within the route width and local vicinity of all route segments in Region C; the route width of Route Segment C1 (Purple Route) would intersect the least acreage. None of the anticipated alignments would cross a Waterfowl Production Area.

Grassland Bird Conservation Areas are in the route width and regional vicinity of Route Segments C1 (Purple Route) and C2; Route Segment C1 (Purple Route) would intersect more acres than Route Segment C2. The anticipated alignments of both route segments would cross Grassland Bird Conservation Areas. The anticipated alignment of Route Segment C1 (Purple Route) would parallel an existing transmission line ROW for a small portion of the Grassland Bird Conservation Area it crosses but otherwise both route segments would cross Grassland Bird Conservation Areas while not paralleling an existing transmission line ROW.

DNR-identified shallow wildlife lakes are located within the route width and local vicinity of Route Segments C2, C3, and C4 (Blue Route). The anticipated alignments of all three route segments would cross and span a shallow wildlife lake while paralleling an existing road ROW.

Less than 1 acre of a Wildlife Action Network corridor ranked medium is located within the local vicinity of Route Segments C2, C3, and C4 (Blue Route); however, none of this area is located within the route width or crossed by anticipated alignments of these route segments.

The route segments in Region C would parallel little to no existing transmission line ROW, with Route Segment C1 (Purple route) paralleling for 11 percent of its length and the other route segments not paralleling any. Traversing wildlife areas along new transmission line corridors could increase potential impacts to avian species traveling through these areas. As discussed in Section 5.6.12.3, avian impacts can be minimized through use of bird flight diverters. All route segments in Region C would minimize potential impacts associated with habitat fragmentation by paralleling existing road rights-of-way, with Route Segments C2 paralleling the most (78 percent of its length) and Route Segment C3 paralleling the least (29 percent of its length).

Table 8-11 Region C, Route Segments, Wildlife Management and Conservation Areas within Route Width

Resource Area	Unit	Route Segments			
		C1 (Purple Route)	C2	C3	C4 (Blue Route)
Wildlife Management Areas	Acres	21	0	20	0
Waterfowl Production Areas	Acres	42	72	72	72
Grassland Bird Conservation Areas	Acres	1,058	416	0	0
Shallow Wildlife Lakes	Count	0	1	1	1

8.7 Costs that are Dependent on Design and Route

Costs of the route segments are generally proportional to length with the exception of the additional factors described in Section 5.9. Costs for route segments in Region C are included in Section 8.8 and are also provided in Appendix O.

8.8 Relative Merits of Route Segments

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 Route Segments C1 through C4 with the exception of some elements of resource categories that are considered to have minimal impacts that might not vary significantly throughout the regions and/or the routing factors are not applicable. These include:

- Impacts on human settlements (factor A)— cultural values, environmental justice, land use and zoning, 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 land-based economies (factor C)— forestry and tourism.
- Impacts on the natural environment (factor E) – air quality, climate, geology and topography, floodplains, and groundwater.

With respect to routing factor G, it is assumed that all route alternatives are equal with regard to maximizing energy efficiencies and accommodating expansion of transmission capacity. With respect to environmental impacts, the examination of such impacts suggested by routing factor G is included in the discussion of other routing factors and elements that more specifically address an environmental impact (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 15.

A relative merits analysis was completed to compare Route Segments C1 through C4 using these routing factors. The analysis uses graphics (Table 8-12) 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 8-13 summarizes the relative merits analysis of Route Segments C1 through C4 for the routing factors that are anticipated to vary amongst route alternatives.

Table 8-12 Guide to Relative Merits Analysis

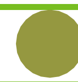
Consistency with Routing Factor or Anticipated Impacts	Symbol
Route alternative is consistent with the routing factor OR Impacts are anticipated to be negligible to minimal or the impact is positive	
Route alternative is consistent with routing factor but less so than the other options OR Impacts are 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 alternative 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	

Table 8-13 Relative Merits of Route Segments C1 through C4

Routing Factor / Resource	Route Segments				
	C1 (Purple Route)	C2	C3	C4 (Blue Route)	Summary
Factor A Human Settlement					
Aesthetics					Aesthetic impacts are anticipated to be moderate for Route Segments C1 (Purple Route), C2, and C3. Route Segment C4 (Blue Route) has the least number of residences in the local vicinity (46) and non-residential structures (319) within its local vicinity. It also follows the second largest percentage of existing infrastructure (68% of its length). It is also the shortest segment. Only Route Segment C1 (Purple Route) parallels ROW with an existing transmission line (6.1 miles and 1% of its length). Segment C2 parallels the largest percentage of ROW with existing infrastructure (45.6 miles and 78% of its length).
Displacement					The ROW of Route Segment C1 (Purple Route) has one non-residential structure, and the C3 ROW has two non-residential structures. The other segments in this region do not have any structures within the ROW.
Recreation					Route segments in Region C do not cross any land-based public trails, state water trails, wild and scenic rivers, or scenic byways. Recreational resources in Region C include snowmobile trails and impacts are anticipated to be minimal. Waterfowl Production Areas and Wildlife Management Areas are discussed in wildlife.
Factor C Land-Based Economies					
Agriculture					Most of the land included in Region C is agricultural. Impacts cannot be avoided but can be mitigated. The Lux Strip Airport is a privately owned grass airstrip located within the route width adjacent and perpendicular to Route Segments C2, C3, and C4 (Blue Route). Impacts to the airstrip could be minimized by selecting Route Segment 223 (Section 8.9.3) as a refinement if Route Segment C2, C3, or C4 is as part of the final route. Prudent routing (parallelling existing infrastructure and/or paralleling division lines) could help minimize impacts. Route Segment C3 parallels the least amount of infrastructure. Route Segment C1 (Purple Route) is the only segment that avoids impacts to the Lux Strip Airport and center pivot irrigation systems.
Mining					There are two prospect gravel pits present in Region C. One is in the route width of Route Segment C1 (Purple Route) and the other is in the route width of Route Segment C2. Impacts are anticipated to be negligible. No other prospect or active gravel pits were identified within the ROI (the route width) for Region C.
Factor D Archaeological and Historic Resources					
Archaeological					Route Segment C1's (Purple Route) route width contains a Euro-American mortuary site and Route Segment C2 contains an alpha site (which has not been investigated by a qualified archaeologist) that is a Native American burial site that might have been subject to previous disturbance. Route Segments C3 and C4 (Blue Route) contain no archaeological sites within the route widths.
Historic					Route Segments Route Segment C1 (Purple Route) and C2 contain three unevaluated resources within the route widths, compared to two unevaluated resources in the route widths of Route Segments C3 and C4 (Blue Route).
Factor E Natural Resources					
Public and Designated Lands					There are at least 15 acres of CREP easements within the ROIs of all Route Segments, except for Route Segment C4 (Blue Route) which has none. RIM Reserve Land is present within the ROIs of Route Segment C1 (Purple Route) and C3. No RIM reserve Land or CREP land is crossed by the anticipated alignments and their associated ROWs, and it is anticipated to be avoided during final design. Wildlife Management Areas are present but assessed in wildlife. There are no state game refuges in the ROI of Region C.
Soils					Most of the soils in the region have a moderate or severe rutting hazard rating. Impacts could be minimized with BMPs or mitigated if long-term re-vegetation impacts extend beyond construction. Impacts to soils would be independent of the route selected.
Surface Water					The total count of watercourse crossings by the anticipated alignments of the route segments in Region C varies between 22 and 51, most watercourses are classified as ephemeral streams. The route segments in Region C have between six and eleven PWI watercourse crossings (Crow River South Fork, Chetomba Creek, Hawk Creek, and Belle Creek) and between four and six impaired watercourse crossings Route Segment C4 (Blue Route) has the fewest watercourse crossings while Route Segment C3 has the most watercourse crossings. Two unnamed agricultural drainageways parallel Route Segment C3 No waterbodies are crossed, and watercourses could be spanned by the project. No in-water work would occur.
Vegetation					Forested vegetation is minimal (up to 1 acre) for all route segments in Region C.
Wetlands					The route width of Route Segment C4 (Blue Route), the shortest route segment, would include the least wetland area (121.5 acres). All route segments contain 4.4 acres or less of forested wetlands within the ROW.

Routing Factor / Resource	Route Segments				
	C1 (Purple Route)	C2	C3	C4 (Blue Route)	Summary
Wildlife and Wildlife Habitat					Wildlife Management Areas are located within the route width and local vicinity of Route Segments C1 (Purple Route) and C3; their anticipated alignments would not cross them. The route width of Route Segment C1 (Purple Route) would cross the least acreage (42 acres) of Waterfowl Production Areas compared to the others (72 acres); however, none of their anticipated alignments would cross a Waterfowl Production Area. The route widths and anticipated alignments of Route Segments C1 (Purple Route) and C2 would intersect Grassland Bird Conservation Areas. Anticipated alignments of Route Segments C2, C3, and C4 (Blue Route) would cross (and span) a shallow wildlife lake.
Factor F Rare and Unique Natural Resources					
Rare and Unique Natural Resources					There are no documented records of threatened/endangered species within 1 mile of any of the route segments. The route width of Route Segment C1 (Purple Route) would intersect the most acres of Sites of Biodiversity Significance, native plant communities, and railroad ROW prairie. The route width of the other three route segments would generally avoid these areas or insect less than 1 acre.
Minnesota Statute 216E.03 - Subpart 7 (15e) *(transmission lines)*					
Paralleling Existing Transmission Line [1]					Route Segment C1 (Purple Route) is the only segment that parallels existing transmission line (6.1 miles and 11%). The other route segments do not parallel existing transmission line.
Minnesota Statute 216E.03 - Subpart 7 (8) *(roads/railroads)*					
Paralleling Roads and Railroads					Route Segment C2 parallels the most existing road ROW (45.6 miles, 78% of its length). Route Segments C1 (Purple Route), C3, C4 (Blue Route) parallel existing road for between 29% and 68% of their lengths.
Factor H Paralleling Division Lines					
Paralleling existing survey lines, natural division lines, and agricultural field boundaries					All route segments parallel existing division lines for 89% or more of their lengths.
Factor J Paralleling Existing Infrastructure					
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.					Route Segment C1 (Purple Route) parallel existing transmission lines for 6.1 miles and the second least amount of existing ROW (48% of its length). C2 parallels the most existing ROW (45.6 miles and 78%) but no existing transmission line. Route Segment C3 follows no existing transmission line and the least amount of existing ROW (16.9 miles, 29% of its length).
Factor L Costs					
Costs Dependent on Design and Route	$243,619,000	$255,129,000	$251,496,000	$124,307,000	As noted in Section 8.7, costs generally coincide with the length of the line. Route Segment C4 (Blue Route) has lower costs but it's within the other's margin of error when considered as a length per mile.

[1] Minnesota Statute 216E.03 - Subpart 7 (15e) requires the Commission to consider locating a route for a high-voltage transmission line on an existing high-voltage transmission route. The summarized here indicates where ROW paralleling to existing transmission lines occurs but does not distinguish between HVTLs and other transmission lines that might not meet the definition of a HVTL (for example, distribution lines). Highways are included in the assessment provided for Minnesota Statute 216E.03 - Subpart 7 (8).

8.9 Potential Refinements

A refinement is a route segment that was included in the scoping decision but not included within C1 through C4. For purposes of analysis, refinements are considered in standalone comparisons against Purple Route or Blue Route equivalents. Table 8-14 summarizes the refinements in Region C and indicates which alternative the refinement would replace. Data tables for the refinements are provided in Appendix E.

Table 8-14 Region C Refinements Summary

Refinement	Route Segment			
	C1 (Purple Route)	C2	C3	C4 (Blue Route)
Route Segment 224	x			
Route Segment 225	x			
Route Segment 222		x		x
Route Segment 223		x		x

8.9.1 Route Segment 224

Route Segment 224 departs the Purple Route at 30th Avenue SE and traverses east. It turns halfway into T119N, R33W, S19 until it rejoins the Purple Route (Map N.126, Map N.127, and Map N.128). This route segment was proposed to avoid agricultural lands and to follow a roadway. Table 8-15 summarizes differences in potential impacts of Route Segment 224 compared against its equivalent.

Table 8-15 Route Segment 224 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 224 parallels more existing infrastructure ROW (3.2 miles or 86%) compared to its equivalent (0.1 miles or 2%).
Human Settlement	Route Segment 224 has more residences within 250 to 500 feet (2) than its equivalent (1). Route Segment 224 has fewer residences within 500 to 1,600 feet (3) versus its equivalent (8).
Natural Environment – Surface Waters and Wetlands	Route Segment 224's equivalent crosses five watercourses; it also includes 2 acres of NWI wetlands. Route Segment 224 crosses six watercourses and has 2 acres of NWI wetlands.
Rare and Unique Natural Resources	The route width of Route Segment 224 would intersect a Site of Biodiversity Significance, and its anticipated alignment would cross it. The equivalent of Route Segment 224 would avoid this resource.

8.9.2 Route Segment 225

Route Segment 225 departs the Purple Route continuing north halfway into T119N, R33W, S6. It turns east at 30th Avenue NE until it rejoins the Purple Route (Map N.130 and Map N.131). This route segment was proposed to reduce the negative impacts to property values, plant life, wildlife, and stray voltage. Table 8-16 summarizes differences in potential impacts of Route Segment 225 compared against its equivalent.

Table 8-16 Route Segment 225 vs Its Equivalent Impact Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 225 parallels more existing infrastructure ROW (2.0 miles or 90%) compared to its equivalent (<0.1 miles or 1%). Route Segment 225 does not have any length that does not parallel division lines. The equivalent to Route Segment 225 includes a total of 1.0 miles that does not parallel existing infrastructure or division lines.
Human Settlement	Route Segment 225 has more residences within 75 to 250 feet (4) than its equivalent (1). Route Segment 225 has fewer residences within 500 to 1,600 feet (4) than its equivalent (9).
Natural Environment – Wildlife and Wildlife Habitat	The route widths of Route Segment 225 and its equivalent intersect a similar amount of a Grassland Bird Conservation Area and both of their anticipated alignments would cross it.
Rare and Unique Natural Resources	The route widths of Route Segment 225 and its equivalent intersect a Site of Biodiversity Significance, with the equivalent of Route Segment 225 intersecting more acreage (120 acres versus 60 acres). The anticipated alignments of both Route Segment 225 and its equivalent would cross the Site of Biodiversity Significance. However, Route Segment 225 would be on its outer edge and could potentially avoid crossing it during final design.

8.9.3 Route Segment 222 and 223

Route Segment 222 departs the Blue Route at 195th Avenue SE and traverses north. It turns east at CR 77 until it rejoins the Blue Route (Map N.149, Map N.150, and Map N.151). This route segment was proposed to minimize impacts to property values.

Route Segment 223 departs the Blue Route continuing east on 100th Street. It turns north at 515th Avenue until it rejoins the Blue Route (Map N.149, Map N.150, and Map N.151). This route segment was proposed to reduce the land use impacts to the area. Noted land use impacts included: "location of buried power cable, and fiber along the Kandi Meeker line Road as well as proximity to open drainage ditches and the Lux Air Strip."

Table 8-17 summarizes differences in potential impacts of Route Segment 222 and 223 compared against its equivalent.

Table 8-17 Route Segment 222 and 223 vs Its Equivalent Impact Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 222 and 223 parallel more existing infrastructure ROW (6.0 miles or 75% and 8.0 miles, or 100%, respectively) compared to their equivalent (5.0 miles or 63%).
Land-based economies, agricultural	Route Segment 223 would minimize impacts to the Lux Strip Airport because it would traverse parallel to the airstrip versus perpendicular and would traverse parallel to an already existing transmission line as shown in Figure 8-5.
Human Settlement	Route Segment 222 has one residence within 250 to 500 feet; Route Segment 223 has three and their equivalent has two. Route Segment 223 has the most residences within 500 and 1,600 feet (13), the equivalent has the least (5).
Natural Environment – Designated Lands	Neither Route Segment 222 nor its equivalent contain any conservation easements with the route width. Route Segment 223 includes 1 acre of CREP conservation easement.
Natural Environment – Surface Waters and Wetlands	Route Segment 222 crosses five watercourses; it also includes 2 acres of NWI wetlands. Route Segment 223 crosses five watercourses and has <1 acres of NWI wetlands. Route Segment 222, 223's equivalent crosses five watercourses; it also includes 2 acres of NWI wetlands.
Natural Environment - Vegetation	According to the NLCD, the ROW of Route Segment 223 would intersect less than 1 acre of forested landcover, while Route Segment 222 and the equivalent do not intersect any forested landcover.

8.10 Alternative Alignment

Alternative Alignment 2 is the only alternative alignment in Region C. It was proposed to move the alignment back from the commentor's dwelling and to minimize the need for tree clearing which the commenter says is used for a shelter belt and CRP. It is shown on Map N.156.

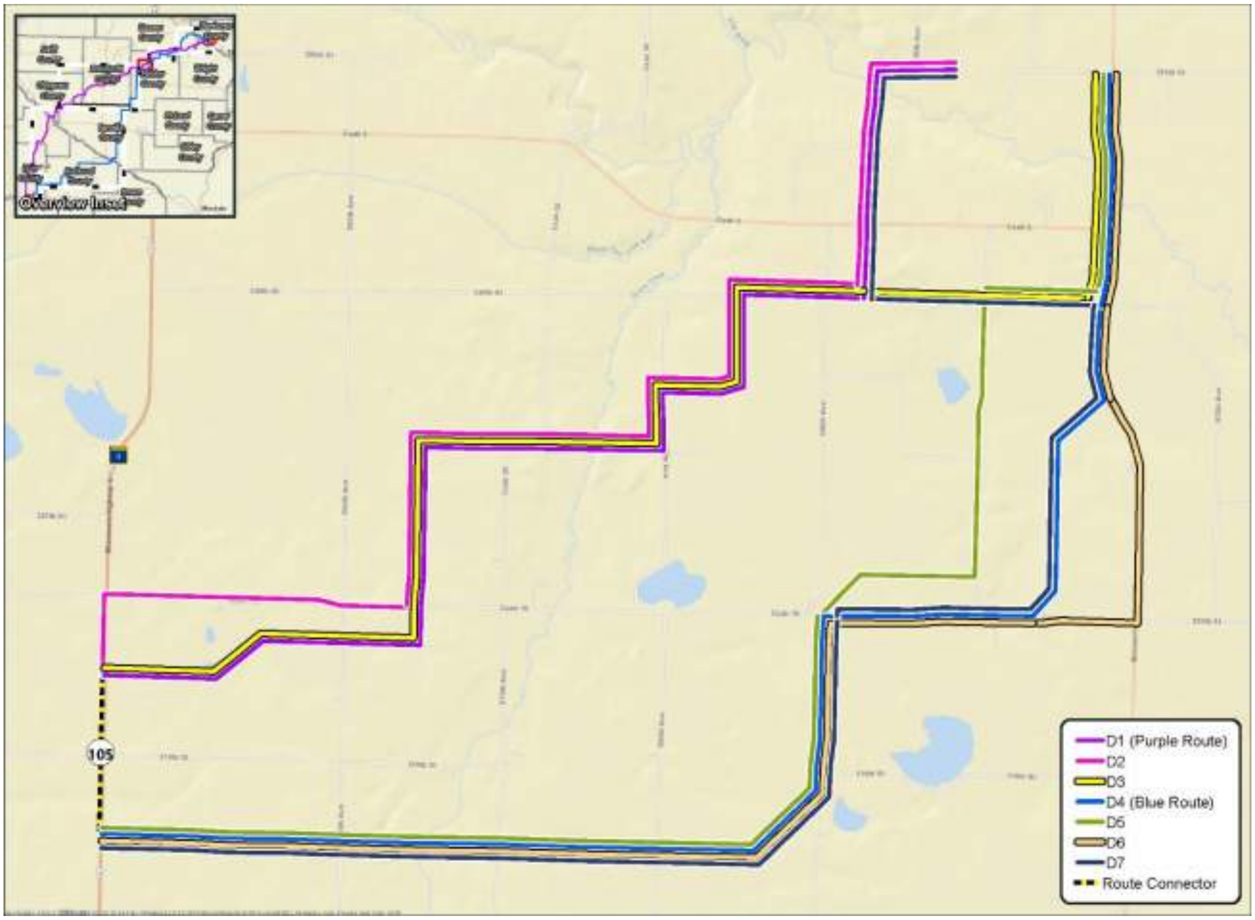
9 Region D - Potential Impacts and Mitigation

Chapter 9 describes potential impacts in Region D, which is in the northern half of the project area and is in Meeker County (Map 2). The seven route segments in Region D are shown in Figure 9-1 and described below.

- Route Segment D1 is the applicant's proposed Purple Route. It is 9.1 miles long.
- Route Segment D2 is a variation of the Purple Route. It is 9.2 miles long. It includes Route Segment 228 which was proposed as an alternative to minimize potential impacts to wetlands, wildlife habitat, and farmland.
- Route Segment D3 is a variation of the Purple Route to Blue Route. It is 10.1 miles long. It includes a portion of the applicant's proposed Purple Route, Route Connector 106 (proposed by the applicant as a means of shifting from one proposed route to the other) and a portion of the applicant's proposed Blue Route.
- Route Segment D4 is the applicant's proposed Blue Route. It is 10.8 miles long.
- Route Segment D5 is a variation of the Blue Route. It is 10.9 miles long. It includes Route Segment 226 which was proposed as an alternative to minimize potential impacts to farmland and decrease the proximity to homes.
- Route Segment D6 is a variation of the Blue Route. It is 11.4 miles long. It includes Route Segment 227 which was proposed as an alternative to minimize potential impacts to wetlands, wildlife habitat, and farmland.
- Route Segment D7 is a variation of the Purple Route to Blue Route. It is 12.8 miles long. It includes a portion of the applicant's proposed Blue Route, Route Connector 106 (proposed by the applicant as a means of shifting from one proposed route to the other), and a portion of the applicant's proposed Purple Route.

Route Connector 105 can connect the Purple Route and Blue Route in either direction. Route Connector 106 was proposed by the applicant as a means of shifting from one proposed route to the other. It is further described in Section 9.9 and it is 1 mile long.

Figure 9-1 Region D Route Segments



9.1 Environmental Setting

Region D is dominated by agricultural land use and with rural residential (Map 6). Major waterways crossed by the route alternatives within Region D include the North Fork Crow River and Grove Creek (Map 14).

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. Under this classification system, Region D is in the North Central Glaciated Plains section of the Prairie Parkland Province and the Minnesota and NE Iowa Morainal section of the Eastern Broadleaf Forest Province (Map 15). These sections are further broken down into subsections, including the Minnesota River Prairie Subsection and the Hardwood Hills Subsection in the northeast portion of the region. These subsections are used below to classify the environmental setting of the project.

The Minnesota River Prairie Subsection most predominantly spans the route alternatives throughout the project, and is present in the on the northeastern portion of Region A. This area is characterized by large till plains that are bisected by the broad valley of the Minnesota River. Topography is steepest along the

Minnesota River and the Big Stone Moraine, which has steep kames and broad slopes, while topography outside of the river valley consists of level to gently rolling ground moraine. Glacial drift generally ranges between 100 and 400 feet throughout this subsection. Soils are mostly well to moderately well-drained loams formed in gray calcareous till with some localized inclusions of clay, sand, and gravel soils. Wetlands were common within this subsection prior to pre-European contact, and most have been drained to establish usable cropland (reference (188)).

The Hardwood Hills Subsection is characterized by steep slopes, high hills, and lakes formed in glacial end moraines and outwash plains. The Alexandria Moraine forms a high ridge that is the headwaters region of many rivers and streams flowing east and west. Most of this subsection is covered in 100 to 500 feet of glacial drift over diverse bedrock. Loamy soils are dominant, with loamy sands and sandy loams on outwash plains as well as loams and clay loams on moraines. Woodland and forest were common within this subsection prior to pre-European contact, with some forests remaining adjacent to lakes or steep landscapes. Wetlands and lakes in poorly-drained potholes provide opportunities for recreation or wildlife habitat in this subsection with tourism opportunities, especially in areas around lakes (reference (212)).

Region D is in the northern half of the project area and is in Meeker County Minnesota (Map 2). Grove City is the nearest major community near the project and is to the southwest of Region D (Map 2). Existing transmission lines are prevalent throughout the region. No railroads traverse through the region. Region D is generally bounded by State Highway 4 to the west and State Highway 22 to the east. Region D intersects with State Highways 4 and 22. There are no Federal highways within Region D. State highways within the project area include State Highway 22 and State Highway 4. County and Township roads are also present within the region (Map 9).

9.2 Human Settlement

9.2.1 Aesthetics

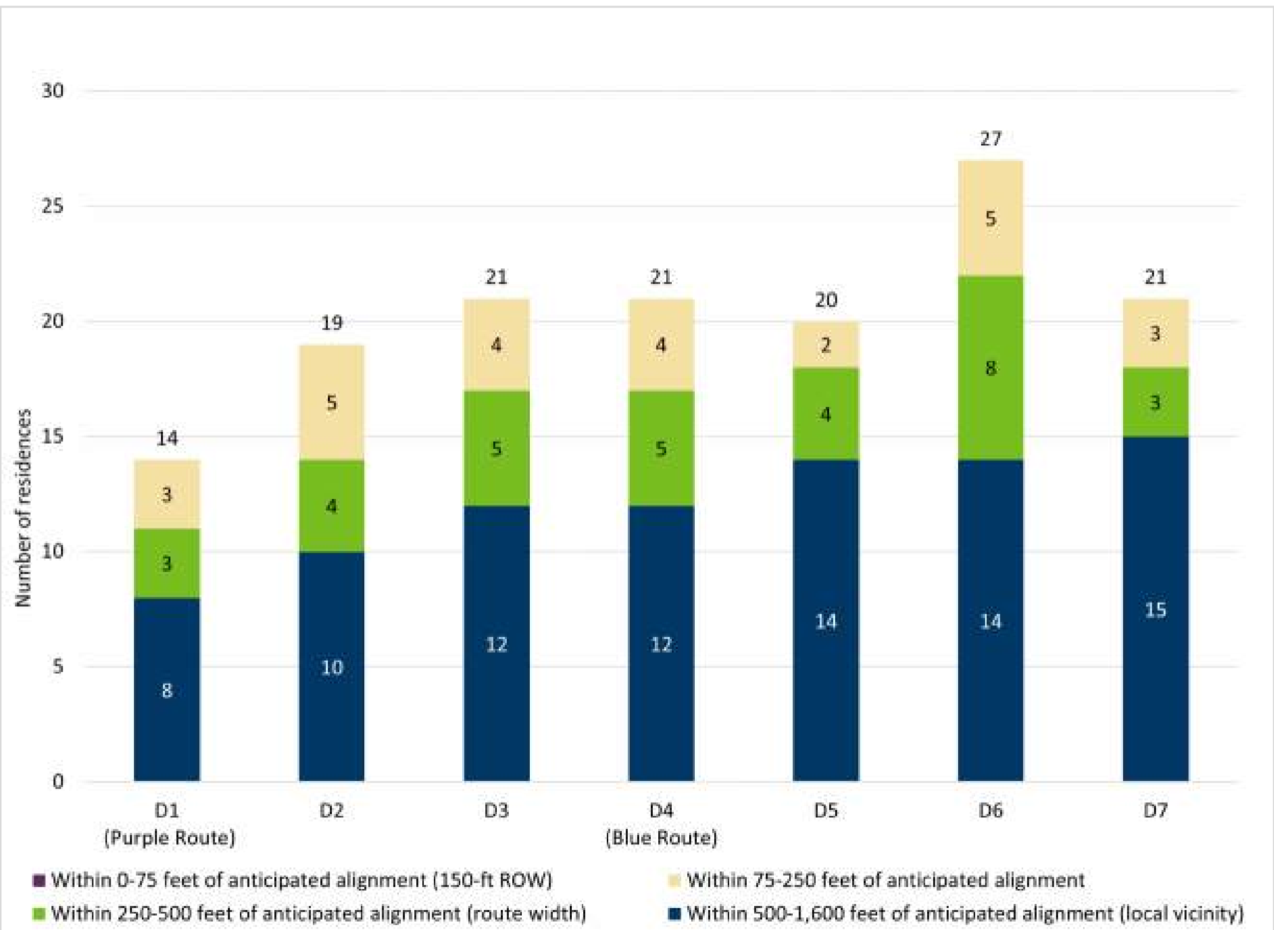
The ROI for aesthetics is the local vicinity. HVTLs alter a viewshed (Section 5.2.1.2). Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes. 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, and 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 HVTL 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. Additional details regarding potential impacts to aesthetics and potential mitigation measures is provided in Section 5.2.1.

All route segments cross the North Fork of the Crow River. This watercourse is designated as a state water trail, which promotes water recreation (Minnesota Statutes § 85.31), and a wild and scenic river (Minnesota Statutes § 103F.305), which falls under certain protections put in place in Minnesota's 1973 Wild and Scenic Rivers Act. Route Segment D1 (Purple Route) and Route Segment D2 would cross the watercourse parallel to an existing road crossing at 355th Street. Some forested area adjacent to the existing road would require clearing Map N.177. Route Segments D3 through D7 would cross the watercourse parallel to an existing road crossing at County Road 22. Some forested area adjacent to the existing road and west of a canoe landing would require clearing Map N.182.

Appendix N shows human settlement features (for example, residences and nursing homes) in the local vicinity of the route segments. The proximity of residential structures (homes) and non-residential structures to route segments at various distances is shown in Figure 9-2 and Table 9-1, respectively. Route Segment D1 (Purple Route) would have the least number of residences within the local vicinity (14). It also has the least number of non-residential structures within the local vicinity (91).

Figure 9-2 Region D Route Segments Proximity of Residential Structures



For total count of residential structures within the route width, combine residential structures within 75-250 feet and residential structures within 250 and 500 feet. For total count of residential structures within the local vicinity, combine residential structures within each distance; this number is also stated at the top of each bar.

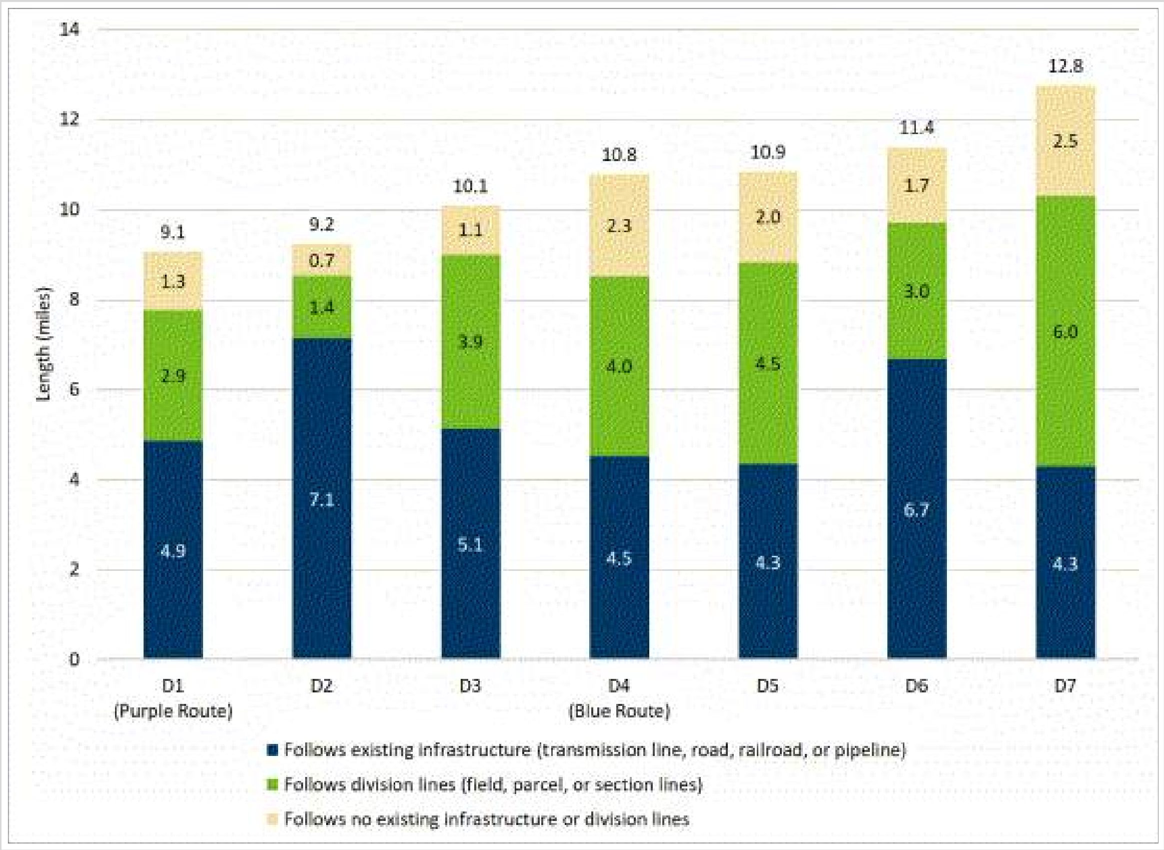
Table 9-1 Region D Route Segments Proximity of Non-Residential Structures

Non-Residential Structures	Route Segment						
Distances from Anticipated Alignment	D1 (Purple Route)	D2	D3	D4 (Blue Route)	D5	D6	D7
0-75 feet (150-foot-ROW)	0	0	0	0	0	0	0
75-250 feet	9	12	3	3	1	3	9
250-500 feet (generally route width)	23	33	38	36	31	39	22
500-1,600 feet (local vicinity)	59	79	81	87	83	102	114
Total	91	124	122	126	115	144	145

Non-residential structures include churches, schools (public and private), daycares/child-care centers/pre-schools, hospitals, nursing homes, and commercial and non-residential structures.

Each route segment would parallel with existing infrastructure or division lines as shown in Figure 9-3 and Table 9-2. In some cases, portions of a route segment might parallel ROW with more than one of these existing features at the same time. Map 9 illustrates where ROW paralleling occurs and shows existing infrastructure and division lines in the region. None of the segments parallel existing transmission line ROW. Route Segment D2 parallels the most roadways (7.1 miles and 77 percent of its length). Route Segment D7 parallels the least amount of ROW with existing infrastructure (4.3 miles and 34 percent of its length).

Figure 9-3 Region D Route Segments ROW Paralleling of Existing Infrastructure and/or Division Lines Summary



The total mileage at the top of each route segment represents that route segment's total length. Numbers may not sum due to rounding.

Table 9-2 Region D Route Segments ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

Infrastructure and/or Division Lines	Route Segment						
	D1 (Purple Route)	D2	D3	D4 (Blue Route)	D5	D6	D7
Follows existing transmission line (miles, percent)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Follows existing roads (miles, percent)	4.9 (54)	7.1 (77)	5.1 (51)	4.5 (42)	4.3 (40)	6.7 (59)	4.3 (34)
Follows existing railroad (miles, percent)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Follows existing pipeline (miles, percent)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total ROW paralleling (w/transmission line, road, and railroad) (miles, percent)	4.9 (54)	7.1 (77)	5.1 (51)	4.5 (42)	4.3 (40)	6.7 (59)	4.3 (34)
Follows Field, parcel, and Section Lines (miles, percent)	7.8 (86)	8.5 (92)	9.0 (89)	8.5 (79)	8.8 (81)	9.7 (85)	10.3 (81)
Total- All (miles, percent) [1]	7.8 (86)	8.5 (92)	9.0 (89)	8.5 (79)	8.8 (81)	9.7 (85)	10.3 (81)

Totals might not sum to 100 percent due to rounding.
[1] This total is indicative of the full length of the route segment that parallels existing infrastructure ROW and/or division lines. For Region D, the total presented here is the same as the total for following division lines because there is not any length that follows existing infrastructure that doesn't allow follow division lines.

9.2.2 Cultural Values

Potential impacts to cultural values are discussed for the entire project in Section 5.2.2. The assessment was completed for the project as a whole because existing conditions are better understood at a broader scale than the regional level. Impacts to cultural values are independent of the route selected.

9.2.3 Displacement

The ROI for displacement is the ROW. Displacement occurs when a residence or building is required to be removed for construction of the project. Residential buildings within the ROI would require removal, whereas non-residential buildings could stay within the ROI if the activities taking place in these buildings are compatible with the safe operation of the line. Additional details regarding displacement and potential mitigation measures are provided in Section 5.2.3.

There are no residences or non-residential structures within the ROI for the route segments within Region D (Table 9-1).

9.2.4 Environmental Justice

No EJ areas were identified in Region D. See Section 5.2.4 for the assessment on environmental justice in Region D.

9.2.5 Land Use and Zoning

Potential impacts to land use and zoning are discussed in Section 5.2.5. The assessment for land use and zoning was completed for the project as a whole because existing conditions are determined by jurisdictional areas (counties) and do not coincide with the project's regional boundaries.

9.2.6 Noise

Potential impacts from noise are discussed for the entire project in Section 5.2.6. The assessment for noise was completed for the project as a whole because there is limited variability in the potential for noise across the route alternatives.

9.2.7 Property Values

Potential impacts to property values are discussed for the entire project in Section 5.2.7. The assessment for property values was completed for the project as a whole because there is limited variability in the potential for property value impacts across the route alternatives.

9.2.8 Recreation

The ROI for recreation is the route width. 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 5.2.8.2**). 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 would vary based on individual perspectives and experiences. Impacts to recreation are assessed through identification of recreational resources within the ROI. The project is not anticipated to directly impede recreational activities within the ROI such as snowmobiling, golfing, canoeing, hunting, or fishing. Additional details regarding potential impacts to recreation and potential mitigation measures for the project is provided in Section** 5.2.8**.**

Route segments in Region D do not cross any public land-based trails or scenic byways. No Wildlife Management Areas or Waterfowl Production Areas are present in Region D. A state water trail, wild and scenic river and snowmobile trails are present (Map 5) and summarized in Table 9-3.

The Crow River is designated as a state water trail and a wild and scenic river as described in Section 5.2.8 and is crossed by each of the route segments in Region D (Map N.177 and Map N.182). Aesthetic impacts related to the watercourse crossing are discussed in Section 9.2.1.

Snowmobile trails, by the name of Meeker County Trails, are present within the route widths of all route segments and maintained by Meeker County Sno Drifters. Route segments cross snowmobile trails a similar number of times, however Route Segments D1 (Purple Route) and D2 have 1.2 miles of snowmobile trails present compared to 1.8 miles or more being present in the other routes.

Table 9-3 Region D Route Segments Recreational Resources within Route Width

Recreational Resource	Unit	Route Segment						
		D1 (Purple Route)	D2	D3	D4 (Blue Route)	D5	D6	D7
Crow River, North Fork State Water Trail and Wild and Scenic River	Crossings (linear feet) [1]	1 (1,608)	1 (1,608)	1 (2,222)	1 (2,222)	1 (2,222)	1 (2,222)	1 (1,608)
Meeker County Trails - Snowmobile Trail	Crossings (miles)	5 (1.2)	5 (1.2)	5 (2.3)	6 (2.9)	6 (2.9)	6 (2.9)	6 (1.8)

[1] Linear feet totals are taken from the DNR Minnesota State Water Trails Dataset

9.2.9 Socioeconomics

Potential impacts to socioeconomics are discussed for the entire project in Section 5.2.9. This is because the assessment was completed at the county level, which does not always align with regional boundaries.

9.2.10 Transportation and Public Services

Potential impacts to transportation and public services are discussed for the entire project in Section 5.2.10. The assessment was completed for the project as a whole and not carried forward at the regional level because there is limited variability in across the route alternatives. Potential impacts to private airstrips are discussed in land-based economies.

9.3 Human Health and Safety

The impacts to human health and safety are discussed generally for the entire project in Section 5.3. The assessment was completed for the project as a whole and not carried forward at the regional level because there is limited variability across the route alternatives and generally impacts would be minimized by appropriate placement and adhering to applicable transmission line standards and codes**.**

9.4 Land-based Economies

Land-based economies are assessed by considering four elements: agriculture, forestry, mining, and tourism (Section 5.4). Impacts to three elements of land-based economies are anticipated to be minimal and independent of the route segment selected in Region D. These elements are:

- **Forestry –** There are no known forestry operations in the ROI (Section 5.4.1.3).
- **Mining**- No active aggregate mining was identified within the ROI (the route width) for Region D.
- **Tourism** – Recreational resources, including a state water trail and scenic byways, are present within the ROI. However, the project is not anticipated to adversely affect the recreational resources. Therefore, any direct impacts to the recreation that would cause an indirect impact to tourism-based economies are anticipated to be negligible (Section 5.4.2.4).

9.4.1 Agriculture

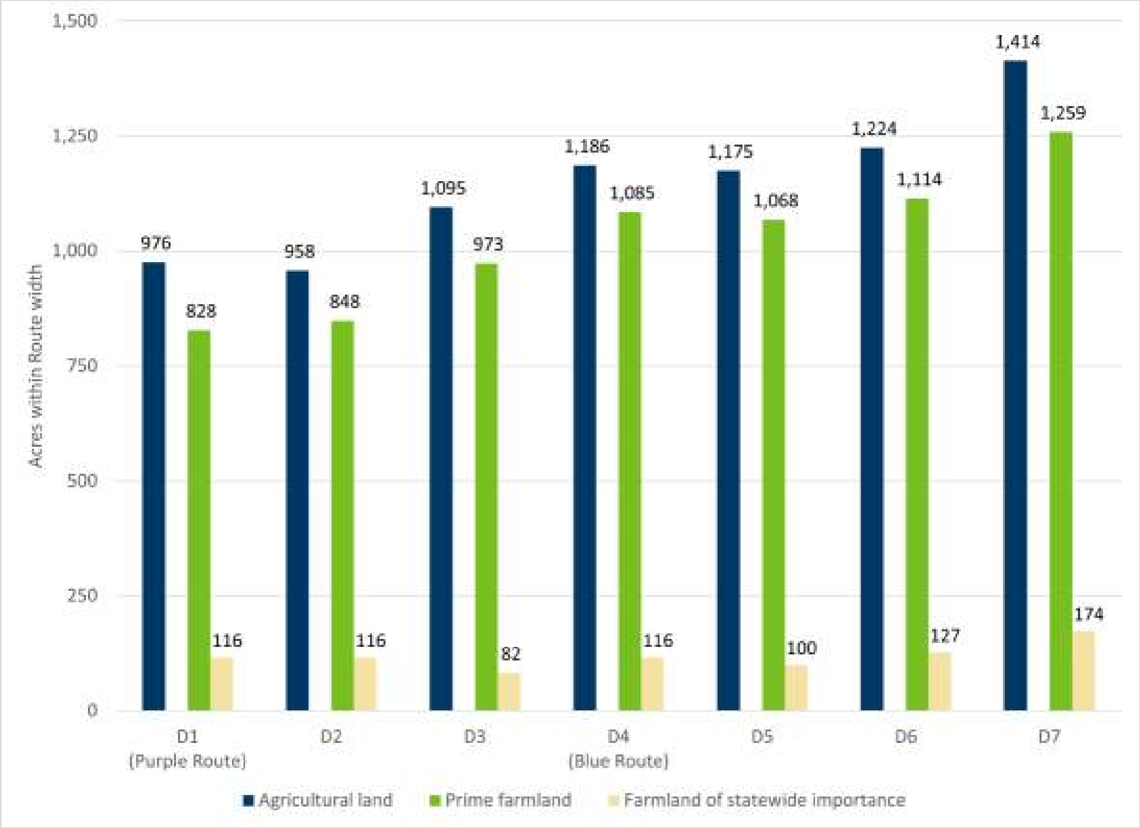
The ROI for the land-based economy of agriculture is the route width. Construction and operation of a HVTL impacts agriculture (Section 5.4.2.1). During construction, impacts would include the limited use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Permanent impacts would also occur when the footprint of the HVTL structures directly impedes agricultural production and/or impedes efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields.

Prudent routing (paralleling existing infrastructure and/or paralleling division lines) could help minimize potential impacts. Implementation of the AIMP (Appendix K), would minimize and mitigate impacts to agriculture. Additional details regarding potential impacts to agriculture and potential mitigation measures is provided in Section 5.4.

Figure 9-4 summarizes the total acres within the route widths of Region D route segments that are designated as agricultural land use, as well as prime farmland and farmland of statewide importance. Most land (more than 70%) within the route widths of the route segments in Region D is designated as agricultural land use (cultivated crops and hay/pasture; see Section 9.6.10). Route Segment D7 has the most prime farmland and farmland of statewide importance and is the longest route segment (12.8 miles). Route Segments D1 (Purple Route) and D2 have the least prime farmland and are the shortest segments (9.1 and 9.2 miles).

As noted in Table 9-2, Route Segment D2 parallels the most existing infrastructure (77% of its total length) and Route Segment D7 parallels the least amount (34% of its total length). Route Segment D7 also has the greatest distance that does not follow existing infrastructure or division lines at 2.5 miles (Figure 9-3), and Route Segment D2 has the smallest distance that does not follow existing infrastructure or division lines at 0.7 miles. Route Segment D2 also avoids impacts to center pivot irrigation systems.

Figure 9-4 Region D Route Segments, Acres of Agricultural Lands and Prime Farmland within Route Widths



Source: Agricultural land, NLCD and prime farmland/farmland of statewide importance, SSURGO (Appendix C)

Two center pivot irrigation systems are crossed by the anticipated alignments for Route Segments D4 (Blue Route), D5, D6, and D7 (Map 11.5). Both systems are centered within the route width and therefore would be unavoidable.

While not crossed by its anticipated alignment, one center pivot irrigation system is located within the route width of Route Segments D4 (Blue Route), D6, and D7. The anticipated alignment avoids impacts to the center pivot irrigation systems because it is located west of Minnesota Highway 22 where it traverses north (Map 11.5).

9.5 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 (Section 5.5.2). 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. Indirect 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. Additional details concerning potential impacts and mitigation for the project as a whole regarding archaeological and historic resources are provided in Section 5.5.3.

Documented archaeological and historic resources within Region D are summarized in the following tables.

- Table 9-4 summarizes the number of archaeological and historic resources within the project area (which is within one mile of the anticipated alignments).
- Table 9-5 summarizes the number of archaeological and historic resources within the ROI (route width) for each of the Region D, route segments.
- Table 9-6 provides descriptions of the resources located within the route widths.

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

Table 9-4 Region D, Route Segments, Number of Archaeological and Historic Resources within the Project Area

Route Segment	Archaeological Resources	Historic Architectural Resources	Historic Cemeteries (1 Mile)
D1 (Purple Route)	0	9	0
D2	0	8	0
D3	0	10	0
D4 (Blue Route)	0	8	0
D5	0	8	0
D6	0	8	0
D7	0	9	0

Table 9-5 Region D, Route Segments, Number of Archaeological and Historic Resources within the Route Width

Route Segment	Archaeological Resources	Historic Architectural Resources	Historic Cemeteries
D1 (Purple Route)	0	3	0
D2	0	3	0
D3	0	4	0
D4 (Blue Route)	0	3	0
D5	0	3	0
D6	0	3	0
D7	0	3	0

Table 9-6 Region D, Route Segments, Historic Resources within the Route Width Summary

Route Segment(s)	Site/Resource Number	Resource Type	Resource Name/Description	NRHP Status
D1 (Purple Route), D2, D3	ME-HAR-00009	Historic Architecture	Culvert 96275	Not Eligible
D1 (Purple Route), D2, D7	ME-MAN-00014	Historic Architecture	Bridge 47519	Not Eligible
D1 (Purple Route), D2, D3, D4 (Blue Route), D5, D6, D7	XX-ROD-00026	Historic Architecture	Trunk Highway 4	Not Eligible
D3, D4 (Blue Route), D5, D6	ME-MAN-00011	Historic Architecture	Bridge 47007	Not Eligible
D3, D4 (Blue Route), D5, D6, D7	XX-ROD-00056	Historic Architecture	Trunk Highway 22	Not Eligible

9.5.1 Archaeological Resources

There are no previously recorded archaeological resources present within the route widths of any of the route segments in Region D (Table 9-5).

9.5.2 Historic Architectural Resources

Five historic architectural resources are present within the route widths of the route segments in Region D (Table 9-6). All five historic architectural resources are ineligible. No route segments contain eligible or unevaluated resources.

9.6 Natural Environment

9.6.1 Air Quality

Potential impacts to air quality are expected to be similar to those discussed for the entire project in Section 5.6.1. The assessment for air quality was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

9.6.2 Climate

Potential impacts to climate are expected to be similar to those discussed for the entire project in Section 5.6.2. The assessment for climate was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

9.6.3 Geology and Topography

Potential impacts to geology and topography are expected to be similar to those discussed for the entire project in Section 5.6.3. The assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

9.6.4 Greenhouse Gases

Potential impacts to greenhouse gases are expected to be similar to those discussed for the entire project in Section 5.6.4. The assessment for greenhouse gases was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected given their similar lengths.

9.6.5 Groundwater

Potential impacts to groundwater are expected to be similar to those discussed for the entire project in Section 5.6.5. The assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

9.6.6 Public and Designated Lands

There are no public or designated lands within the route width of Region D.

9.6.7 Rare and Unique Natural Resources

Rare and unique natural resources encompasses 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 construction and operation-related impacts to protected species and sensitive ecological resources are discussed in Section 5.6.7.4. 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. 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.

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 that 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, are described in Section 5.6.7.5.

Sensitive ecological resources within Region D are shown on Map 12. To protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on maps.

9.6.7.1 Protected Species

According to the NHIS database, no federally or state protected species or state special concern species have been documented within 1 mile of the route segments in Region D.

Formal protected species surveys have not been conducted for the project; as such, it is possible that protected species could be present where suitable habitat is available within the ROW or route width of the route segments. Prior to construction, the applicant could be required to conduct field surveys in coordination with the USFWS and/or DNR for the potential presence of protected species.

9.6.7.2 Sensitive Ecological Resources

The route widths of Route Segments D1 (Purple Route), D2, and D7 would intersect a Site of Biodiversity Significance ranked moderate and a native plant community within it (Table 9-7). None of the anticipated alignments for these route segments would cross these resources.

Table 9-7 Region D, Route Segments, Sensitive Ecological Resources Within Route Width

Resource	Units	Route Segment						
		D1 (Purple Route)	D2	D3	D4 (Blue Route)	D5	D6	D7
Sites of Biodiversity Significance	Total acres; all ranked moderate	6	6	0	0	0	0	6
Native Plant Communities	Total acres; Conservation status S3	6	6	0	0	0	0	6

9.6.8 Soils

The ROI for soils is the ROW. Common soil impacts include rutting, compaction, and erosion (Section 5.6.8.2). Potential impacts would be short-term during construction and localized. Impacts 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 vehicles trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored a suitable location. Disturbed areas would be promptly seeded after construction. Additional details regarding potential impacts to soils and potential mitigation measures is provided in Section 5.6.8.

Map 13 shows the surface soil textures across the region. Soil types within the ROW were reviewed to identify soil characteristics that could be more prone to impacts in some areas versus others (Table 9-8). Soils within the ROW of the route segments of Region D include soils prone to compaction (13 to 44 percent of ROW), soil susceptible to erosion (less than 6 percent of ROW), and hydric soil (less than 55 percent of ROW). Most soils within the ROW of the route segments of Region D have a moderate or severe rutting hazard rating.

Table 9-8 Region D, Route Segments, NRCS Mapped Soils Within ROW

Soil Data	Unit	Route Segment						
		D1 (Purple Route)	D2	D3	D4 (Blue Route)	D5	D6	D7
Area within Route Segment ROW	Acres	165	168	184	196	198	207	232
Hydric Soils 1	Acres	47	48	55	69	67	66	69
Compaction Prone 2	Acres	72	72	70	65	75	65	99
Rutting Hazard 3	Acres	165	168	184	196	198	207	232
Erosion Hazard (Off-Road, Off-Trail) 4	Acres	6	6	6	10	5	11	15
Revegetation Concerns 5	Acres	0	0	0	0	0	0	0

[1] Hydric soil include hydric soils (100%) and predominantly hydric soils (67-99%).
[2] Soils considered to be Compaction Prone soils include those with a rating of "Medium" or higher.
[3] Soils considered susceptible to Rutting Hazard include those with a rating of "Moderate" or "Severe".
[4] Soils considered susceptible to erosion hazard soils include those with a rating of "Medium", "Severe", or "Very Severe".
[5] Soils considered to have revegetation concerns include soils with a non-irrigated land capability classification of 3 or greater.

9.6.9 Surface Water

The ROI for surface water is the route width. Potential impacts to surface waters are discussed in Section 5.6.9.2. Direct impacts caused by structures placed in surface waters would be avoided by spanning the 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 or waterbodies and/or special or impaired waters.

Impacts would be mitigated by using BMPs. 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. Additional details regarding potential impacts to surface waters and potential mitigation measures, including those provided in the DNR's Natural Heritage Review response, is provided in Section 5.6.8.3.

Map 14 shows the waterbodies and watercourses across the region. There are no trout streams crossed by the route segments in Region D.

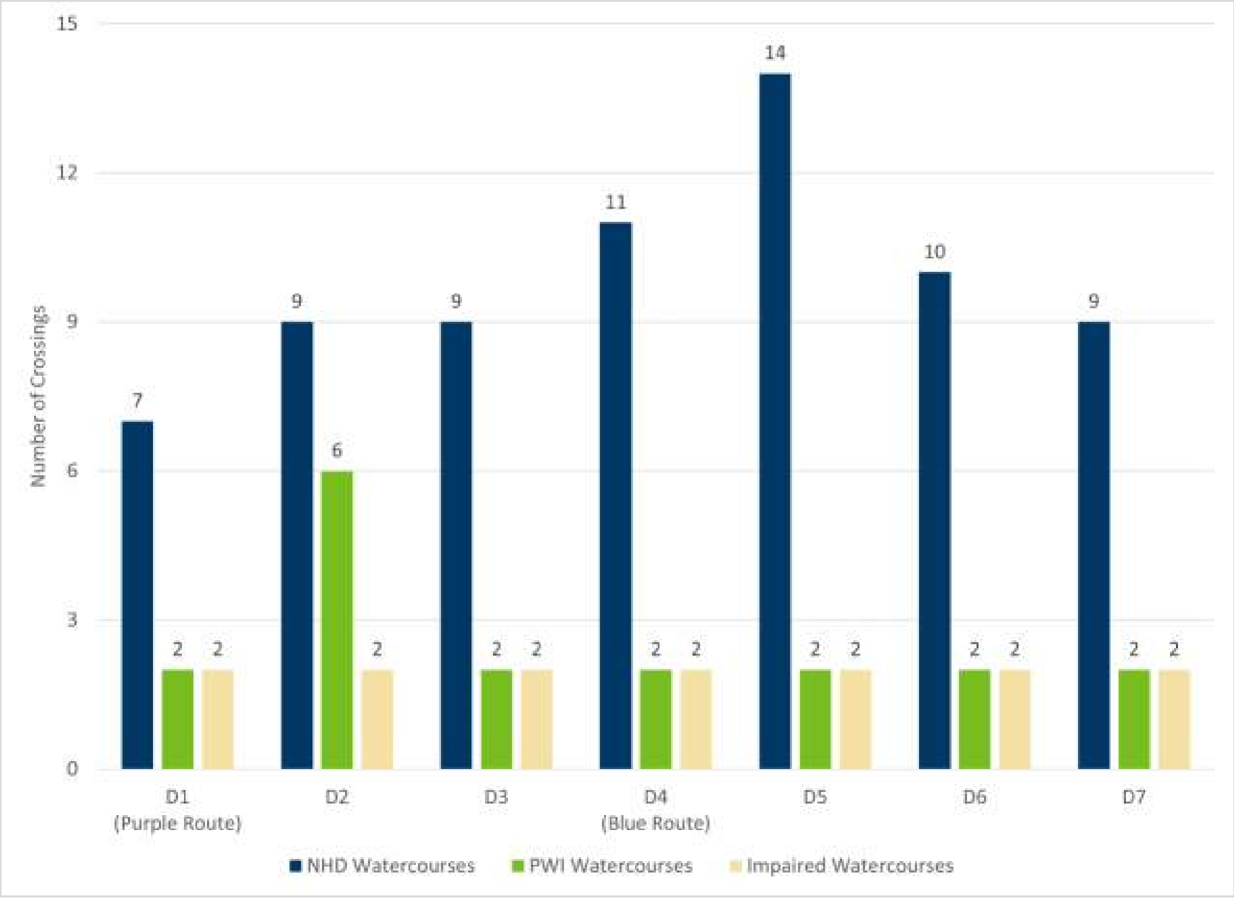
All route segments cross the Crow River, which is a state-designated outstanding resource value water and a state-designated wild and scenic (Map N.82 and Map N.177). As noted in Section 9.2.1, tree clearing near the banks of the watercourse would be required at both crossing locations. Tree clearing could cause an increased potential for erosion and sedimentation.

Each route segment includes up to one waterbody in their route width. Of the waterbodies present in Region D, only one is designated as a PWI basin. The PWI basin (Half Moon Lake) is within the route width of Route Segments D4 (Blue Route), D5, D6, and D7 but is not crossed by any of their anticipated alignments (Map N.179).

The total count of watercourse crossings by the anticipated alignments of route segments in Region D varies between seven to 14 watercourses (Figure 9-5); most of the watercourses are classified as intermittent streams. Route Segment D1 (Purple Route) has the fewest watercourse crossings while Route Segment D5 has the most watercourse crossings.

All the route segments have two impaired watercourse crossings, with the exception of Route Segment D2 which has six impaired watercourse crossings. PWI watercourses crossed in Region D include Grove Creek, Crow River, and County Ditch 7.

Figure 9-5 Region D, Route Segments, Number of Watercourse Crossings by Type



9.6.10 Vegetation

The ROI for vegetation is the ROW. Potential construction and operation-related impacts to vegetation are discussed in Section 5.6.10.2. 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. 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, as described in Section 5.6.10.3.

Map 7 provides an overview of landcover types across Region D, and Table 9-9 summarizes the landcover types within the ROW of each route segment in Region D. Agricultural vegetation, particularly cultivated cropland, represents the dominant vegetative landcover type within the ROW of each route segment in Region D. Small amounts of herbaceous landcover, primarily wetlands, are also present in the ROW of each route segment. A minimal amount of forested landcover (1 acre or less), primarily consisting of forested wetlands, is present in the ROW of all route segments.

As discussed in Section 5.6.10.2, the applicant would clear forested vegetation from the ROW during construction, and the ROW would be maintained with low-growing vegetation during operations to minimize potential interference with the transmission line. Given that a maximum of 1 acre of forested vegetation is in the ROW of all route segments in Region D, impacts are anticipated to be minimal.

Table 9-9 Region D, Route Segments, Landcover Types in the ROW

Landcover Type	Route Segment						
	D1 (Purple Route)	D2	D3	D4 (Blue Route)	D5	D6	D7
Agricultural (cultivated crops and hay/pasture) (acres in ROW [%of ROW])	129 (78%)	128 (76%)	148 (81%)	152 (77%)	152 (77%)	151 (73%)	186 (80%)
Herbaceous (upland and wetland) (acres in ROW [%of ROW])	3 (2%)	2 (1%)	4 (2%)	5 (3%)	5 (3%)	5 (2%)	3 (2%)
Forest (upland and wetland) (acres in ROW [%of ROW])	1 (<1%)	1 (<1%)	<1 (<1%)	<1 (<1%)	1 (<1%)	<1 (<1%)	1 (<1%)
Open water (acres in ROW [%of ROW])	2 (1%)	0 (0%)	2 (1%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Developed (low-high intensity; open space) (acres in ROW [%of ROW])	30 (18%)	38 (22%)	29 (16%)	39 (20%)	40 (20%)	51 (25%)	42 (18%)

Source: NLCD (Appendix C)
Totals might not sum to 100 percent due to rounding.

Potential impacts to agricultural vegetation and wetlands are discussed Section **5.4.2** and **5.6.11.2**, respectively.

9.6.11 Wetlands

The ROI for wetlands is the route width. Short-term and long-term potential impacts to wetlands are discussed in Section 5.6.11.2. Impacts to wetland 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 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.

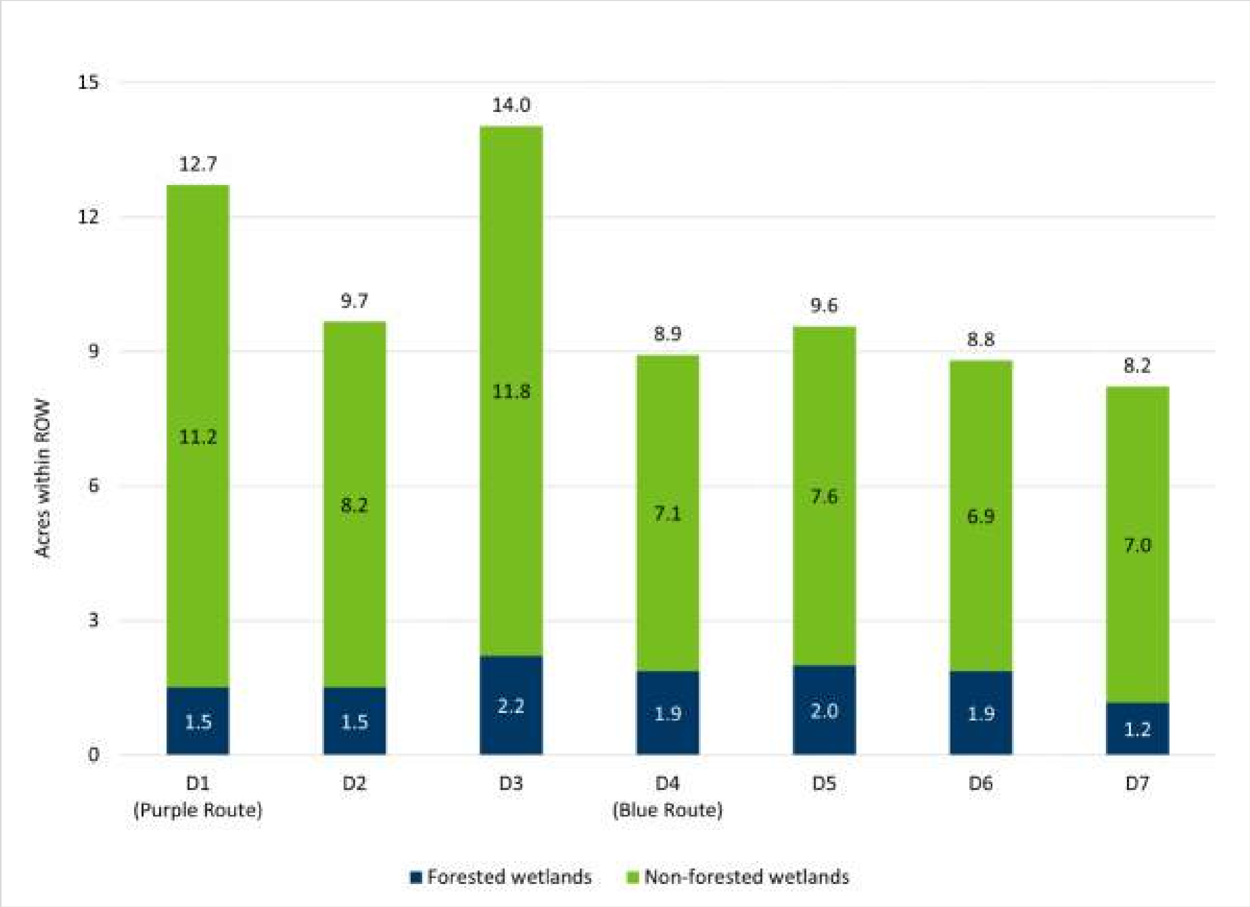
Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width. Wetland impacts would be regulated as described in Section 5.6.11.1.1. Additional details regarding potential impacts to wetlands, including those provided in the DNR's Natural Heritage Review response, and potential mitigation measures is provided in Section 5.6.11.3.

Map 14 shows the mapped wetlands within the ROI. Direct wetland impacts would occur within the construction workspace (within or adjacent to the ROW); not all wetland areas within the ROI would be subject to direct impacts as most could be spanned. Wetlands in the Region D ROI consist mainly of emergent wetlands but also aquatic bed, forested, scrub-shrub, unconsolidated bottom, and riverine wetlands. Total acres of wetlands within the route widths of the route segments are provided in Appendix E.

The route width of Route Segment D4 (Blue Route) would include the least wetland area (69.6 acres). The route width of Route Segment D3 would include the most wetland area (103.7 acres). One PWI wetland is mapped within the route width of Route Segment D5 (Map N.181).

Forested wetlands subject to permanent impacts due to their conversion would be contained within the ROW. All route segments have a minimal amount of forested wetland in the ROW (1.2 to 2.2 acres; Figure 9-6).

Figure 9-6 Region D Route Segments, Acres of Wetland by Type within ROW



9.6.12 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. Potential construction and operation-related impacts to wildlife and wildlife habitat are discussed in Section 5.6.12.2. Potential short-term, localized impacts could occur from displacement during construction or maintenance activities. Potential long-term impacts could occur as a result to 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, as described in Section 5.6.12.3.

Map 16 provides an overview of resources across Region D, and Table 9-10 summarizes the wildlife resources within the route width of each route segment in Region D.

Grassland Bird Conservation Areas are located within the route width and local vicinity of all route segments in Region D. The route widths of Route Segments D1 (Purple Route), D2, and D7 would intersect less than 1 acre of Grassland Bird Conservation Areas and none of their alignments would cross these areas. Route Segment D6 would intersect more acres of Grassland Bird Conservation Areas than Route

Segments D3, D4 (Blue Route), and D5; however, their anticipated alignments would cross Grassland Bird Conservation Areas while not paralleling an existing transmission line ROW.

A DNR-identified shallow wildlife lake is located within the route width and local vicinity of Route Segments D4 (Blue Route), D5, D6, and D7. The anticipated alignments for these route segments would not cross the shallow wildlife lake (Map N.179).

The route segments in Region D would not parallel any existing transmission line ROW; as such, traversing wildlife areas along new transmission line corridors could increase potential impacts to avian species traveling through these areas. As discussed in Section 5.6.12.3, avian impacts can be minimized through use of bird flight diverters. Route segments in Region D would minimize potential impacts associated with habitat fragmentation by paralleling existing road rights-of-way, with Route Segment D2 paralleling the most (77 percent of its length) and Route Segment D7 paralleling the least (34 percent of its length).

Table 9-10 Region D, Route Segments, Wildlife Management and Conservation Areas within Route Width

Resource Area	Unit	Route Segment						
		D1 (Purple Route)	D2	D3	D4 (Blue Route)	D5	D6	D7
Grassland Bird Conservation Areas	Acres	< 1	< 1	117	117	117	157	< 1
Shallow Wildlife Lakes	Count	0	0	0	1	1	1	1

9.7 Costs that are Dependent on Design and Route

Costs of the route segments are generally proportional to length with the exception of the additional factors described in Section 5.9. Costs for route segments in Region D are included in Section 9.8 and are also provided in Appendix O.

9.8 Relative Merits of Route Segments

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 Route Segments D1 through D7 with the exception of some elements of resource categories that are considered to have minimal impacts that might not vary significantly throughout the regions and/or the routing factors are not applicable. These include:

- Impacts on human settlements (factor A)— cultural values, environmental justice, land use and zoning, 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 land-based economies (factor C)— forestry and tourism.
- Impacts on the natural environment (factor E) – air quality, climate, geology and topography, floodplains, and groundwater.

With respect to routing factor G, it is assumed that all route alternatives are equal with regard to maximizing energy efficiencies and accommodating expansion of transmission capacity. With respect to environmental impacts, the examination of such impacts suggested by routing factor G is included in the discussion of other routing factors and elements that more specifically address an environmental impact (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 Section **15**.

A relative merits analysis was completed to compare Route Segments D1 through D7 using these routing factors. The analysis uses graphics (Table 9-11) 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 9-12 summarizes the relative merits analysis of Route Segments D1 through D7 for the routing factors that are anticipated to vary amongst route alternatives.

Table 9-11 Guide to Relative Merits Analysis

Consistency with Routing Factor or Anticipated Impacts	Symbol
Route alternative is consistent with the routing factor OR Impacts are anticipated to be negligible to minimal or the impact is positive	●
Route alternative 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 alternative 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	○

Table 9-12 Relative Merits for Route Segments D1 through D7

Routing Factor / Resource	Route Segment							Summary
	D1 (Purple Route)	D2	D3	D4 (Blue Route)	D5	D6	D7	
Factor A Human Settlement								
Aesthetics	◒	◒	◒	◒	◒	◒	◒	Aesthetic impacts are anticipated to be moderate for all route segments. Route Segment D1 (Purple Route) has the least number of residential structures and nonresidential structures within its local vicinity (14). Route Segment D2 parallels the most roadways (7.1 miles and 77%). Route Segment D7 parallels the least amount of ROW with existing infrastructure (4.3 miles and 34% of its length).
Displacement	●	●	●	●	●	●	●	There are no structures within the ROW on any of the route segments.
Recreation	●	●	●	●	●	●	●	Route segments in Region D do not cross any land-based public trails. No Wildlife Management Areas or Waterfowl Production Areas are present. All route segments cross the Crow River, a state water trail and wild and scenic river. Regional recreational resources in Region D include snowmobile trails and impacts are anticipated to be minimal.
Factor C Land-Based Economies								
Agriculture	◒	◒	◒	○	○	○	○	Most of the land included in Region D is agricultural. Impacts cannot be avoided but can be mitigated. Prudent routing (parallelling existing infrastructure and/or paralleling division lines) could help minimize impacts. Route Segment D7 parallels the most existing infrastructure (77% of its total length) but also has the most acres of prime farmland. Route Segments D4 (Blue Route) through D7 would result in unavoidable impacts to two center pivot irrigation systems.
Mining	●	●	●	●	●	●	●	No active aggregate gravel pits were identified within the ROI (the route width) for Region D; therefore, impacts to mining are anticipated to be independent of the route segment selected.
Factor D Archaeological and Historic Resources								
Archaeological	●	●	●	●	●	●	●	There are no archaeological sites within the ROI.
Historic	●	●	●	●	●	●	●	There are no listed, eligible or unevaluated historic architectural resources within the ROI.
Factor E Natural Resources								
Public and Designated Lands	●	●	●	●	●	●	●	There are no state game refuges, CREP easements, or RIM Reserve Land within Region D.
Soils	●	●	●	●	●	●	●	Most of the soils in the region have a moderate or severe rutting hazard rating. Impacts could be minimized with BMPs or mitigated if long-term re-vegetation impacts extend beyond construction. Impacts to soils would be independent of the route selected.
Surface Water	●	◒	●	◒	◒	◒	◒	The total count of watercourse crossings by the anticipated alignments of route segments in Region D varies between seven to 14 watercourses, most are classified as intermittent streams. Route Segments D1 (Purple Route) and D3 cross the least watercourses and avoid crossing the PWI basin (Half Moon Lake). All route segments cross the Crow River, a state-designated outstanding resource value water. All waterbodies and watercourses could be spanned by the project. No in-water work would occur.
Vegetation	●	●	●	●	●	●	●	Forested vegetation is minimal (up to 1 acre) for all route segments in Region D.
Wetlands	◒	◒	◒	◒	◒	◒	◒	All route segments go through forested wetlands. The route width of Route Segment D4 (Blue Route) includes the least wetland area (69.6 acres). No route segments span a wetland >1,000 feet in width. Route Segment D5 would include one PWI wetland.

Routing Factor / Resource	Route Segment							Summary
	D1 (Purple Route)	D2	D3	D4 (Blue Route)	D5	D6	D7	
Wildlife and Wildlife Habitat	●	●	●	◒	◒	◒	●	Route widths and anticipated alignments of Route Segments D3, D4 (Blue Route), D5, and D6 would intersect Grassland Bird Conservation areas. A shallow wildlife lake is in the route width of Route Segments D4 (Blue Route), D5, D6, and D7; their anticipated alignments would not cross it.
Factor F Rare and Unique Natural Resources								
Rare and Unique Natural Resources	●	●	●	●	●	●	●	No documented records of threatened/endangered species within 1 mile of any of the route segments. Route widths of Route Segments D1 (Purple Route), D2, and D7 would intersect 6 acres of an SBS and a native plant community; none of their alignments would cross these resources.
Minnesota Statute 216E.03 - Subpart 7 (15e) *(transmission lines)*								
Paralleling Existing Transmission Line [1]	○	○	○	○	○	○	○	None of the Route Segments parallel existing transmission line for any portion of their length.
Minnesota Statute 216E.03 - Subpart 7 (8) *(roads/railroads)*								
Paralleling Roads and Railroads	◒	●	○	○	◒	◒	○	Route Segments D4 (Blue Route), D5 and D7 parallel the least amount of road ROW (4.3 to 5.5 miles and 34% to 42%). Route Segment D2 parallels the most existing road ROW (7.1 miles and 77%).
Factor H Paralleling Division Lines								
Paralleling existing survey lines, natural division lines, and agricultural field boundaries	◒	●	◒	○	○	◒	○	All route segments parallel division lines for 79% or more of their lengths. Route Segment D2 parallels the largest amount of division lines (8.5 miles and 92% of its length).
Factor J Paralleling Existing Infrastructure								
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.	◒	●	○	○	◒	◒	○	Route Segment D2 parallels the most existing ROW (8.5 miles and 92%). Route Segments D4 (Blue Route), D5, and D7 parallel the least amount of existing ROW (8.5 to 10.3 miles and 79% to 81%).
Factor L Costs								
Costs Dependent on Design and Route	● $40,935,000	● $41,753,000	● $43,574,000	● $46,498,000	● $46,841,000	● $49,054,000	● $57,612,000	As noted in Section 9.7, costs generally coincide with the length of the line. Route Segments D6 and D7 are anticipated to cost 20% and 41% more (respectively) than other route segments but they are also the longest. The remaining costs estimates are within one another's margin of error.

[1] Minnesota Statute 216E.03 - Subpart 7 (15e) requires the Commission to consider locating a route for a high-voltage transmission line on an existing high-voltage transmission route. The summarized here indicates where ROW paralleling to existing transmission lines occurs but does not distinguish between HVTLs and other transmission lines that might not meet the definition of a HVTL (for example, distribution lines). Highways are included in the assessment provided for Minnesota Statute 216E.03 - Subpart 7 (8).

9.9 Route Connector 105

Route connectors are segments that can be used to transition from the Purple Route to the Blue Route, or vice versa. For purposes of analysis, route connectors are either incorporated into route segments studied at the regional level and travel in one direction or can be used to connect the Purple and Blue Routes. Route Connector 105 is a two-way route connector, which means it can be used to connect the Purple and Blue Route in either direction. Data tables for the route connectors are provided in Appendix E.

Route Connector 105 is one mile long and parallels existing infrastructure (roads) for the entire length of the route (Map N.174 and Map N.175). There is one residence between 500 and 1,600 feet away from the centerline. Vegetation is mapped as cultivated crops and the soils are designated as prime farmland or farmland of statewide importance.

There are no watercourses, waterbodies, wetlands or forested wetlands crossed or within the ROW. There are also no public lands or conservation easements located within the siting area.

There are no grassland bird conservation areas, Wildlife Action Network corridors, important bird areas, wildlife management areas, state game refuges, waterfowl production areas, or shallow wildlife lakes.

There are no rare and unique natural resources, records of a state threatened or endangered species, sites of biodiversity significance, or native plant communities. There are no railroad rights-of-way prairie, prairie bank easements, or lakes of biological significance.

9.10 Potential Refinements

A refinement is a route segment that was included in the scoping decision but not included within Route Segments D1 through D7. For purposes of analysis, refinements are considered in standalone comparisons against Purple Route or Blue Route equivalents. There is one refinement in Region D. Route Segment 229 is shown on Map 3.11 and could replace a component of Route Segment D1 (Purple Route).

9.10.1 Route Segment 229

Route Segment 229 departs the Purple Route at 590th Avenue and traverses north. It turns east at 349th Street until it rejoins the Purple Route (Map N.177). This route segment was proposed to minimize the impacts to dwellings, farming operations, and unwanted noise. Table 9-13 summarizes differences in potential impacts of Route Segment 229 compared against its equivalent.

Table 9-13 Route Segment 229 vs Its Impact Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	The equivalent to Route Segment 229 parallels more existing infrastructure ROW (0.5 miles or 40%) compared to Route Segment 229 (0.2 miles or 20%). The equivalent to Route Segment 229 includes a total of 0.2 miles that does not parallel existing infrastructure or division lines.
Natural Environment – Surface Waters and Wetlands	Route Segment 229 does not cross any watercourses or waterbodies. However, it includes 1 acre of NWI wetlands. Route Segment 229's equivalent crosses one watercourse and has <1 acre of NWI wetlands (<1 acre of which are forested wetlands).

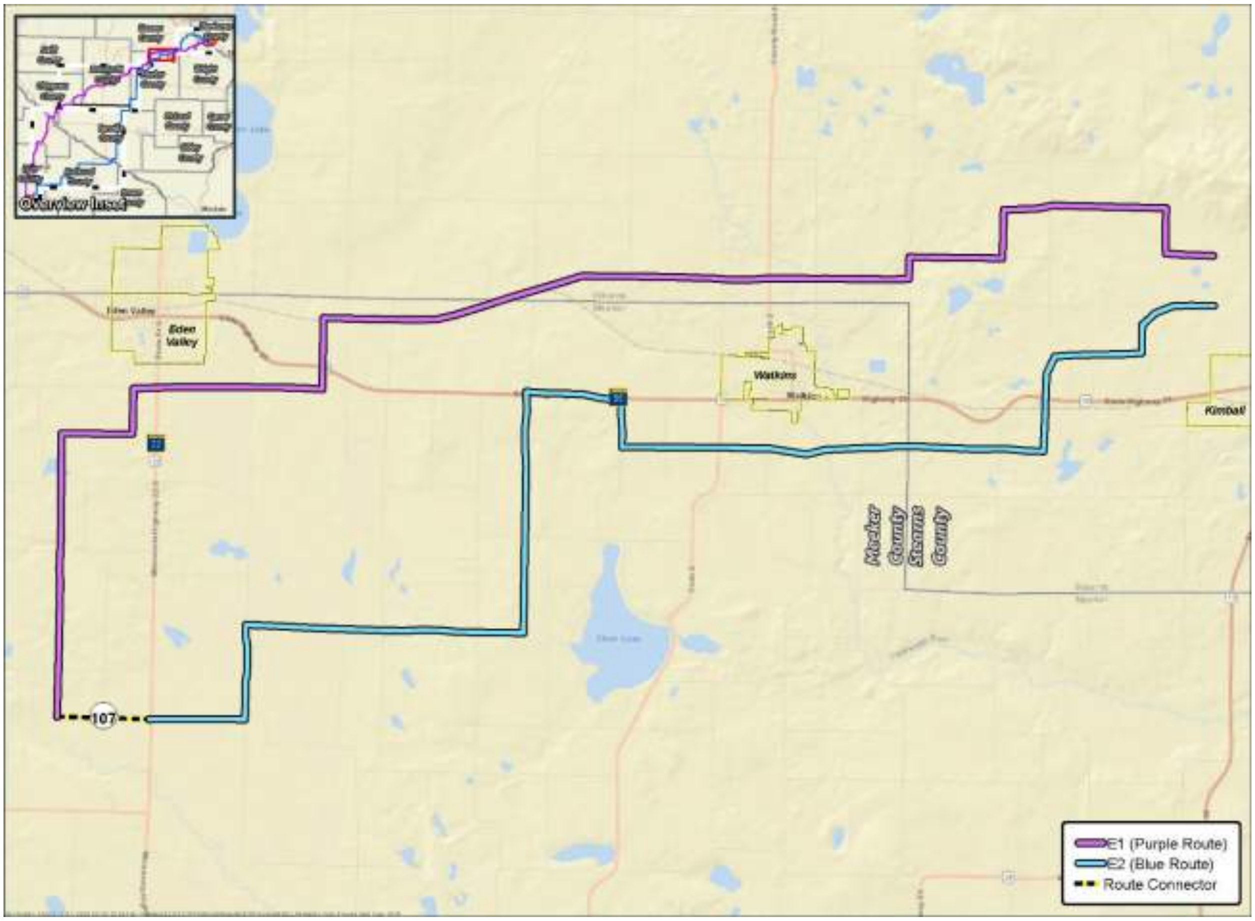
10 Region E - Potential Impacts and Mitigation

Chapter 10 describes potential impacts in Region E, which is in the northern half of the project area and is in Meeker and Stearns Counties (Map 2). The two route segments in Region E are shown in Figure 10-1 and described below.

- Route Segment E1 is the applicant's proposed Purple Route. It is 17.7 miles long.
- Route Segment E2 is the applicant's proposed Blue Route. It is 16.6 miles long.

Route Connector 107 can connect the Purple Route and Blue Route in either direction. Route Connector 107 was proposed as an alternative to provide a means of shifting from the Purple Route to the Blue Route to avoid farmland (specifically 40 acres of organic pollinator habitat and an eagle's nest). It is further described in Section 10.9. It is 1 mile long.

Figure 10-1 Region E Route Segments



10.1 Environmental Setting

Region E is dominated by agricultural land use and rural residential (Map 6). Major waterways crossed by the route alternatives within Region E include the North Fork of the Crow River and Clearwater River (Map 14).

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. Under this classification system, Region E is in the Minnesota and NE Iowa Morainal section of the Eastern Broadleaf Forest Province (Map 15). This section is further broken down into subsections, including the Hardwood Hills Subsection, which spans the entire region. This subsection is used below to classify the environmental setting of the project.

The Hardwood Hills Subsection is characterized by steep slopes, high hills, and lakes formed in glacial end moraines and outwash plains. The Alexandria Moraine forms a high ridge that is the headwaters region of many rivers and streams flowing east and west. Most of this subsection is covered in 100 to 500 feet of glacial drift over diverse bedrock. Loamy soils are dominant, with loamy sands and sandy loams on outwash plains as well as loams and clay loams on moraines. Woodland and forest were common within this subsection prior to pre-European contact, with some forests remaining adjacent to lakes or steep landscapes. Wetlands and lakes in poorly-drained potholes provide opportunities for recreation or wildlife habitat in this subsection with tourism opportunities, especially in areas around lakes (reference (212)).

Region E is in the northern half of the project area and is in Meeker and Stearns Counties (Map 2). Major communities nearest the route alternatives are Eden Valley and Watkins. Existing transmission lines are prevalent throughout the region (Map 2). No railroads traverse through the region. Region E is generally bounded by State Highway 22 to the west. Region E intersects with State Highway 55. There are no federal highways within Region E. State highways in Region E include State Highway 22 and State Highway 55. County and township roads are also present within the region (Map 9).

10.2 Human Settlement

10.2.1 Aesthetics

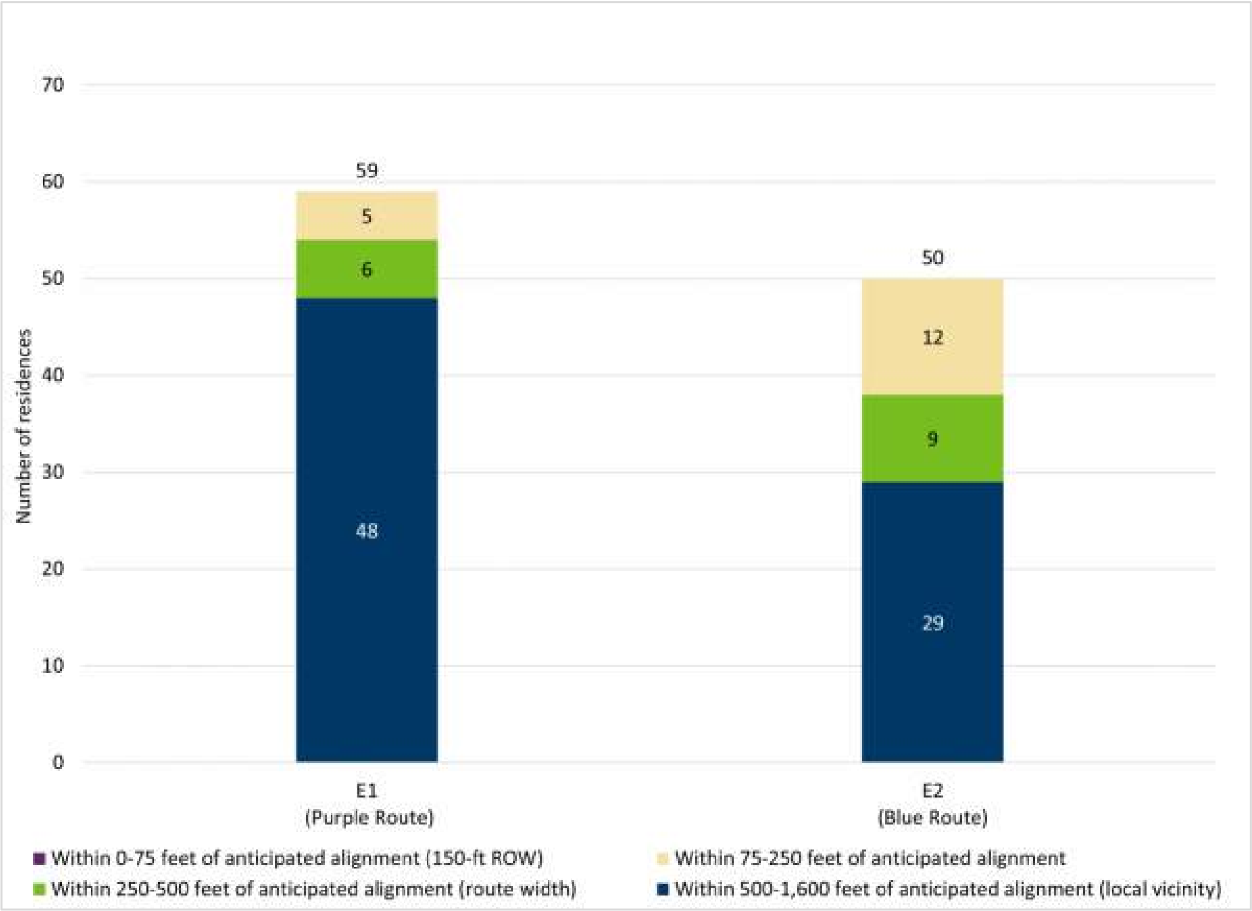
The ROI for aesthetics is the local vicinity. HVTLs alter a viewshed (Section 5.2.1.2**). Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes. 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, and 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 HVTL 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. Additional details regarding potential impacts to aesthetics and potential mitigation measures is provided in Section 5.2.1**.**

Appendix N shows human settlement features (for example, residences and nursing homes) in the local vicinity of the route segments. No recreational resources where people might congregate were identified within the ROI (Section 10.2.8). The proximity of residential structures (homes) and non-residential structures to route segments at various distances is shown in Figure and Table 10-1, respectively. Route Segment E1 (Purple Route) would have ten less residences within the route width. Route segment E2 (Blue Route) would have nine less residences within the local vicinity. In other words, Route Segment E1 (Purple Route) has less residences within close proximity and Route Segment E2 (Blue Route) has fewer residences when looking at a slightly broader area (local vicinity). The same pattern is true for non-residential structures (Table 10-1).

Figure 10-2 Region E, Route Segments, Proximity of Residential Structures



For total count of residential structures within the route width, combine residential structures within 75-250 feet and residential structures within 250 and 500 feet.

For total count of residential structures within the local vicinity, combine residential structures within each distance; this number is also stated at the top of each bar.

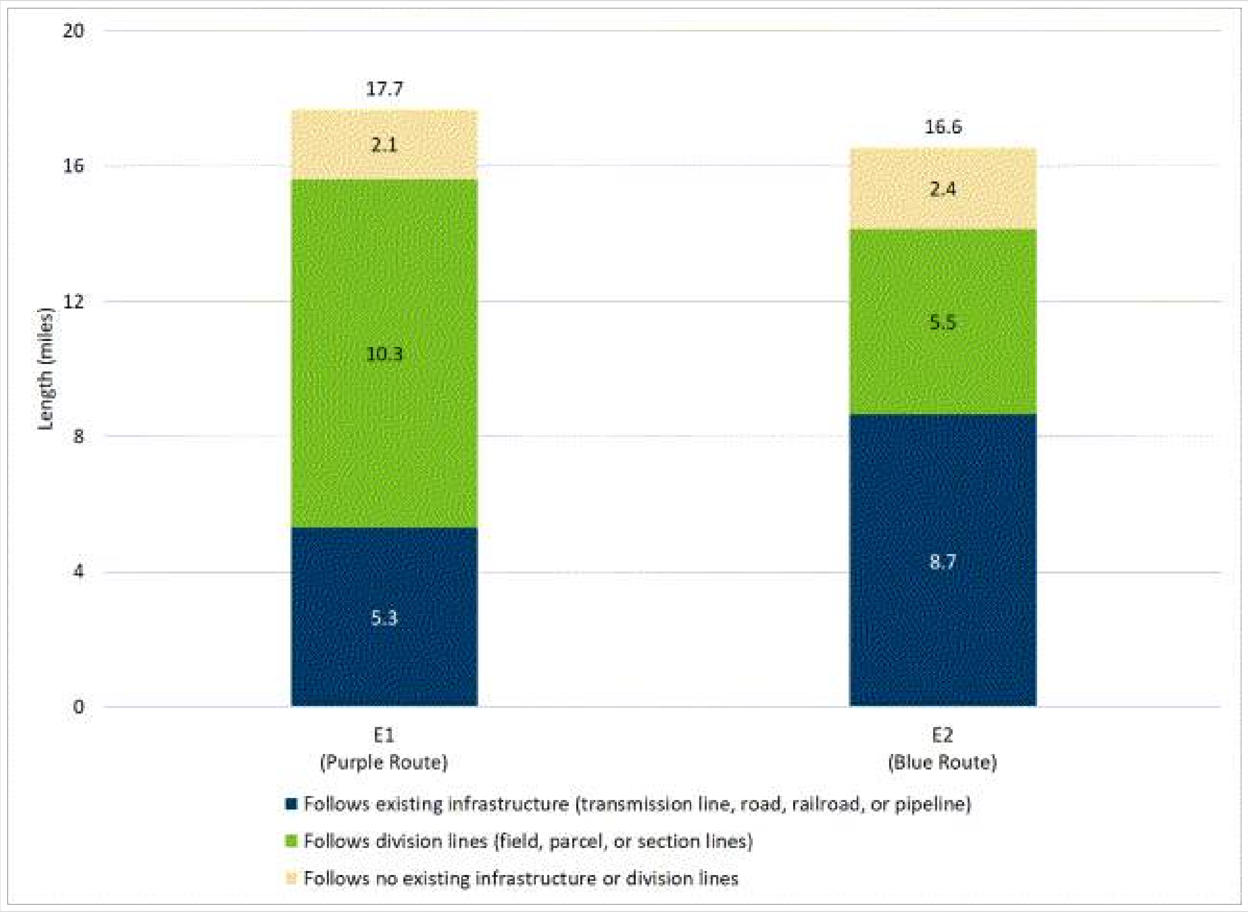
Table 10-1 Region E, Route Segments, Proximity of Non-Residential Structures

Distances from Anticipated Alignment	Route Segment	
	E1 (Purple Route)	E2 (Blue Route)
0-75 feet (150-foot-ROW)	0	0
75-250 feet	5	20
250-500 feet (generally route width)	38	41
500-1,600 feet (local vicinity)	186	152
Total	229	213

Non-residential structures include churches, schools (public and private), daycares/child-care centers/pre-schools, hospitals, nursing homes, and commercial and non-residential structures.

Each route segment would parallel with existing infrastructure or division lines as shown in Figure 10-3 and Table 10-2. In some cases, portions of a route segment might parallel ROW with more than one of these existing features at the same time. Map 9 illustrates where ROW paralleling occurs and shows existing infrastructure and division lines in the region. Neither route segment parallels existing transmission lines. Route Segment E2 (Blue Route) parallels more existing infrastructure (8.7 miles, 52 percent of its length) compared to Route Segment E1 (Purple Route) (5.3 miles, 30 percent of its length).

Figure 10-3 Region E, Route Segments, ROW Paralleling of Existing Infrastructure and/or Division Lines Summary



The total mileage at the top of each route segment represents that route segment's total length. Numbers may not sum due to rounding.

Table 10-2 Region E, Route Segments, Route Segments, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

Infrastructure and/or Division Lines	Route Segment	
	E1 (Purple Route)	E2 (Blue Route)
Follows existing transmission line (miles, percent)	0 (0)	0 (0)
Follows existing roads (miles, percent)	3.0 (17)	8.7 (52)
Follows existing railroad (miles, percent)	2.3 (13)	0 (0)
Follows existing pipeline (miles, percent)	0 (0)	0 (0)
Total ROW paralleling (w/transmission line, road, and railroad) (miles, percent)	5.3 (30)	8.7 (52)
Follows Field, parcel, and Section Lines (miles, percent)	15.6 (88)	14.2 (86)
Total- All (miles, percent) [1]	15.6 (88)	14.2 (86)

Totals might not sum to 100 percent due to rounding.
[1] This total is indicative of the full length of the route segment that parallels existing infrastructure ROW and/or division lines. For Region E, the total presented here is the same as the total for following division lines because there is not any length that follows existing infrastructure that doesn't allow follow division lines.

10.2.2 Cultural Values

Potential impacts to cultural values are discussed for the entire project in Section 5.2.2. The assessment was completed for the project as a whole because existing conditions are better understood at a broader scale than the regional level. Impacts to cultural values are independent of the route selected.

10.2.3 Displacement

The ROI for displacement is the ROW. Displacement occurs when a residence or building is required to be removed for construction of the project. Residential buildings within the ROI would require removal, whereas non-residential buildings could stay within the ROI if the activities taking place in these buildings are compatible with the safe operation of the line. Additional details regarding displacement and potential mitigation measures are provided in Section 5.2.3**.**

There are no residences or non-residential structures within the ROI for the route segments within Region E (Table 10-1).

10.2.4 Environmental Justice

No EJ areas were identified in Region E. See Section 5.2.4 for the assessment on environmental justice in Region E.

10.2.5 Land Use and Zoning

Potential impacts to land use and zoning are discussed in Section 5.2.5. The assessment for land use and zoning was completed for the project as a whole because existing conditions are determined by jurisdictional areas (counties) and do not coincide with the project's regional boundaries.

10.2.6 Noise

Potential impacts from noise are discussed for the entire project in Section 5.2.6. The assessment for noise was completed for the project as a whole because there is limited variability in the potential for noise across the route alternatives.

10.2.7 Property Values

Potential impacts to property values are discussed for the entire project in Section 5.2.7. The assessment for property values was completed for the project as a whole because there is limited variability in the potential for property value impacts across the route alternatives.

10.2.8 Recreation

The ROI for recreation is the route width. 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 5.2.8.2**). 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 would vary based on individual perspectives and experiences. Impacts to recreation are assessed through identification of recreational resources within the ROI. The project is not anticipated to directly impede recreational activities within the ROI such as snowmobiling, golfing, canoeing, hunting, or fishing. Additional details regarding potential impacts to recreation and potential mitigation measures for the project is provided in Section** 5.2.8**.**

Route segments in Region E do not cross any land-based public trails, state water trails, wild and scenic rivers, or scenic byways. Snowmobile trails maintained by Meeker County Trails and Stearns County Snowmobile Trails are present (Map 5).

Route Segment E1 (Purple Route) has seven snowmobile trail crossings and Route Segment E2 (Blue Route) has six crossings. Route Segment E2 (Blue Route) has 4.1 miles of snowmobile trails present compared to E1 (Purple Route), which as 2.4 miles.

Public lands, including Waterfowl Production Areas and Wildlife Management Areas, are publicly accessible and can be used for recreational purposes. Public lands used for wildlife management (Waterfowl Production Areas and Wildlife Management Areas) are discussed in Section 10.6.12.

10.2.9 Socioeconomics

Potential impacts to socioeconomics are discussed for the entire project in Section 5.2.9. This is because the assessment was completed at the county-level which does not always align with regional boundaries.

10.2.10 Transportation and Public Services

Potential impacts to transportation and public services are discussed for the entire project in Section 5.2.10. The assessment was completed for the project as a whole and not carried forward at the regional level because there is limited variability in across the route alternatives. Potential impacts to private airstrips are discussed in land-based economies.

10.3 Human Health and Safety

The impacts to human health and safety are discussed generally for the entire project in Section 5.3. The assessment was completed for the project as a whole and not carried forward at the regional level because there is limited variability across the route alternatives and generally impacts would be minimized by appropriate placement and adhering to applicable transmission line standards and codes**.**

10.4 Land-based Economies

Land-based economies are assessed by considering four elements: agriculture, forestry, mining, and tourism (Section 5.4). Impacts to three elements of land-based economies are anticipated to be minimal and independent of the route segment selected in Region E. These elements are:

- **Forestry –** There are no known forestry operations in the ROI (Section 5.4.1.3).
- **Mining**- No active aggregate mining was identified within the ROI (the route width) for Region E.
- **Tourism –** Limited recreational resources are located within the ROI (local vicinity) for Region E (Section 10.2.8); therefore, any direct impacts to the recreation that would cause an indirect impact to tourism based economies are anticipated to be negligible (Section 5.4.2.4).

10.4.1 Agriculture

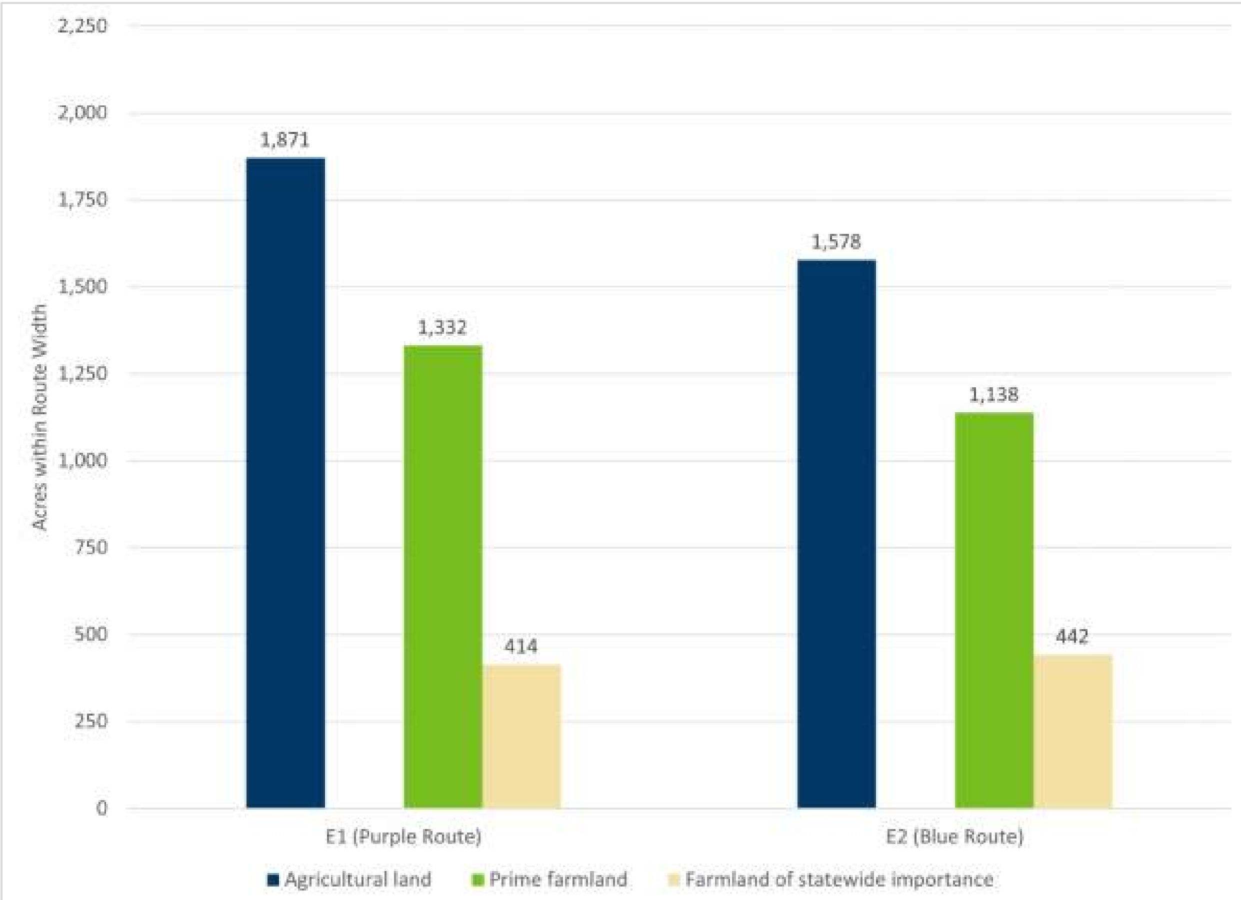
The ROI for the land-based economy of agriculture is the route width. Construction and operation of a HVTL impacts agriculture (Section 5.4.2.1). During construction, impacts would include the limited use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Permanent impacts would also occur when the footprint of the HVTL structures directly impedes agricultural production and/or impedes efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields.

Prudent routing (paralleling existing infrastructure and/or paralleling division lines) could help minimize potential impacts. Implementation of the AIMP (Appendix K), would minimize and mitigate impacts to agriculture. Additional details regarding potential impacts to agriculture and potential mitigation measures is provided in Section 5.4**.**

Figure 10-4 summarizes the total acres within the route widths of Region E route segments that are designated as agricultural land use, as well as prime farmland and farmland of statewide importance. Most land (70 percent or more) within the route widths of the route segments in Region E is designated as agricultural land use (cultivated crops and hay/pasture; see Section 10.6.10).

Route Segment E2 (Blue Route) has less prime farmland and farmland of statewide importance and is the shorter route segment (17.7 miles). As noted in Table 10-2, Route Segment E2 (Blue Route) also parallels more existing infrastructure (52% of its total length).

Figure 10-4 Region E Route Segments, Acres of Agricultural Lands and Prime Farmland within Route Widths



Source: Agricultural land, NLCD and prime farmland/farmland of statewide importance, SSURGO (Appendix C)

Multiple center pivot irrigation systems are present in Region E (Map 11.7 and Map 11.8). While not crossed by its anticipated alignment, one center pivot irrigation system is located within the route width of Route Segment E1 (Purple Route). The anticipated alignment avoids impacts to the center pivot irrigation systems because it is located east of Caldron Road where it traverses south then continues east (Map 11.8).

Route Segment E2 (Blue Route) has two center pivot irrigation systems located within its route width, however neither are crossed by the anticipated alignment. The anticipated alignment is located west of 355th Street and continues north on 617th Avenue (Map 11.7). It is north of the second center pivot irrigation system and traverses east (Map 11.7).

10.5 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 (Section 5.5.2). 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. Indirect 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. Additional details concerning potential impacts and mitigation for the project as a whole regarding archaeological and historic resources are provided in Section 5.5.3.

Documented archaeological and historic resources within Region E are summarized in the following tables.

- Table 10-3 summarizes the number of archaeological and historic resources within the project area (which is within one mile of the anticipated alignments).
- Table 10-4 summarizes the number of archaeological and historic resources within the ROI (route width) for each of the Region E, route segments.
- Table 10-5 provides descriptions of the resources located within the route widths.

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

10.5.1 Archaeological Resources

Table 10-3 Region E, Route Segments, Number of Archaeological and Historic Resources within the Project Area

Route Segment	Archaeological Resources	Historic Architectural Resources	Historic Cemeteries
E1 (Purple Route)	1	25	6
E2 (Blue Route)	3	17	5

Table 10-4 Region E, Route Segments, Number of Archaeological and Historic Resources within the Route Width

Route Segment	Archaeological Resources	Historic Architectural Resources	Historic Cemeteries
E1 (Purple Route)	0	4	1
E2 (Blue Route)	0	4	0

Table 10-5 Region E, Route Segments, Historic Resources within the Route Width Summary

Route Segment(s)	Site/Resource Number	Resource Type	Resource Name/Description	NRHP Status
E1 (Purple Route)	ME-FPT-00004	Historic Architecture	Bridge 47529	Not Eligible
E1 (Purple Route), E2 (Blue Route)	XX-ROD-00043	Historic Architecture	Trunk Highway	Not Eligible
E1 (Purple Route), E2 (Blue Route)	XX-RRD-SOO002	Historic Architecture	Minneapolis & Pacific Railway Company/Minneapolis, St. Paul & Ste. Marie Railroad: Mainline (extant)	Unevaluated
E1 (Purple Route), E2 (Blue Route)	XX-ROD-00056	Historic Architecture	Trunk Highway 22	Not Eligible
E1 (Purple Route)	St. Peters Cemetery	Historic Cemetery	St. Peter's Cemetery (mapped at PLS forty level)	N/A
E2 (Blue Route)	ME-MAN-00001	Historic Architecture	School	Unevaluated

10.5.2 Archaeological Resources

There are no previously archaeological resources present within the route widths for any of the route segments in Region E (Table 10-4).

10.5.3 Historic Architectural Resources

Five historic architectural resources are present within the route widths of the route segments in Region E, three of which are not eligible for listing on the NRHP, and two of which are unevaluated (Table 10-5).

Route Segment E1 (Purple Route) contains one unevaluated resource, and Route Segment E2 (Blue Route) contains two unevaluated resources.

10.6 Natural Environment

10.6.1 Air Quality

Potential impacts to air quality are expected to be similar to those discussed for the entire project in Section 5.6.1. The assessment for air quality was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

10.6.2 Climate

Potential impacts to climate are expected to be similar to those discussed for the entire project in Section 5.6.2. The assessment for climate was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

10.6.3 Geology and Topography

Potential impacts to geology and topography are expected to be similar to those discussed for the entire project in Section 5.6.3. The assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

10.6.4 Greenhouse Gases

Potential impacts to greenhouse gases are expected to be similar to those discussed for the entire project in Section 5.6.4. The assessment for greenhouse gases was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected given their similar lengths.

10.6.5 Groundwater

Potential impacts to groundwater are expected to be similar to those discussed for the entire project in Section 5.6.5. The assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

10.6.6 Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands often involve unique resources intended for protection and/or preservation and would be subject to short and long-term impacts depending upon their use (Section 5.6.6.2). Public and designated lands within the ROI are first identified and then further reviewed to better understand potential impacts such as vegetation clearing. Occupying public and designated lands would require coordination with the landowner (Section 5.6.6.3).

There are no public or designated lands within the route width of Region E with the exception of Wildlife Management Areas and Waterfowl Production Areas which are discussed in Section 10.6.12.

10.6.7 Rare and Unique Natural Resources

Rare and unique natural resources encompasses 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 construction and operation-related impacts to protected species and sensitive ecological resources are discussed in Section 5.6.7.4. 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. 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.

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 that 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, are described in Section 5.6.7.5.

Sensitive ecological resources within Region E are shown on Map 12. To protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on maps.

10.6.7.1 Protected Species

According to the NHIS database, no federally protected species have been documented within 1 mile of the route segments in Region E; these are summarized in Table 10-6. One state protected species, the Blanding's turtle, has been documented within 1 mile of both Route Segment E1 (Purple Route) and E2 (Blue Route); however, the documented occurrences were not within the ROW or route width of either route segment. A state protected bird species, the loggerhead shrike, has been documented within 1 mile of Route Segment E2 (Blue Route); this documented occurrence was in the ROW of Route Segment E2 (Blue Route; Appendix M). In addition, a state special concern species has been documented within 1 mile of Route Segment E2 (Blue Route); special concern species are summarized in Appendix M.

Table 10-6 Region E, Route Segments, Natural Heritage Information System Database Documented Records of Protected Species within One Mile

Scientific Name	Common Name	Type	State/Federal Status[1]	Route Segment	
				E1 (Purple Route)	E2 (Blue Route)
Lanius ludovicianus	Loggerhead shrike	Bird	Endangered/not listed		X
Emydoidea blandingii	Blanding's turtle	Turtle	Threatened/not listed	X	X

[1] The status of the species is provided at the state level prior to the dash and the status of the species is provided at the federal level after the dash.

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 ROW or route width of the route segments. Prior to construction, the applicant could be required to conduct field surveys in coordination with the USFWS and/or DNR for the potential presence of protected species.

10.6.7.2 Sensitive Ecological Resources

The route widths of both route segments in Region E would intersect Sites of Biodiversity Significance ranked "below", with Route Segment E1 (Purple Route) intersecting 19 acres and Route Segment E2 (Blue Route) intersecting 21 acres. The anticipated alignment of Route Segment E1 (Purple Route) would not cross the Site of Biodiversity Significance, while the anticipated alignment of Route Segment E2 (Blue Route) would cross the western edge of a Site of Biodiversity Significance while paralleling an existing road

ROW. Given the crossing distance is greater than 1,000 feet, one or more structures might need to be placed at the edge of the Site of Biodiversity Significance.

10.6.8 Soils

The ROI for soils is the ROW. Common soil impacts include rutting, compaction, and erosion (Section 5.6.8.2). Potential impacts would be short-term during construction and localized. Impacts 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 vehicles trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored a suitable location. Disturbed areas would be promptly seeded after construction. Additional details regarding potential impacts to soils and potential mitigation measures is provided in Section 5.6.8.

Map 13 shows the surface soil textures across the region. Soil types within the ROW were reviewed to identify soil characteristics that could be more prone to impacts in some areas versus others (Table 10-7). Soils within the ROW of the route segments of Region E include soil susceptible to erosion (less than 10 percent of ROW) and hydric soil (less than one quarter of ROW). Nearly all of soils within the ROW of the route segments of Region E have a moderate or severe rutting hazard rating, and most soils are prone to compaction (64 to 70 percent of ROW).

Table 10-7 Region E, Route Segments, NRCS Mapped Soils Within ROW

Soil Data	Unit	Route Segment	
		E1 (Purple Route)	E2 (Blue Route)
Area within Route Segment ROW	Acres	322	301
Hydric Soils 1	Acres	64	56
Compaction Prone 2	Acres	225	193
Rutting Hazard 3	Acres	320	301
Erosion Hazard (Off-Road, Off-Trail) 4	Acres	30	21
Revegetation Concerns 5	Acres	0	0

[1] Hydric soil includes hydric soils (100%) and predominantly hydric soils (67-99%).
[2] Soils considered to be compaction-prone soils include those rated "Medium" or higher.
[3] Soils considered susceptible to Rusting Hazards include those rated "Moderate" or “severe.”
[4] Soils considered susceptible to erosion hazard soils include those rated “Medium,” “Severe,” or “Very Severe.”
[5] Soils considered to have revegetation concerns include soils with a non-irrigated land capability classification of 3 or greater.

10.6.9 Surface Water

The ROI for surface water is the route width. Potential impacts to surface waters are discussed in Section 5.6.9.2. Direct impacts caused by structures placed in surface waters would be avoided by spanning the 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 or waterbodies and/or special or impaired waters.

Impacts would be mitigated by using BMPs. 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. Additional details regarding potential impacts to surface waters and potential mitigation measures, including those provided in the DNR's Natural Heritage Review response, is provided in Section 5.6.8.3.

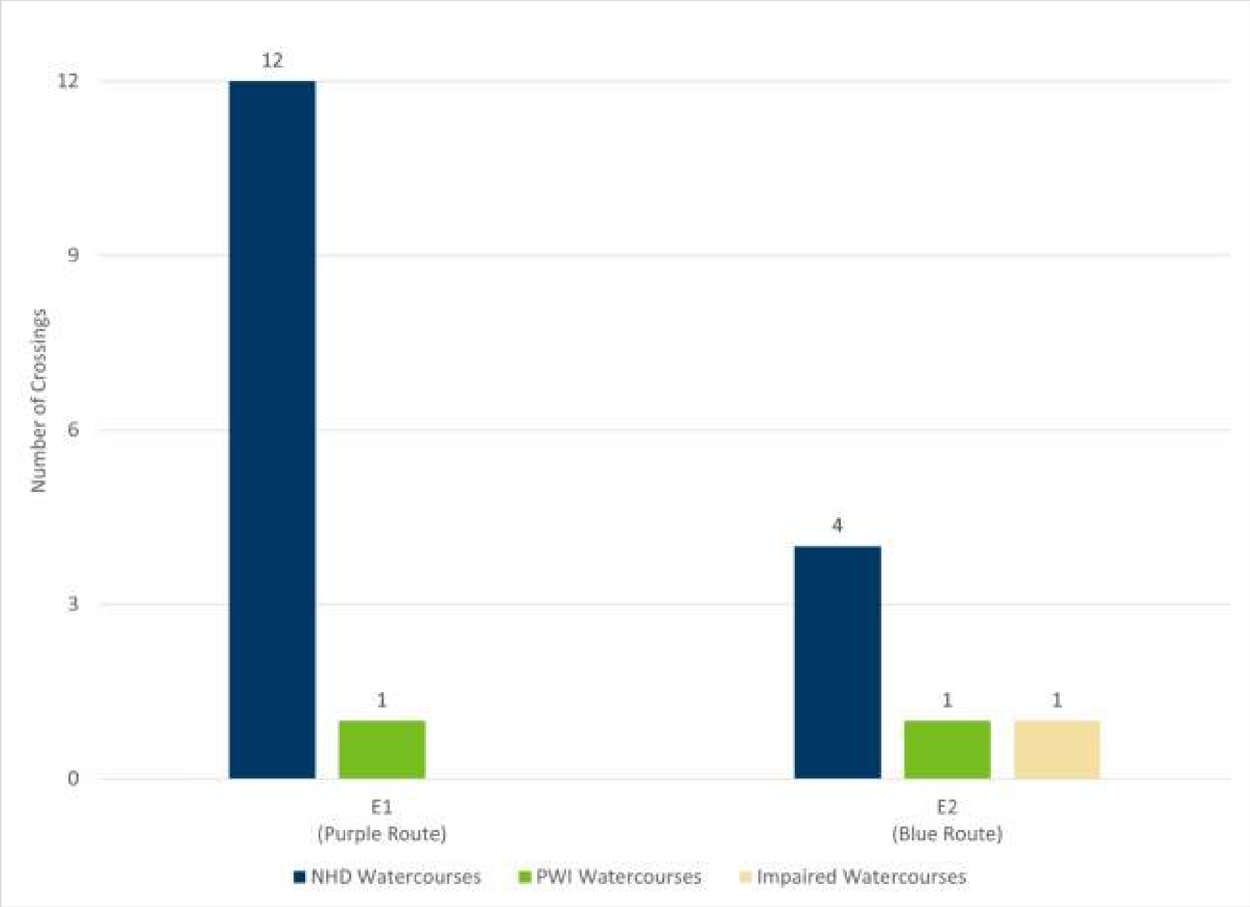
Map 14 shows the waterbodies and watercourses across the region. There are no trout streams, state-designated outstanding resource value waters, or state and federal wild and scenic and recreational rivers crossed by the route segments in Region E.

Each route segment includes two waterbodies within their route width. Of the waterbodies present in Region E, one is designated as a PWI basin (Willow Lake). Willow Lake is within the route width of Route Segment E2 (Blue Route) (Map N.195). As discussed in Section 10.6.11, one waterbody crossed by Route Segment E2 (Blue Route) is a PWI wetland (Map N.189).

Route Segment E1 (Purple Route) has three times as many watercourse crossings as Route Segment E2 (Blue Route) (Figure 10-5). Most of the watercourses crossed are intermittent or ephemeral streams.

Both route segments cross one PWI watercourse (Clearwater River). Route Segment E2 (Blue Route) has one impaired watercourse crossing (Map N.188 and Map N.194). An unnamed tributary of Eden Brook parallels the anticipated alignment of Route Segment E1 (Purple Route) within the route width (Map N.184). If the anticipated alignment parallels this stream, the potential for impacts (such as erosion or sedimentation) during construction could increase.

Figure 10-5 Region E Route Segments Number of Watercourse Crossings by Type



10.6.10 Vegetation

The ROI for vegetation is the ROW. Potential construction and operation-related impacts to vegetation are discussed in Section 5.6.10.2. 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. 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, as described in Section 5.6.10.3.

Map 7 provides an overview of landcover types across Region E, and Table 10-8 summarizes the landcover types within the ROW of each route segment in Region E. Agricultural vegetation, particularly cultivated cropland, represents the dominant vegetative landcover type within the ROW of both route segments in Region E. Small amounts of herbaceous landcover, primarily wetlands, are also present in the ROW of both route segments. A minimal amount of forested landcover (3 acres), primarily consisting of upland deciduous and mixed forest and forested wetlands, is present in the ROW of both route segments.

As discussed in Section 5.6.10.2, the applicant would clear forested vegetation from the ROW during construction, and the ROW would be maintained with low-growing vegetation during operations to minimize potential interference with the transmission line. Given that a maximum of 3 acres of forested vegetation is in the ROW of both route segments in Region E, impacts are anticipated to be minimal.

Table 10-8 Region E, Route Segments, Landcover Types in the ROW

Landcover Type	Route Segment	
	E1 (Purple Route)	E2 (Blue Route)
Agricultural (cultivated crops and hay/pasture) (acres in ROW [%of ROW])	275 (85%)	211 (70%)
Herbaceous (upland and wetland) (acres in ROW [%of ROW])	13 (4%)	8 (3%)
Forest (upland and wetland) (acres in ROW [%of ROW])	3 (1%)	3 (1%)
Developed (low-high intensity; open space) (acres in ROW [%of ROW])	31 (10%)	79 (26%)

Source: NLCD (Appendix C)
Totals might not sum to 100 percent due to rounding.

Potential impacts to agricultural vegetation and wetlands are discussed Section **5.4.2** and **5.6.11.2**, respectively.

10.6.11 Wetlands

The ROI for wetlands is the route width. Short-term and long-term potential impacts to wetlands are discussed in Section 5.6.11.2. Impacts to wetland 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 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.

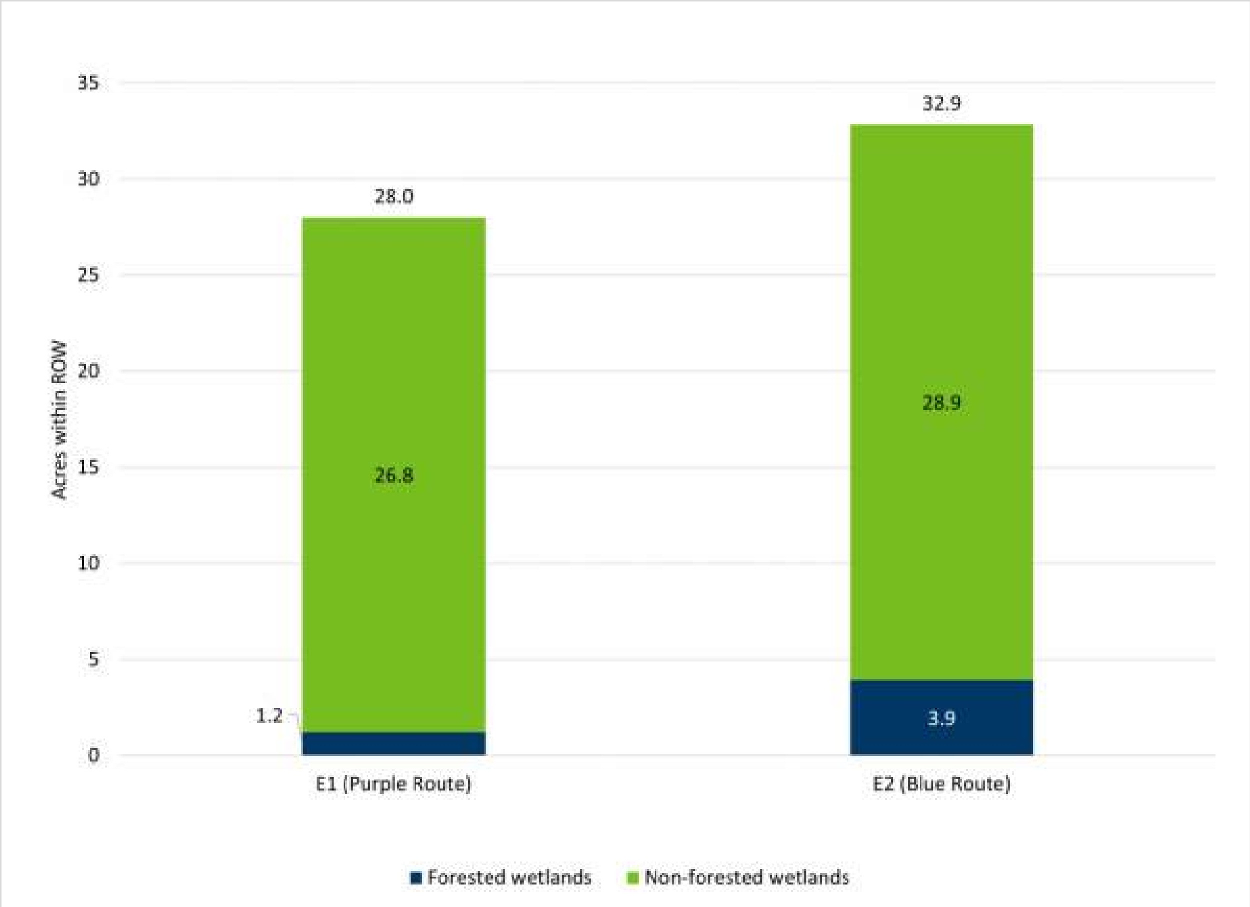
Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width. Wetland impacts would be regulated as described in Section 5.6.11.1.1. Additional details regarding potential impacts to wetlands, including those provided in the DNR's Natural Heritage Review response, and potential mitigation measures is provided in Section 5.6.11.3.

Map 14 shows the mapped wetlands within the ROI. Direct wetland impacts would occur within the construction workspace (within or adjacent to the ROW); not all wetland areas within the ROI would be subject to direct impacts as most could be spanned. Wetlands in the Region E ROI consist mainly of emergent wetlands but also aquatic bed, forested, scrub-shrub, unconsolidated bottom, and riverine wetlands. Total acres of wetlands within the route widths of the route segments are provided in Appendix E.

The route width of Route Segment E1 (Purple Route) includes less wetland area (200.7 acres) than Route Segment E2 (Blue Route) (256.9 acres). Four PWI wetlands are mapped within the route width of Route Segment E1 (Purple Route) and two PWI wetlands are mapped within the route width of Route Segment E2 (Blue Route). Route Segment E2 (Blue Route) includes an isolated wetland crossing longer than 1,000 feet (no existing crossing).

Forested wetlands subject to permanent impacts due to their conversion would be contained within the ROW. Both route segments have a relatively minimal amount of forested wetland in the ROW; however, Route Segment E2 (Blue Route) has more forested wetland than Route Segment E1 (Purple Route) (Figure 10-6).

Figure 10-6 Region E Route Segments, Acres of Wetland by Type within ROW



10.6.12 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. Potential construction and operation-related impacts to wildlife and wildlife habitat are discussed in Section 5.6.12.2. Potential short-term, localized impacts could occur from displacement

during construction or maintenance activities. Potential long-term impacts could occur as a result to 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, as described in Section 5.6.12.3.

Map 16 provides an overview of resources across Region E and Table 10-9 summarizes the wildlife resources within the route width of each route segment in Region E.

A Wildlife Management Area is located within the route width and local vicinity of both route segments in Region E; however, neither anticipated alignment would cross it. A Waterfowl Production Area is located within the route width and local vicinity of Route Segment E2 (Blue Route); however, its anticipated alignment would not cross it.

Grassland Bird Conservation Areas are located within the route width and local vicinity of both route segments in Region E, with the route width of Route Segment E2 (Blue Route) intersecting more acreage of Grassland Bird Conservation Areas. The anticipated alignments of both route segments would cross Grassland Bird Conservation Areas, and neither would parallel an existing transmission line ROW while doing so.

DNR-identified shallow wildlife lakes are located within the route width and local vicinity of both route segments in Region E. The anticipated alignments of both route segments would cross a shallow wildlife lake in an area that would not parallel an existing transmission line or road ROW (Map N.185 and Map N.194).

Wildlife Action Network corridors are located within the route width and local vicinity of Route Segment E2 (Blue Route), while Route Segment E1 (Purple Route) would avoid this area. The anticipated alignment of Route Segment E2 (Blue Route) would cross a Wildlife Action Network corridor polygon ranked medium while paralleling an existing road ROW.

The route segments in Region E would not parallel any existing transmission line ROW; as such, traversing wildlife areas along new transmission line corridors could increase potential impacts to avian species traveling through these areas. As discussed in Section 5.6.12.3, avian impacts can be minimized through use of bird flight diverters. Both route segments in Region E would minimize potential impacts associated with habitat fragmentation by paralleling existing road rights-of-way, with Route Segment E2 (Blue Route) paralleling more than twice the amount of Route Segment E1 (Purple Route).

Table 10-9 Region E, Route Segments, Wildlife Management and Conservation Areas within Route Width

Resource Area	Unit	Route Segment	
		E1 (Purple Route)	E2 (Blue Route)
Wildlife Management Areas	Acres	2	2
Waterfowl Production Areas	Acres	0	81
Grassland Bird Conservation Areas	Acres	892	1481
Shallow Wildlife Lakes	Count	1	2
Wildlife Action Network Corridors	Medium rank (acres)	0	148
	Low or medium-low rank (acres)	0	2
	Total acres	0	150

10.7 Costs that are Dependent on Design and Route

Costs of the route segments are generally proportional to length with the exception of the additional factors described in Section 5.9. Costs for route segments in Region E are included in Section 10.8 and are also provided in Appendix O.

10.8 Relative Merits of Route Segments

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 Route Segments E1 (Purple Route) and E2 (Blue Route) with the exception of some elements of resource categories that are considered to have minimal impacts that might not vary significantly throughout the regions and/or the routing factors are not applicable. These include:

- Impacts on human settlements (factor A)— cultural values, environmental justice, land use and zoning, 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 land-based economies (factor C)— forestry and tourism.
- Impacts on the natural environment (factor E) – air quality, climate, geology and topography, floodplains, and groundwater.

With respect to routing factor G, it is assumed that all route alternatives are equal with regard to maximizing energy efficiencies and accommodating expansion of transmission capacity. With respect to environmental impacts, the examination of such impacts suggested by routing factor G is included in the discussion of other routing factors and elements that more specifically address an environmental impact (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 Section **15**.

A relative merits analysis was completed to compare Route Segments E1 and E2 using these routing factors. The analysis uses graphics (Table 10-10) 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 10-11 summarizes the relative merits analysis of Route Segments E1 and E2 for the routing factors that are anticipated to vary amongst route alternatives.

Table 10-10 Guide to Relative Merits Analysis

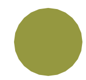
Consistency with Routing Factor or Anticipated Impacts	Symbol
Route alternative is consistent with the routing factor OR Impacts are anticipated to be negligible to minimal or the impact is positive	
Route alternative is consistent with routing factor but less so than the other options OR Impacts are 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 alternative 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	

Table 10-11 Relative Merits for Route Segments E1 and E2

Routing Factor / Resource	Route Segment		Summary
	E1 (Purple Route)	E2 (Blue Route)	
Factor A Human Settlement			
Aesthetics	◒	◒	Aesthetic impacts are anticipated to be moderate. Route Segment E1 (Purple Route) has less residences within close proximity (route width) and Route Segment E2 (Blue Route) has less residences when looking at a slightly broader area (local vicinity). Route Segment E2 (Blue Route) parallels more existing infrastructure (8.7 miles, 52% of its length) compared to Route Segment E1 (Purple Route) (5.3 miles, 30% of its length).
Displacement	●	●	There are no structures within the ROW on any of the routes.
Recreation	●	●	Route segments in Region E do not cross any land-based public trails, state water trails, wild and scenic rivers, or scenic byways. Regional recreational resources in Region E include snowmobile trails and impacts are anticipated to be minimal.
Factor C Land-Based Economies			
Agriculture	◒	◒	Most of the land included in Region E is agricultural. Impacts cannot be avoided but can be mitigated. Prudent routing (parallelling existing infrastructure and/or paralleling division lines) could help minimize impacts. Route Segment E2 (Blue Route) parallels more existing infrastructure (52 percent) and has less prime farmland. Some center pivot irrigation systems are present that could be avoided during final design.
Mining	●	●	No active aggregate gravel pits were identified within the ROI (the route width) for Region A; therefore, impacts to mining are anticipated to be minimal and independent of the route segment selected.
Factor D Archaeological and Historic Resources			
Archaeological	●	●	There are no archaeological sites present within the route width of either route segment.
Historic	◒	◒	Two unevaluated historic architectural resources are present within the route width of Route Segment E2 (Blue Route), and one unevaluated resource is within the route width of Route Segment E1 (Purple Route).
Factor E Natural Resources			
Public and Designated Lands	●	●	Region E has no public or designated land within the route width, with the exception of Wildlife Management Areas and Waterfowl Production Areas which are discussed in wildlife.
Soils	●	●	Nearly all of soils in this region have a moderate or severe rutting hazard rating, and most soils are prone to compaction (64 to 70 percent of ROW). Impacts could be minimized with BMPs or mitigated if long-term re-vegetation impacts extend beyond construction. Impacts to soils would be independent of the route selected.
Surface Water	◒	●	Route Segment E1 (Purple Route) has three times as many watercourse crossings as Route Segment E2 (Blue Route). Most of the watercourses crossed are intermittent or ephemeral streams. An unnamed tributary of Eden Brook parallels the anticipated alignment of Route Segment E1 within the route width. If the anticipated alignment parallels this stream, the potential for impacts (such as erosion or sedimentation) during construction could increase. All waterbodies and watercourses could be spanned by the project. No in-water work would occur.
Vegetation	●	●	Forested vegetation is minimal (3 acres) for both route segments.
Wetlands	●	◒	Both route segments have a relatively minimal amount of forested wetland in the ROW; however, Route Segment E2 (Blue Route) has more forested wetland than Route Segment E1 (Purple Route).
Wildlife and Wildlife Habitat	◒	◒	Route widths and anticipated alignments of both route segments would intersect Grassland Bird Conservation Areas, with E2 (Blue Route) intersecting more than E1 (Purple Route). Route width of Route Segment E2 (Blue Route) would intersect a Waterfowl Production Area but its anticipated alignment would not cross it. Route width of Route Segment E2 (Blue Route) would intersect Wildlife Action Network corridors and its anticipated alignment would cross them, while Route Segment E1 (Purple Route) would avoid these areas. Anticipated Alignments of both route segments would cross a shallow wildlife lake.

Routing Factor / Resource	Route Segment		Summary
	E1 (Purple Route)	E2 (Blue Route)	
Factor F Rare and Unique Natural Resources			
Rare and Unique Natural Resources	●	●	Documented record of Blanding's turtle (state threatened) found within 1 mile of both route segments. Documented record of loggerhead shrike (state endangered) was also found in the ROW of Route Segment E2 (Blue Route). However, this is a mobile species and could be found in the ROW of either route segment. The route width of both route segments would intersect Sites of Biodiversity Significance ranked "below". Route Segment E2 (Blue Route) would intersect a few more acres and its anticipated alignment would cross it.
Minnesota Statute 216E.03 - Subpart 7 (15e) *(transmission lines)*			
Paralleling Existing Transmission Line [1]	○	○	Neither route segment parallels existing transmission line.
Minnesota Statute 216E.03 - Subpart 7 (8) *(roads/railroads)*			
Paralleling Roads and Railroads	○	◒	Route Segment E1 (Purple Route) parallels less road ROW (3.0 miles and 17%). Route Segment E2 (Blue Route) parallels more existing road ROW (8.7 miles and 52%).
Factor H Paralleling Division Lines			
Paralleling existing survey lines, natural division lines, and agricultural field boundaries	●	●	Route Segment E1 (Purple Route) parallels division lines for 15.6 miles and 88% of its length. Route Segment E2 (Blue Route) parallels 14.2 miles and 86% of its length.
Factor J Paralleling Existing Infrastructure			
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.	○	◒	Route Segment E1 (Purple Route) parallels less existing ROW (5.3 miles and 30%). Route Segment E2 (Blue Route) parallels more existing ROW (8.7 miles and 52%).
Factor L Costs			
Costs Dependent on Design and Route	● $79,882,000	● $71,387,000	As noted in Section 10.7, costs generally coincide with the length of the line. Route Segment E2 (Blue Route) is anticipated to be within the margin of error for Route Segment E1.

[1] Minnesota Statute 216E.03 - Subpart 7 (15e) requires the Commission to consider locating a route for a high-voltage transmission line on an existing high-voltage transmission route. The summarized here indicates where ROW paralleling to existing transmission lines occurs but does not distinguish between HVTLs and other transmission lines that might not meet the definition of a HVTL (for example, distribution lines). Highways are included in the assessment provided for Minnesota Statute 216E.03 - Subpart 7 (8).

10.9 Route Connector 107

Route connectors are segments that can be used to transition from the Purple Route to the Blue Route, or vice versa. For purposes of analysis, route connectors are either incorporated into route segments studied at the regional level and travel in one direction or can be used to connect the Purple and Blue Routes. Route Connector 107 is a two-way route connector, which means it can be used to connect the Purple and Blue Route in either direction. Data tables for the route connectors is in Appendix E.

Route Connector 107 is one-half mile long and parallels existing infrastructure (roads) for 49 percent of its length (Map N.182). Two residences are between 500 and 1,600 feet away from the centerline. Most of the land within the ROW is cultivated crops (12 acres), and 6 acres are designated as prime farmland. There are no public lands or conservation easements located within the ROW.

There are three watercourse crossings and less than one acre of wetlands within the ROW. There are no waterbodies or forested wetlands crossed or within the ROW.

There are 17 acres of grassland bird conservation areas within the ROW and 118 acres within the route width. There are no Wildlife Action Network corridors, important bird areas, wildlife management areas, state game refuges, waterfowl production areas, or shallow wildlife lakes.

There are no rare and unique natural resources, records of a state threatened or endangered species, sites of biodiversity significance, or native plant communities. There are no railroad rights-of-way prairie, prairie bank easements, or lakes of biological significance.

10.10 Potential Refinements

A refinement is a route segment that was included in the scoping decision but not included within Route Segments E1 or E2. For purposes of analysis, refinements are considered in standalone comparisons against Purple Route or Blue Route equivalents. All three refinements would replace a component of Route Segment E1 (Purple Route) if included in the permitted route. Map 3.12 and Map 3.13 provide the locations of the refinements in Region E. Data tables for the refinements are provided in Appendix E.

10.10.1 Route Segment 230

Route Segment 230 departs the Purple Route halfway into T112N, R31W, S10 and traverses north. It turns east at CR 36 until it rejoins the Purple Route (Map N.184). This route segment was proposed to avoid impacts on agricultural lands and an eagle’s nest. Table 10-12 summarizes differences in potential impacts of Route Segment 230 compared against its equivalent.

Table 10-12 Route 230 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 230 parallels more existing infrastructure ROW (0.5 miles or 63%) compared to its equivalent (<0.1 miles or 2%). Neither Route Segment 230 nor its equivalent have any length that does not parallel division lines.
Human Settlement	Route Segment 230 has a residences within 75 top 250 feet, while the equivalent does not have any at this distance. Route Segment only has one residence within 500 to 1,600 feet, while its equivalent has 5.
Natural Environment – Surface Waters and Wetlands	Route Segment 230 has <1 acres of NWI wetlands. Route Segment 230's equivalent crosses one watercourse and has <1 acres of NWI wetlands.
Natural Environment – Wildlife and Wildlife Habitat	The route widths of Route Segment 230 and its equivalent intersect a Grassland Bird Conservation Area, with the Route Segment 230 equivalent intersecting more acreage (81 acres versus 22 acres). The anticipated alignment for Route Segment 230 would cross the Grassland Bird Conservation Area for a small portion of its length, while its equivalent would cross it for most of its length.

10.10.2 Route Segment 231

Route Segment 231 departs the Purple Route at 140th Street and traverses east. It turns north at County Highway 149 until it rejoins the Purple Route (Map N.186 through Map N.188). This Route Segment was proposed to minimize impact on dwellings, human health, cattle, property values, and farming operations. Table 10-13 summarizes differences in potential impacts of Route Segment 231 compared against its equivalent.

Table 10-13 Route Segment 231 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 231 parallels existing infrastructure ROW for 3.7 miles or 88% of its length; the equivalent does not parallel any. Route Segment 231 does not have any length that does not parallel division lines; the equivalent to Route Segment 231 includes a total of 1.8 miles that does not parallel existing infrastructure or division lines.
Human Settlement	Route Segment 231 has more residences than its equivalent within 75 to 250 feet (8 versus 1), 250 to 500 feet (4 versus 1), and 500 to 1,600 feet (19 versus 15).
Natural Environment – Surface Waters and Wetlands	Route Segment 231 crosses three watercourses and has 5 acres of NWI wetlands (<1 acre of which are forested wetlands). Route Segment 231's equivalent crosses two watercourses; it also includes 1 acre of NWI wetlands.

10.10.3 Route Segment 232

Route Segment 232 departs the Purple Route three quarters through T122N, R29W, S32 and traverses east. It continues east at Balsam Road and follows the curve of the road until it rejoins the Purple Route (Map N.189). This Route Segment was proposed to avoid impact on future center pivot irrigation system.

Table 10-14 summarizes differences in potential impacts of Route Segment 232 compared against its equivalent.

Table 10-14 Route 232 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 232 parallels more existing infrastructure ROW (1.3 miles or 75%) compared to its equivalent (0.6 miles or 25%). The equivalent does not have any length that does not parallel division lines; Route Segment 232 includes a total of 0.2 miles that does not parallel existing infrastructure or division lines.
Human Settlement	Route Segment 232 has three residences within 75 to 250 feet, while its equivalent does not have any at this distance. The equivalent has more residences than Route Segment 232 within 250 to 500 feet (2 versus 1) and within 500 to 1,600 feet (7 versus 4).
Natural Environment – Surface Waters and Wetlands	Route Segment 232 does not cross any watercourses or waterbodies and has 6 acres of NWI wetlands. Route Segment 232's equivalent does not cross any watercourses or waterbodies and has 2 acres of NWI wetlands.
Natural Environment - Vegetation	According to the NLCD, Route Segment 232's ROW would intersect approximately 1 acre of forested landcover, while its equivalent would avoid forested landcover.

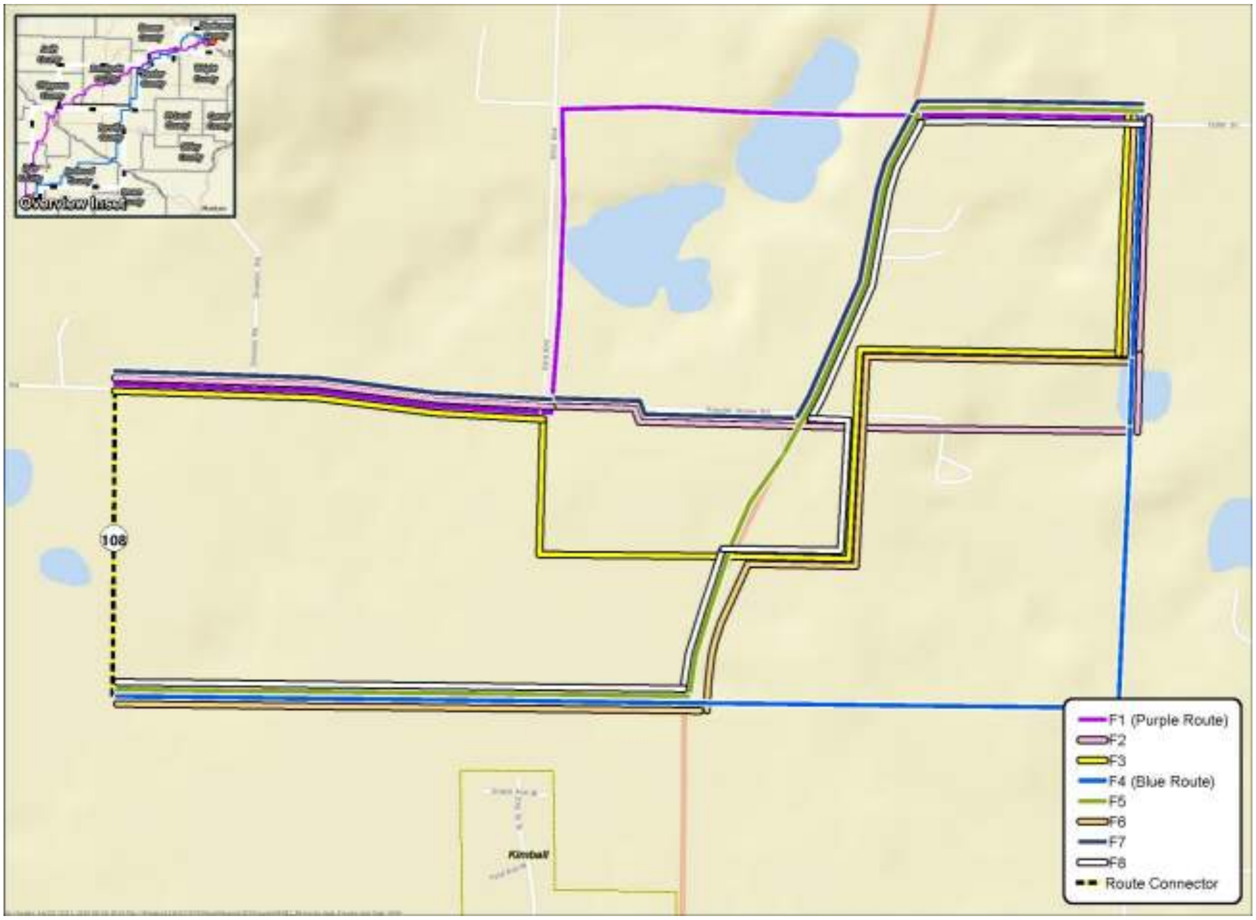
11 Region F - Potential Impacts and Mitigation

Chapter 11 describes potential impacts in Region F, which is the second northern-most region and is in Stearns County (Map 2). The eight route segments in Region F are shown in Figure 11-1 and described below.

- Route Segment F1 is the applicant's proposed Purple Route. It is 2.2 miles long.
- Route Segment F2 is a variation of the Purple Route to Blue Route. It is 2.3 miles long. It includes a portion of the applicant's proposed Purple Route, Route Connector 110 and a portion of the applicant's proposed Blue Route. Route Connector 110 was proposed as an alternative to avoid a center pivot irrigation system.
- Route Segment F3 is a variation of the Purple Route to Blue Route. It is 2.7 miles long. It includes a portion of the applicant's proposed Purple Route, Route Connector 109 and a portion of the applicant's proposed Blue Route. Route Connector 109 was proposed by the DNR to avoid two PWI wetlands and a pivot irrigation system crossed by Route Segment F1 (Purple Route).
- Route Segment F4 is the applicant's proposed Blue Route. It is 2.7 miles long.
- Route Segment F5 is a variation of the Blue Route to Purple Route. It is 2.4 miles long. It includes a portion of the applicant's proposed Blue Route, Route Segment 234a (proposed as an alternative to follow road ROW), and a portion of the applicant's proposed Purple Route.
- Route Segment F6 is a variation of the Blue Route. It is 2.7 miles long. It includes Route Segment 233 which was proposed by the DNR as an alternative to minimize potential impacts to avoid two PWI wetlands and a pivot irrigation system crossed by Route Segment F1 (Purple Route).
- Route Segment F7 is a variation of the Purple Route. It is 2.1 miles long. It includes a portion of the applicant's proposed Purple Route, Route Connector 110, Route Segment 234a (proposed as an alternative to follow road ROW), and a portion of the applicant's proposed Purple Route. Route Connector 110 was proposed as an alternative to avoid a center pivot irrigation system.
- Route Segment F8 is a variation of the Blue Route to the Purple Route. It is 2.7 miles long. It includes a portion of the applicant's proposed Blue Route, Route Connector 109, Route Connector 110, Route Segment 234a (proposed as an alternative to follow road ROW), and a portion of the applicant's proposed Purple Route. Route Connector 109 was proposed by the DNR to avoid two PWI wetlands and a pivot irrigation system crossed by Route Segment F1 (Purple Route). Route Connector 110 was proposed as an alternative to avoid a center pivot irrigation system.

Route Connector 108 can connect the Purple Route and Blue Route in either direction. Route Connector 108 was proposed as an alternative to avoid a portion of the Blue Route to the east (in other words, avoid Route Segment F4 Blue Route) that impacts agricultural land. The commentor also noted this option provides more opportunity for Kimball to grow to the north. Route Connector 108 is further described in Section 11.7. It is 0.5 miles long.

Figure 11-1 Region F Route Segments



11.1 Environmental Setting

Region F is dominated by agricultural land use and rural residential and nearby commercial areas (Map 6). There are no major waterways crossed by the route alternatives within Region F. Two unnamed PWI waterbodies are in the northwestern part of the region and School Section Lake is located directly east of Region F (Map N.197).

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. Under this classification system, Region F is in the Minnesota and NE Iowa Morainal section of the Eastern Broadleaf Forest Province (Map 15). This section is further broken down into subsections, including the Hardwood Hills subsection, which spans this entire region. This subsection is used below to classify the environmental setting of the project.

The Hardwood Hills Subsection is characterized by steep slopes, high hills, and lakes formed in glacial end moraines and outwash plains. The Alexandria Moraine forms a high ridge that is the headwaters region of many rivers and streams flowing east and west. Most of this subsection is covered in 100 to 500 feet of glacial drift over diverse bedrock. Loamy soils are dominant, with loamy sands and sandy loams on outwash plains as well as loams and clay loams on moraines. Woodland and forest were common within this subsection prior to pre-European contact, with some forests remaining adjacent to lakes or steep landscapes. Wetlands and lakes in poorly-drained potholes provide opportunities for recreation or wildlife habitat in this subsection with tourism opportunities, especially in areas around lakes (reference (212)).

Region F is the second northern-most region and is in Stearns County (Map 2). Major communities nearest the route alternatives include Annandale and Kimball to the south (Map 2). Existing transmission lines are prevalent throughout the region. No railroads traverse through the region. Region F is generally bounded by State Highway 15 to the west. Region F intersects with State Highway 55. There are no federal highways within Region F. State highways within the region include State Highway 55 and State Highway 15. County and township roads are also present within the region (Map 9).

11.2 Human Settlement

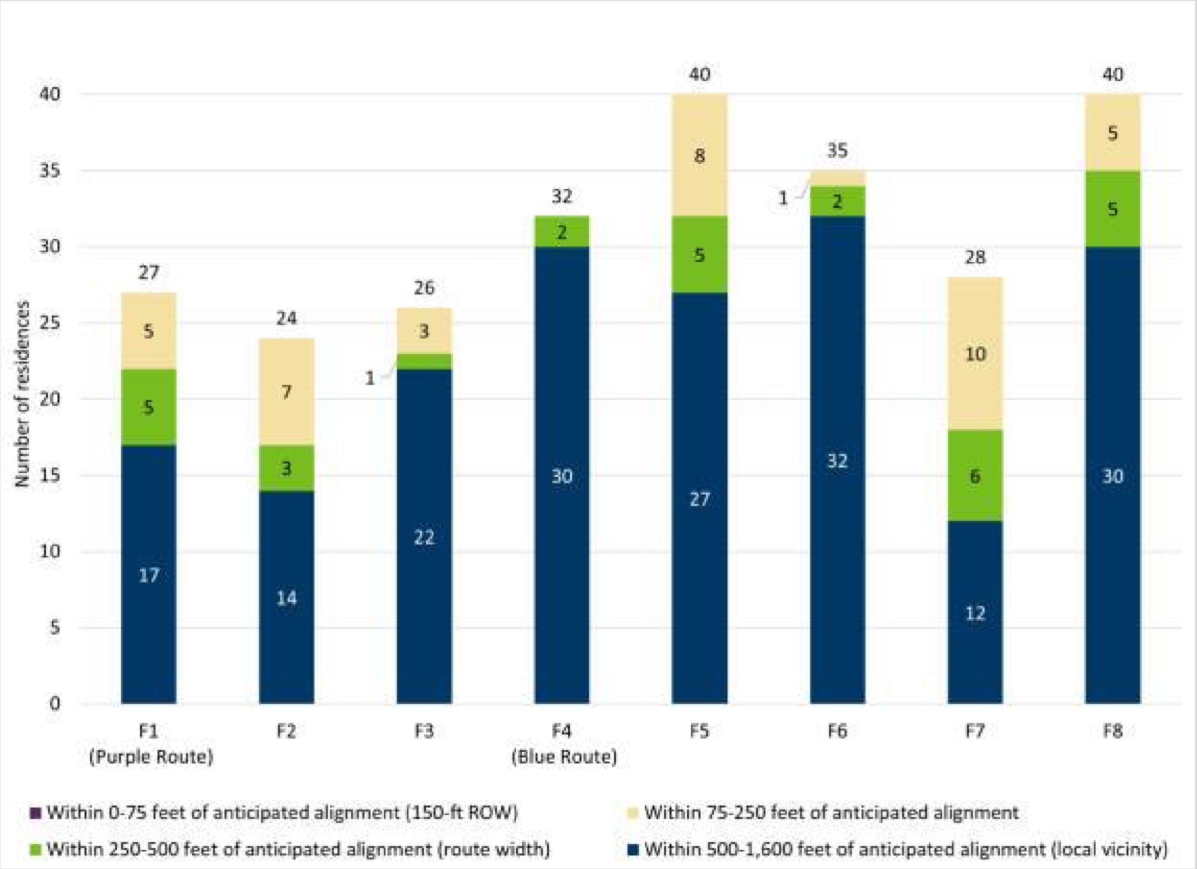
11.2.1 Aesthetics

The ROI for aesthetics is the local vicinity. HVTLs alter a viewshed (Section 5.2.1.2). Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes. 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, and 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 HVTL 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. Additional details regarding potential impacts to aesthetics and potential mitigation measures is provided in Section 5.2.1.

Appendix N shows human settlement features (for example, residences and nursing homes) in the local vicinity of the route segments. No recreational resources where people might congregate were identified within the ROI (Section 11.2.8). The proximity of residential structures (homes) and non-residential structures to route segments at various distances is shown in Figure 11-2 and Table 11-1, respectively. Route Segments F3, F4 (Blue Route), and F6 have the least residences within 250 feet. Route Segment F2 has the least residences within the local vicinity. Route Segments F5 and F8 have the most residences within their local vicinities. Route Segment F7 has the most non-residential structures within its route width and total local vicinity (Table 11-1).

Figure 11-2 Region F, Route Segments, Proximity of Residential Structures



For total count of residential structures within the route width, combine residential structures within 75-250 feet and residential structures within 250 and 500 feet.

For total count of residential structures within the local vicinity, combine residential structures within each distance; this number is also stated at the top of each bar.

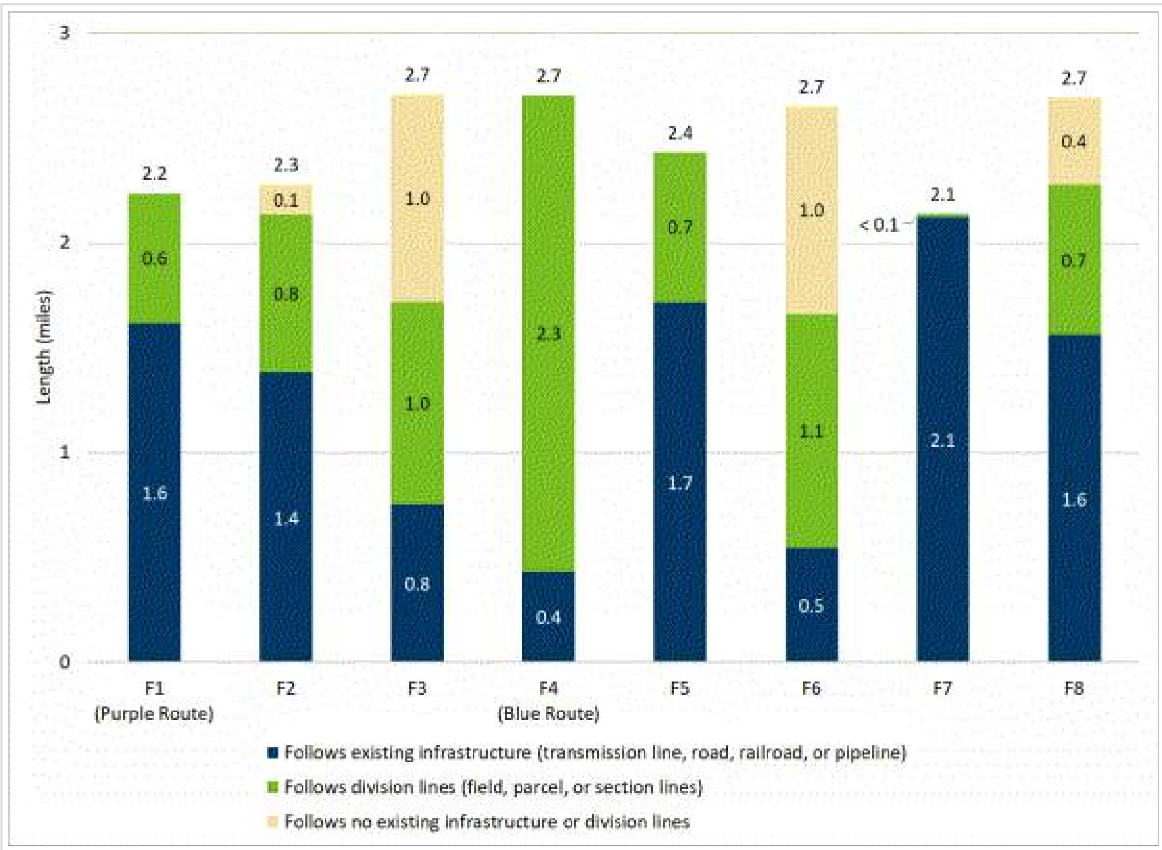
Table 11-1 Region F, Route Segments, Proximity of Non-Residential Structures

Distances from Anticipated Alignment	Route Segment							
	F1 (Purple Route)	F2	F3	F4 (Blue Route)	F5	F6	F7	F8
0-75 feet (150-foot-ROW)	0	1	0	0	1	0	1	1
75-250 feet	7	15	4	0	15	0	20	12
250-500 feet (generally route width)	22	14	14	2	21	6	30	19
500-1,600 feet (local vicinity)	55	41	61	24	27	42	38	32
Total	84	71	79	26	64	48	89	64

Non-residential structures include churches, schools (public and private), daycares/child-care centers/pre-schools, hospitals, nursing homes, and commercial and non-residential structures.

Each route segment would parallel with existing infrastructure or division lines as shown in Figure11-3 and Table 11-2. In some cases, portions of a route segment might parallel ROW with more than one of these existing features at the same time. Map 9 illustrates where ROW paralleling occurs and shows existing infrastructure and division lines in the region. None of the route segments parallel existing transmission line ROW. Route Segment F7 parallels the most ROW with existing infrastructure (2.1 miles and 99 percent of its length). Route Segments F3, F4 (Blue Route), and F6 parallel the least ROW with existing infrastructure.

Figure11-3 Region F, Route Segments, ROW Paralleling of Existing Infrastructure and/or Division Lines Summary



The total mileage at the top of each route segment represents that route segment's total length. Numbers may not sum due to rounding.

Table 11-2 Region F, Route Segments, Route Segments, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

Infrastructure and/or Division Lines	Route Segment							
	F1 (Purple Route)	F2	F3	F4 (Blue Route)	F5	F6	F7	F8
Follows existing transmission line (miles, percent)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Follows existing roads (miles, percent)	1.6 (72)	1.4 (61)	0.8 (28)	0 (0)	1.5 (60)	0.3 (10)	2.1 (99)	1.3 (48)
Follows existing railroad (miles, percent)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Follows existing pipeline (miles, percent)	0 (0)	0 (0)	0 (0)	0.4 (16)	0.3 (11)	0.3 (11)	0 (0)	0.3 (10)
Total ROW paralleling (w/transmission line, road, and railroad) (miles, percent)	1.6 (72)	1.4 (61)	0.8 (28)	0.4 (16)	1.7 (71)	0.5 (21)	2.1 (99)	1.6 (58)
Follows Field, parcel, and Section Lines (miles, percent)	2.2 (100)	2.1 (94)	1.7 (63)	2.7 (100)	2.4 (100)	1.7 (63)	2.1 (100)	2.3 (85)
Total- All (miles, percent) [1]	2.2 (100)	2.1 (94)	1.7 (63)	2.7 (100)	2.4 (100)	1.7 (63)	2.1 (100)	2.3 (85)

Totals might not sum to 100 percent due to rounding.
[1] This total is indicative of the full length of the route segment that parallels existing infrastructure ROW and/or division lines. For Region F, the total presented here is the same as the total for following division lines because there is not any length that follows existing infrastructure that doesn't allow follow division lines.

11.2.2 Cultural Values

Potential impacts to cultural values are discussed for the entire project in Section 5.2.2. The assessment was completed for the project as a whole because existing conditions are better understood at a broader scale than the regional level. Impacts to cultural values are independent of the route selected.

11.2.3 Displacement

The ROI for displacement is the ROW. Displacement occurs when a residence or building is required to be removed for construction of the project. Residential buildings within the ROI would require removal, whereas non-residential buildings could stay within the ROI if the activities taking place in these buildings are compatible with the safe operation of the line. Additional details regarding displacement and potential mitigation measures are provided in Section 5.2.3.

There are no residences within the ROI for the route segments within Region F. Route Segments F2, F5, F7, and F8 include one non-residential structure within the ROW (Table 11-1). The structure within the ROW of F2 is an unidentifiable building. The structures within the ROW of F5, F7, and F8 appear to be industrial or commercial buildings. The non-residential structures are shown in Map N.197.

11.2.4 Environmental Justice

No EJ areas were identified in Region F. See Section 5.2.4 for the assessment on environmental justice in Region F.

11.2.5 Land Use and Zoning

Potential impacts to land use and zoning are discussed in Section 5.2.5. The assessment for land use and zoning was completed for the project as a whole because existing conditions are determined by jurisdictional areas (counties) and do not coincide with the project's regional boundaries.

11.2.6 Noise

Potential impacts from noise are discussed for the entire project in Section 5.2.6. The assessment for noise was completed for the project as a whole because there is limited variability in the potential for noise across the route alternatives.

11.2.7 Property Values

Potential impacts to property values are discussed for the entire project in Section 5.2.7. The assessment for property values was completed for the project as a whole because there is limited variability in the potential for property value impacts across the route alternatives.

11.2.8 Recreation

The ROI for recreation is the route width. 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 5.2.8.2). 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 would vary based on individual perspectives and experiences. Impacts to recreation are assessed through identification of recreational resources within the ROI. The project is not anticipated to directly impede recreational activities within the ROI such as snowmobiling, golfing, canoeing, hunting, or fishing. Additional details regarding potential impacts to recreation and potential mitigation measures for the project is provided in Section 5.2.8.

Route segments in Region F do not cross any land-based public trails, state water trails, wild and scenic rivers, or scenic byways. Snowmobile trails maintained by Meeker County Trails and Stearns County Snowmobile Trails are present (Map 5). All route segments cross snowmobile trails one time and include around 0.2 mile of trails within the route width.

Public lands, including state game refuges, are publicly accessible and can be used for recreational purposes. State game refuges are discussed in Section 11.6.12.

11.2.9 Socioeconomics

Potential impacts to socioeconomics are discussed for the entire project in Section 5.2.9. This is because the assessment was completed at the county-level which does not always align with regional boundaries.

11.2.10 Transportation and Public Services

Potential impacts to transportation and public services are discussed for the entire project in Section 5.2.10. The assessment was completed for the project as a whole and not carried forward at the regional level because there is limited variability in across the route alternatives. Potential impacts to private airstrips are discussed in land-based economies.

11.3 Human Health and Safety

The impacts to human health and safety are discussed generally for the entire project in Section 5.3. The assessment was completed for the project as a whole and not carried forward at the regional level because there is limited variability across the route alternatives and generally impacts would be minimized by appropriate placement and adhering to applicable transmission line standards and codes**.**

11.4 Land-based Economies

Land-based economies are assessed by considering four elements: agriculture, forestry, mining, and tourism (Section 5.4). Impacts to three elements of land-based economies are anticipated to be minimal and independent of the route segment selected in Region F. These elements are:

- **Forestry –** There are no known forestry operations in the ROI (Section 5.4.1.3).
- **Tourism –** Limited recreational resources are located within the ROI (local vicinity) for Region F (Section 11.2.8); therefore, any direct impacts to the recreation that would cause an indirect impact to tourism based economies are anticipated to be negligible (Section 5.4.2.4).

11.4.1 Agriculture

The ROI for the land-based economy of agriculture is the route width. Construction and operation of a HVTL impacts agriculture (Section 5.4.2.1). 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 HVTL structures directly impedes agricultural production and/or impedes efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields.

Prudent routing (paralleling existing infrastructure and/or paralleling division lines) could help minimize potential impacts. Implementation of the AIMP (Appendix K), would minimize and mitigate impacts to

agriculture. Additional details regarding potential impacts to agriculture and potential mitigation measures is provided in Section 5.4.

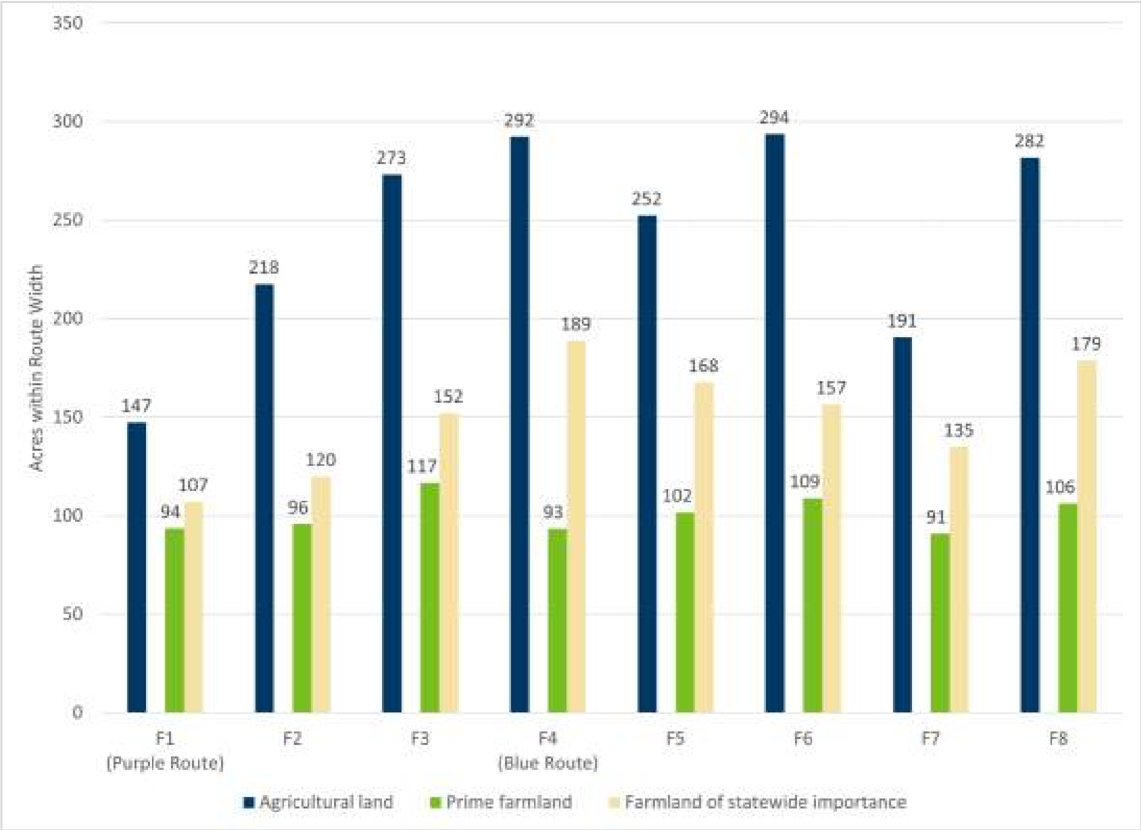
Figure 11-4 summarizes the total acres within the route widths of Region F route segments that are designated as agricultural land use, as well as prime farmland and farmland of statewide importance. More than 40 percent of the land within the route widths of Route Segments F2, F3, F4 (Blue Route), F5, F6, and F8 is designated as agricultural land use (cultivated crops and hay/pasture; see Section 11.6.10). For Route Segments F1 (Purple Route) and F7, agricultural land use is 40 percent or more within the route width.

Route Segment F3 has the most prime farmland; Route Segment F4 (Blue Route) has the most farmland of statewide importance. Route Segment F7 has the least prime farmland; Route Segment F1 (Purple Route) has the least farmland of state importance.

As noted in Table 11-2, Route Segment F7 parallels the most existing infrastructure (nearly 100% of its total length) and Route Segment F4 (Blue Route) parallels the least amount (16% of its total length).

Route Segments F3 and F6 have the greatest distance that does not follow existing infrastructure or division lines at 1.0 miles (Figure), while Route Segments F1 (Purple Route), F4 (Blue Route) and F7 completely parallel division lines. Route Segment F2 only has 0.1 miles that does not follow existing infrastructure or division lines.

Figure 11-4 Region F Route Segments, Acres of Agricultural Lands and Prime Farmland within Route Widths



Source: Agricultural land, NLCD and prime farmland/farmland of statewide importance, SSURGO (Appendix C)

Multiple center pivot irrigation systems are present in Region F (Map 11.8). Route segments in Region F have at least three center pivot irrigation systems within the route width. The anticipated alignments avoid the center pivot irrigation systems in most cases. Route Segment F4 (Blue Route) would unavoidably impact at least two center pivot irrigation systems.

11.4.2 Mining

The ROI for the mining land-based economy is the route width. Impacts to aggregate mine could include interference with access to aggregate resources or the ability to successfully mine these reserves (Section 5.4.2.3). If future geophysical surveys are planned, the surveying technology could also be impacted. Potential impacts are assessed through identification of known, existing and prospective mining operations and assessing potential impacts to those current or potential future operations. If the potential for impacts to mining operations would occur, the applicant would be required to coordinate those impacts with the mining operator (Section 5.4.3).

There are three potentially active gravel pits present within Region F. The first active gravel pit is located north of Powder Ridge Road and west of 93rd Avenue (Map N.197). The anticipated alignments of Route Segments F1 (Purple Route), F2, F3, and F7 are located directly south of the gravel pit on the south side of Powder Ridge Road. The anticipated alignment of Route Segment F1 (Purple Route) deviates from the other three and proceeds north. When Route Segment F1 (Purple Route) traverses north/south, the anticipated alignment is directly east of the gravel pit and on the other side of 93rd Avenue. Impacts to the gravel operation are anticipated to be minimal for all route segments given that access would not be anticipated to be restricted and no impacts to operations would occur.

The second active gravel pit (MnDOT ASIS Number 73079) is located south of 150th Street and north of School Section Lake (Figure 11-5). The route widths of Route Segments F2, F3, F4 (Blue Route), and F6 extend into the gravel pit parcel as seen in Figure 11-5. Impacts to the gravel pit would be dependent upon which route segment is selected. The southern part of the active gravel pit is crossed by Route Segments F3 and F6. If either of these route segments were selected, impacts to the gravel pit would be significant and would require further coordination and potential financial compensation for mitigation between the applicant and the operator. Route Segment F2 traverses the parcel where the gravel pit is in its southern half. Based on aerial imagery review, this area does not appear to be actively mined. If development of the gravel pit continued south, future impacts to its operation could occur. Potential impacts for these options could be moderate to significant.

Many of the route segments also traverse north/south directly east of the gravel pit.

Some route segments traverse north/south on the east side of the gravel pit. The applicant noted in its route permit application that the ROW crosses the eastern edge of the mining operation, but the anticipated alignment follows the eastern parcel boundary. The applicant would be required to coordinate impacts with the mining operator. Potential impacts on the east side of the gravel pit would be anticipated to be minimal as access would not be inhibited.

Figure 11-5 MnDOT ASIS Number 73079 Gravel Pit

The third potentially active gravel pit is ASIS ID 73164. It is located adjacent to route segments in both Region G and Region F. This gravel pit is discussed in Section 12.4.2.

11.5 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 (Section 5.5.2). 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. Indirect 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. Additional details concerning potential impacts

and mitigation for the project as a whole regarding archaeological and historic resources are provided in Section 5.5.3.

Documented archaeological and historic resources within Region F are summarized in the following tables.

- Table 11-3 summarizes the number of archaeological and historic resources within the project area (which is within one mile of the anticipated alignments).
- Table 11-4 summarizes the number of archaeological and historic resources within the ROI (route width) for each of the Region F, route segments.
- Table 11-5 provides descriptions of the resources located within the route widths.

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

Table 11-3 Region F, Route Segments, Number of Archaeological and Historic Resources within the Project Area

Route Segment	Archaeological Resources	Historic Architectural Resources	Historic Cemeteries
F1 (Purple Route)	1	1	1
F2	1	1	1
F3	1	1	1
F4 (Blue Route)	1	6	1
F5	1	6	1
F6	1	6	1

Table 11-4 Region F, Route Segments, Number of Archaeological and Historic Resources within the Route Width

Route Segment	Archaeological Resources	Historic Architectural Resources	Historic Cemeteries
F1 (Purple Route)	0	1	0
F2	0	1	0
F3	0	1	0
F4 (Blue Route)	0	1	0
F5	0	1	0
F6	0	1	0

Table 11-5 Region F, Route Segments, Historic Resources within the Route Width Summary

Route Segment(s)	Site/Resource Number	Resource Type	Resource Name/Description	NRHP Status	Description
F1 (Purple Route), F2, F3, F4 (Blue Route), F5, F6, F7, F8	XX-ROD-00161	Historic Architecture	Trunk Highway 15	Not Eligible	-

11.5.1 Archaeological Resources

There are no archaeological sites within the route widths (Table 11-4) and based on the Minnesota Department of Transportation's predictive model, much of the region has been well surveyed and has low site potential (reference (208)).

11.5.2 11.5.3 Historic Architectural Resources

One historic architectural resource, ineligible for listing on the NRHP, is present within the route widths of the route segments in Region F. No route segments contain eligible or unevaluated resources with the route widths (Table 11-5).

11.6 Natural Environment

11.6.1 Air Quality

Potential impacts to air quality are expected to be similar to those discussed for the entire project in Section 5.6.1. The assessment for air quality was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

11.6.2 Climate

Potential impacts to climate are expected to be similar to those discussed for the entire project in Section 5.6.2. The assessment for climate was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

11.6.3 Geology and Topography

Potential impacts to geology and topography are expected to be similar to those discussed for the entire project in Section 5.6.3. The assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

11.6.4 Greenhouse Gases

Potential impacts to greenhouse gases are expected to be similar to those discussed for the entire project in Section 5.6.4. The assessment for greenhouse gases was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected given their similar lengths.

11.6.5 Groundwater

Potential impacts to groundwater are expected to be similar to those discussed for the entire project in Section 5.6.5. The assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

11.6.6 Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands often involve unique resources intended for protection and/or preservation and would be subject to short and long-term impacts depending upon their use (Section 5.6.6.2). Public and designated lands within the ROI are first identified and then further reviewed to better understand potential impacts such as vegetation clearing. Occupying public and designated lands would require coordination with the landowner (Section 5.6.6.3).

There are no public or designated lands within the route width of Region F except for state game refuges which are discussed in Section 11.6.12.

11.6.7 Rare and Unique Natural Resources

Rare and unique natural resources encompasses 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 construction and operation-related impacts to protected species and sensitive ecological resources are discussed in Section 5.6.7.4. 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. 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.

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 that 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, are described in Section 5.6.7.5.

Sensitive ecological resources within Region F are shown on Map 12. To protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on maps.

11.6.7.1 Protected Species

According to the NHIS database, no federally protected species have been documented within 1 mile of the route segments in Region F. One state protected species, the Blanding's turtle, has been documented within the ROW of Route Segments F1 (Purple Route), F2, F3, and F7 and within 1 mile of Route Segments F4 (Blue Route), F5, F6, and F8 (Appendix M). No state special concern species have been documented within 1 mile of any of the route segments in Region F (Appendix NAppendix M).

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 ROW or route width of the route segments. Prior to construction, the applicant could be required to conduct field surveys in coordination with the USFWS and/or DNR for the potential presence of protected species.

11.6.7.2 Sensitive Ecological Resources

The route widths of the route segments in Region F do not traverse any sensitive ecological resources, as described in Section 5.6.7.3; as such, impacts to sensitive ecological resources are not anticipated.

11.6.8 Soils

The ROI for soils is the ROW. Common soil impacts include rutting, compaction, and erosion (Section 5.6.8.2). Potential impacts would be short-term during construction and localized. Impacts 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 vehicles trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored a suitable location. Disturbed areas would be promptly seeded after construction. Additional details regarding potential impacts to soils and potential mitigation measures is provided in Section 5.6.8.

Map 13 shows the surface soil textures across the region. Soil types within the ROW were reviewed to identify soil characteristics that could be more prone to impacts in some areas versus others (Table 11-6). Soils within the ROW of the route segments of Region F include soil susceptible to erosion (less than 5 percent of ROW) and hydric soil (5 percent or less of ROW). Most soils within the ROW of the route segments of Region F have a moderate or severe rutting hazard rating, and most soils are prone to compaction (generally over 85 percent of ROW).

Table 11-6 Region F, Route Segments, NRCS Mapped Soils Within ROW

Soil Data	Unit	Route Segment							
		F1 (Purple Route)	F2	F3	F4 (Blue Route)	F5	F6	F7	F8
Area within Route Segment ROW	Acres	41	42	50	50	45	49	39	49
Hydric Soils [1]	Acres	0	2	0	0	0	0	0	0
Compaction Prone [2]	Acres	32	35	43	43	43	42	37	46
Rutting Hazard [3]	Acres	35	40	49	47	44	48	39	49
Erosion Hazard (Off-Road, Off-Trail) [4]	Acres	2	1	2	1	1	2	1	2
Revegetation Concerns [5]	Acres	0	0	0	0	0	0	0	0

[1] Hydric soil includes hydric soils (100%) and predominantly hydric soils (67-99%).
[2] Soils considered to be compaction-prone soils include those with a rating of "Medium" or higher.
[3] Soils considered susceptible to Rutting Hazards include those with a rating of "Moderate" or "Severe."
[4] Soils considered susceptible to erosion hazard soils include those with a rating of "Medium," "Severe," or "Very Severe."
[5] Soils considered to have revegetation concerns include soils with a non-irrigated land capability classification of 3 or greater.

11.6.9 Surface Water

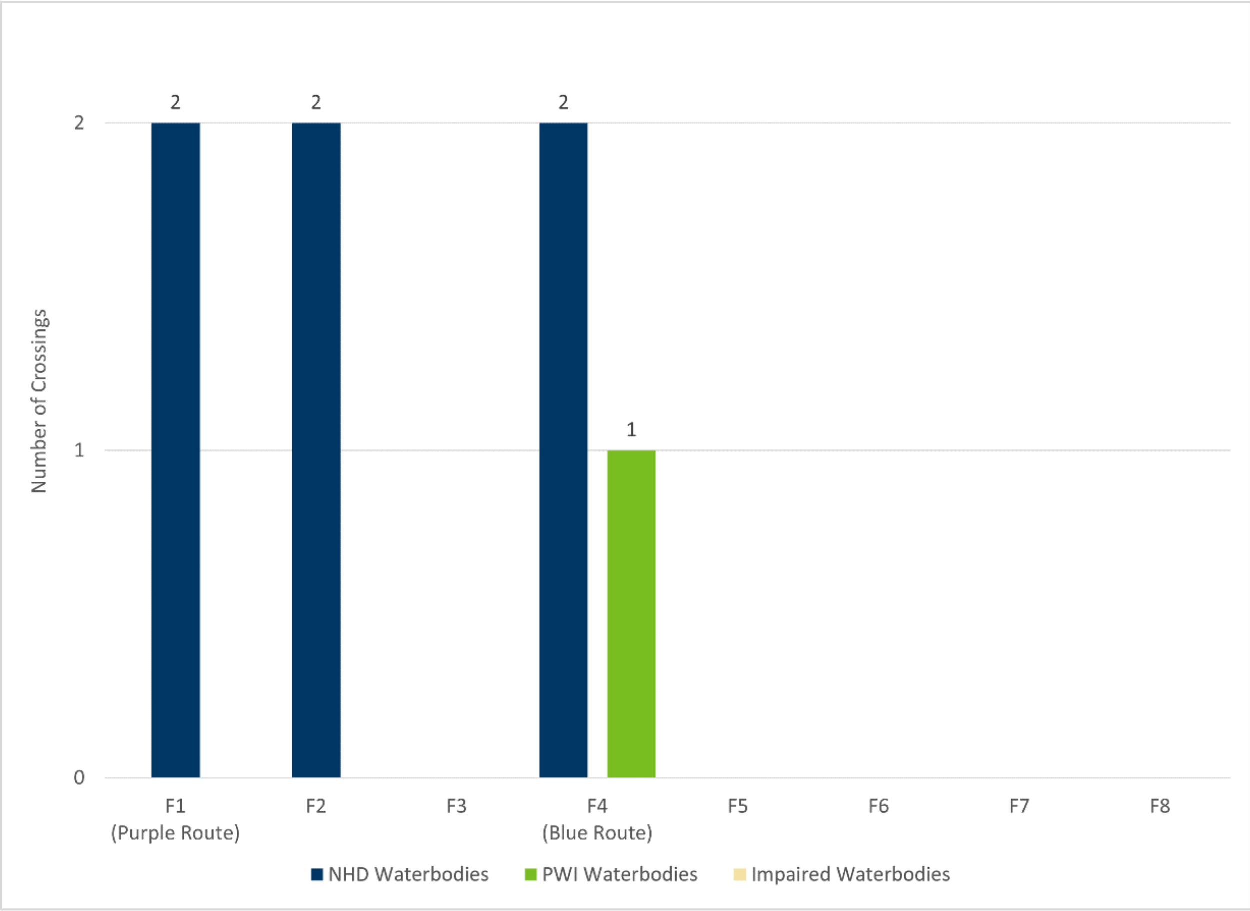
The ROI for surface water is the route width. Potential impacts to surface waters are discussed in Section 5.6.9.2. Direct impacts caused by structures placed in surface waters would be avoided by spanning the surface waters. Direct impacts to other resources can cause indirect impacts to surface waters. 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 or waterbodies and/or special or impaired waters.

Impacts would be mitigated by using BMPs. 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. Additional details regarding potential impacts to surface waters and potential mitigation measures, including those provided in the DNR's Natural Heritage Review response, is provided in Section 5.6.8.3.

Map 14 shows the mapped waterbodies and watercourses across the region. There are watercourses, trout streams, state-designate outstanding resource value waters, or state-designated wild, scenic, and recreational rivers are crossed by the route segments in Region F.

Route Segments F1 (Purple Route), F2, and F4 (Blue Route) include two waterbodies within their route width (Figure 11-6). One is designated as a PWI basin. The PWI basin (School Section Lake) is within the route width of Route Segment F4 (Blue Route) but is not crossed by its anticipated alignment (Map N.197).

Figure 11-6 Region F Route Segments Number of Waterbody Crossings by Type



11.6.10 Vegetation

The ROI for vegetation is the ROW. Potential construction and operation-related impacts to vegetation are discussed in Section 5.6.10.2. 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. 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, as described in Section 5.6.10.3.

Map 7 provides an overview of landcover types across Region F, and Table 11-11 summarizes the landcover types within the ROW of each route segment in Region F. Agricultural vegetation, particularly cultivated cropland, represents the dominant vegetative landcover type within the ROW of each route segment in Region F. Minal amounts (up to two acres) of forested, herbaceous, and/or barren landcover is also present in the ROW of each route segment.

As discussed in Section **5.6.10.2**, the applicant would clear forested vegetation from the ROW during construction, and the ROW would be maintained with low-growing vegetation during operations to minimize potential interference with the transmission line. Given that a maximum of 1 acre of forested vegetation is in the ROW of all route segments in Region F, impacts are anticipated to be minimal.

Table 11-11 Region F, Route Segments, Landcover Types in the ROW

Landcover Type	Route Segment							
	F1 (Purple Route)	F2	F3	F4 (Blue Route)	F5	F6	F7	F8
Agricultural (cultivated crops and hay/pasture) (acres in ROW [%of ROW])	20 (49%)	27 (64%)	39 (79%)	46 (94%)	27 (60%)	44 (91%)	17 (44%)	35 (71%)
Forest (upland and wetland) (acres in ROW [%of ROW])	1 (2%)	1 (2%)	< 1 (0%)	< 1 (0%)	1 (2%)	< 1 (0%)	1 (2%)	1 (1%)
Herbaceous (upland and wetland) (acres in ROW [%of ROW])	< 1 (1%)	1 (1%)	< 1 (0%)	1 (1%)	< 1 (0%)	0 (0%)	< 1 (1%)	0 (0%)
Open water (acres in ROW [%of ROW])	3 (7%)	2 (4%)	0 (0%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Developed (low-high intensity; open space) (acres in ROW [%of ROW])	17 (42%)	12 (28%)	8 (16%)	1 (1%)	17 (38%)	2 (4%)	21 (53%)	14 (27%)

Source: NLCD (Appendix C)
Totals might not sum to 100 percent due to rounding.

Potential impacts to agricultural vegetation and wetlands are discussed Section **5.4.2** and **5.6.11.2**, respectively.

11.6.11 Wetlands

The ROI for wetlands is the route width. Short-term and long-term potential impacts to wetlands are discussed in Section 5.6.11.2. Impacts to wetland 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 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.

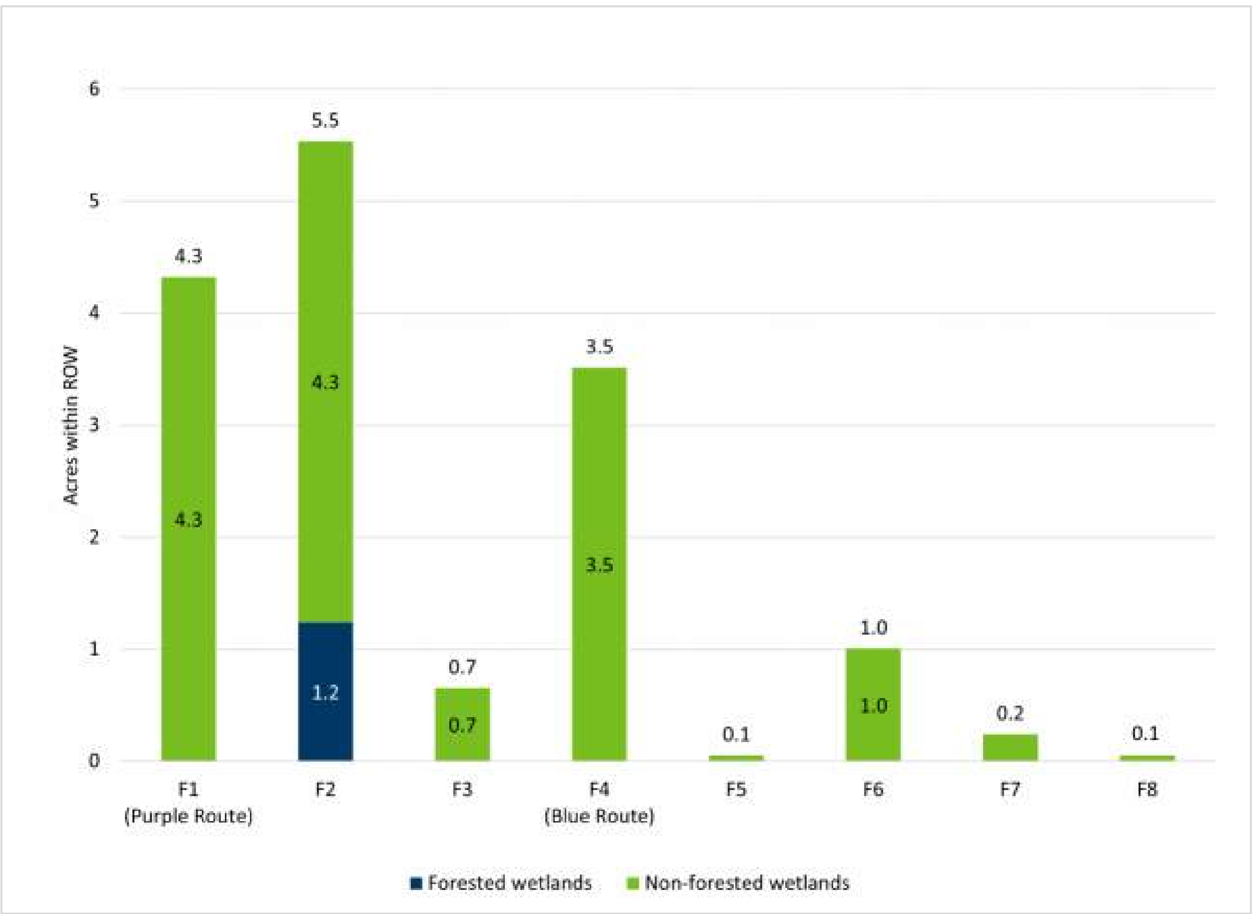
Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width. Wetland impacts would be regulated as described in 5.6.11.1.1. Additional details regarding potential impacts to wetlands, including those provided in the DNR's Natural Heritage Review response, and potential mitigation measures is provided in Section 5.6.11.3.

Map 14 shows the mapped wetlands within the ROI. Direct wetland impacts would occur within the construction workspace (within or adjacent to the ROW); not all wetland areas within the ROI would be subject to direct impacts as most could be spanned. Wetlands in the Region F ROI consist mainly of lake, emergent, and unconsolidated bottom wetlands but also include aquatic bed, forested, and scrub-shrub wetlands. Total acres of wetlands within the route widths of the route segments are provided in Appendix E.

The route width of Route Segments F5 and F8 would include the least wetland area (13.2 acres). The route width of Route Segment F1 (Purple Route) would include the most wetland area (41.9 acres). Two PWI wetlands are crossed by Route Segment F1 (Purple Route).

Forested wetlands subject to permanent impacts due to their conversion would be contained within the ROW. Route Segments F1 (Purple Route), F3, F4 (Blue Route), F5, F6, F7, and F8 would not include any forested wetlands within the ROW (Figure 11-7). Route Segment F2 has 1.2 acres of forested wetland within its ROW.

Figure 11-7 Region F Route Segments Acres of Wetland by Type within ROW



11.6.12 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. Potential construction and operation-related impacts to wildlife and wildlife habitat are discussed in Section 5.6.12.2. Potential short-term, localized impacts could occur from displacement during construction or maintenance activities. Potential long-term impacts could occur as a result to 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, as described in Section 5.6.12.3.

Map 16 provides an overview of resources across Region F and Table 11-7 summarizes the wildlife resources within the route width of each route segment in Region F.

A state game refuge is located within the route widths and local vicinity of all route segments in Region F near School Section Lake (Map N.197). The route width of Route Segment F4 (Blue Route) would intersect the most acres of the state game refuge as it parallels both the western and northern sides of the refuge. None of the anticipated alignments for the route segments in Region F would cross the state game refuge.

Grassland Bird Conservation Areas are located within the route width and local vicinity of all route segments in Region F. The route widths intersect between 209 and 340 acres of Grassland Bird Conservation Areas, with Route Segment F5 intersecting the least and Route Segment F3 intersecting the most. The anticipated alignments of all route segments in Region F would cross Grassland Bird Conservation Areas.

A DNR-identified shallow wildlife lake (School Section Lake) is located within the local vicinity of Route Segments F2, F3, F4 (Blue Route), and F6 (Map N.197); however, Route Segment F4 (Blue Route) is the only one with this lake located within its route width. The anticipated alignment for Route Segment F4 (Blue Route) would cross and span the edge of the lake in an area that does not parallel and existing transmission line or road ROW.

None of the route segments in Region F would parallel existing transmission line ROW; as such, traversing wildlife areas along new transmission line corridors could increase potential impacts to avian species traveling through these areas. As discussed in Section 5.6.12.3, avian impacts can be minimized through use of bird flight diverters. Route Segments F1 (Purple Route) and F7 would minimize potential impacts associated with habitat fragmentation by paralleling existing road rights-of-way for 72 percent and 99 percent of their length, respectively.

Table 11-7 Region F, Route Segments, Wildlife Management and Conservation Areas within Route Width

Resource Area	Unit	Route Segment								
		F1 (Purple Route)	F2	F3	F4 (Blue Route)	F5	F6	F7	F8	Route Connector 108
State Game Refuge	Acres	4	35	28	62	4	28	4	4	0
Grassland Bird Conservation Areas	Acres	287	291	340	242	209	232	274	234	61
Shallow Wildlife Lakes	Count	0	0	0	1	0	0	0	0	0

11.7 Costs that are Dependent on Design and Route

Costs of the route segments are generally proportional to length with the exception of the additional factors described in Section 5.9. Costs for route segments in Region F are included in Section 11.8 and are also provided in Appendix O.

11.8 Relative Merits of Route Segments

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 Route Segments F1 through F8 with the exception of some elements of resource categories that are considered to have minimal impacts that might not vary significantly throughout the regions and/or the routing factors are not applicable. These include:

- Impacts on human settlements (factor A)— cultural values, environmental justice, land use and zoning, 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 land-based economies (factor C)— forestry and tourism.
- Impacts on the natural environment (factor E) – air quality, climate, geology and topography, floodplains, and groundwater.

With respect to routing factor G, it is assumed that all route alternatives are equal with regard to maximizing energy efficiencies and accommodating expansion of transmission capacity. With respect to environmental impacts, the examination of such impacts suggested by routing factor G is included in the discussion of other routing factors and elements that more specifically address an environmental impact (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 15.

A relative merits analysis was completed to compare Route Segments F1 through F8 using these routing factors. The analysis uses graphics (Table 11-8) 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 11-9 summarizes the relative merits analysis of Route Segments F1 through F8 for the routing factors that are anticipated to vary amongst route alternatives.

Table 11-8 Guide to Relative Merits Analysis

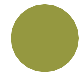
Consistency with Routing Factor or Anticipated Impacts	Symbol
Route alternative is consistent with the routing factor OR Impacts are anticipated to be negligible to minimal or the impact is positive	
Route alternative is consistent with routing factor but less so than the other options OR Impacts are 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 alternative 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	

Table 11-9 Relative Merits for Route Segments F1 through F8

Routing Factor / Resource	F1 (Purple Route)	F2	F3	F4 (Blue Route)	F5	F6	F7	F8	Summary
Factor A Human Settlement									
Aesthetics	◒	◒	◒	◒	◒	◒	◒	◒	Aesthetic impacts are anticipated to be moderate for Route Segments F1 through F8. Route Segments F3, F4 (Blue Route), and F6 have the least residences within 250 feet. Route Segment F2 has the least residences within the local vicinity Route Segment F7 parallels the most ROW with existing infrastructure (2.1 miles and 99 percent of its length). Route Segments F3, F4 (Blue Route) and F6 parallel the least ROW with existing infrastructure.
Displacement	●	◒	●	●	◒	●	◒	◒	There is one non-residential structure in the ROW of Route Segments F2, F5, F7 and F8. There are no structures within the ROW of the other route segments.
Recreation	●	●	●	●	●	●	●	●	Route segments in Region F do not cross any land-based public trails, state water trails, wild and scenic rivers, or scenic byways. Regional recreational resources in Region F include snowmobile trails and impacts are anticipated to be minimal. State game refuges are discussed in wildlife.
Factor C Land-Based Economies									
Agriculture	◒	◒	◒	○	◒	◒	●	◒	Most of the land included in Region F is agricultural. Impacts cannot be avoided but can be mitigated. Prudent routing (parallelling existing infrastructure and/or paralleling division lines) could help minimize impacts. Route Segment F7 has the least prime farmland within its ROI and parallels the most existing infrastructure (nearly 100% of its length). Route Segment F4 (Blue Route) has the most farmland of statewide importance, parallels the least existing infrastructure (17%) and would result in unavoidable impacts to at least two existing center pivot irrigation systems.
Mining	●	◒	○	●	●	○	●	●	There are three potentially active gravel pits present within Region F. Route Segments F3 and F6 would be anticipated to interfere with the current gravel pit operations at MnDOT ASIS Number 73079. For this same gravel pit, Route Segment F2 crosses the owner's southern half of the property. Impacts to other gravel pits adjacent to Region F route segments are anticipated to be avoided.
Factor D Archaeological and Historic Resources									
Archaeological	●	●	●	●	●	●	●	●	There are no archaeological sites within the route width of any route segment in Region F.
Historic	●	●	●	●	●	●	●	●	There are no listed, eligible or unevaluated historic architectural resources within the route width of any route segment.
Factor E Natural Resources									
Public and Designated Lands	●	●	●	●	●	●	●	●	Region F has no public or designated land within the route width. Wildlife Management Areas and Waterfowl Production Areas are discussed in wildlife.
Soils	●	●	●	●	●	●	●	●	Most soils within the region have a moderate or severe rutting hazard rating, and most soils are prone to compaction (generally over 85 percent of ROW). Impacts could be minimized with BMPs or mitigated if long-term re-vegetation impacts extend beyond construction. Impacts to soils would be independent of the route selected.
Surface Water	●	●	●	●	●	●	●	●	Route Segments F1 (Purple Route), F2, and F4 (Blue Route) include waterbodies (2 each) in the route width. Of the waterbodies in the route width, Route Segment F4 (Blue Route) includes a waterbody (School Section Lake) designated as a PWI basin. All waterbodies and watercourses could be spanned by the project. No in-water work would occur.
Vegetation	●	●	●	●	●	●	●	●	Forested vegetation in the ROW is minimal (up to 1 acre) for all route segments.

Routing Factor / Resource	F1 (Purple Route)	F2	F3	F4 (Blue Route)	F5	F6	F7	F8	Summary
Wetlands	◓	◓	●	◓	●	●	●	●	The route width of Route Segments F5 and F8 would include the least wetland area (13.2 acres). The anticipated alignment of Route Segment F1 (Purple Route) would cross two PWI wetlands. F2 is the only Route Segment that would have forested wetlands within the ROW. None of the route segments would span wetlands >1,000 feet in width.
Wildlife and Wildlife Habitat	◓	◓	◓	○	◓	◓	◓	◓	The route width of all route segments intersect a state game refuge. Route Segment F4 (Blue Route) would intersect the most. None of the anticipated alignments would cross it. Route widths and anticipated alignments of all route segments would intersect/cross Grassland Bird Conservation Areas. The route width of Route Segment F3 would intersect the most but all have between 234-340 acres in route width. The anticipated alignment of Route Segment F4 (Blue Route) would cross and span the edge of a shallow wildlife lake.
Factor F Rare and Unique Natural Resources									
Rare and Unique Natural Resources	●	●	●	●	●	●	●	●	The Blanding's turtle (state threatened) has been documented within a mile of all route segments and within the ROW of Route Segments F1 (Purple Route), F2, F3, and F7. None of the route widths intersect sensitive ecological resources.
Minnesota Statute 216E.03 - Subpart 7 (15e) *(transmission lines)*									
Paralleling Existing Transmission Line [1]	○	○	○	○	○	○	○	○	One of the route segments parallel existing transmission line.
Minnesota Statute 216E.03 - Subpart 7 (8) *(roads/railroads)*									
Paralleling Roads and Railroads	◓	◓	○	○	◓	○	●	◓	Route Segment F7 parallels the most existing roads (2.1 miles and 99%). Route Segments F1 (Purple Route), F2, and F5 parallel roads for between 60 and 72% of its length. F3, F6, and F8 parallel a smaller percentage of roads (28%, 10%, and 48%, respectively). F4 (Blue Route) does not parallel any road.
Factor H Paralleling Division Lines									
Paralleling existing survey lines, natural division lines, and agricultural field boundaries	●	◓	○	●	●	○	●	◓	Route Segments F1 (Purple Route), F2, F4 (Blue Route), F5, F7 and F8 parallel division lines for 85% or more of their lengths. F3 and F6 follow division lines for 63% of their lengths.
Factor J Paralleling Existing Infrastructure									
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.	◓	◓	○	○	◓	○	●	◓	Route Segment F7 parallels existing ROW for the largest portion of its length (99%). Route Segment F4 (Blue Route) parallels the least amount of the length (16%).
Factor L Costs									
Costs Dependent on Design and Route	● $10,121,000	● $10,304,000	◓ $12,278,000	◓ $11,646,000	● $10,512,000	◓ $11,465,000	● $9,670,000	◓ $11,779,000	As noted in Section 11.7, costs generally coincide with the length of the line. Route Segments F3, F4 (Blue Route), F6 and F8 are anticipated to cost 19% or more when compared to Route Segment F7.

[1] Minnesota Statute 216E.03 - Sub 7 (15e) requires the Commission to consider locating a route for a high-voltage transmission line on an existing high-voltage transmission route. The summarized here indicates where ROW paralleling to existing transmission lines occurs but does not distinguish between HVTLs and other transmission lines that might not meet the definition of a HVTL (for example, distribution lines). Highways are included in the assessment provided for Minnesota Statute 216E.03 - Sub 7 (8).

11.9 Route Connector 108

Route connectors are segments that can be used to transition from the Purple Route to the Blue Route, or vice versa. For purposes of analysis, route connectors are either incorporated into route segments studied at the regional level and travel in one direction or can be used to connect the Purple and Blue Route. Route Connecter 108 is a two-way route connector, which means it can be used to connect the Purple and Blue Route in either direction. Data tables for the route connectors are provided in Appendix E.

Route Connector 108 is less than 0.1 mile long and parallels existing infrastructure (roads) for 1 percent of its length (Map N.189). There are four residences between 500 and 1,600 feet away from the centerline. Most of the land within the ROW is cultivated crops (8 acres) and 4 acres are designated as prime farmland. There are 1.85 acres of center pivot irrigation systems within the ROW. There are no public lands or conservation easements located within the ROW.

There are six acres of wetlands within the ROW. There are no watercourses, waterbodies or forested wetlands crossed or within the ROW.

There are 8 acres of grassland bird conservation areas within the ROW and 61 acres within the route width. There are no Wildlife Action Network corridors, important bird areas, wildlife management areas, state game refuges, waterfowl production areas, or shallow wildlife lakes.

There are no rare and unique natural resources, records of a state threatened or endangered species, sites of biodiversity significance, or native plant communities. There are no railroad rights-of-way prairie, prairie bank easements, or lakes of biological significance.

11.10 Potential Refinements

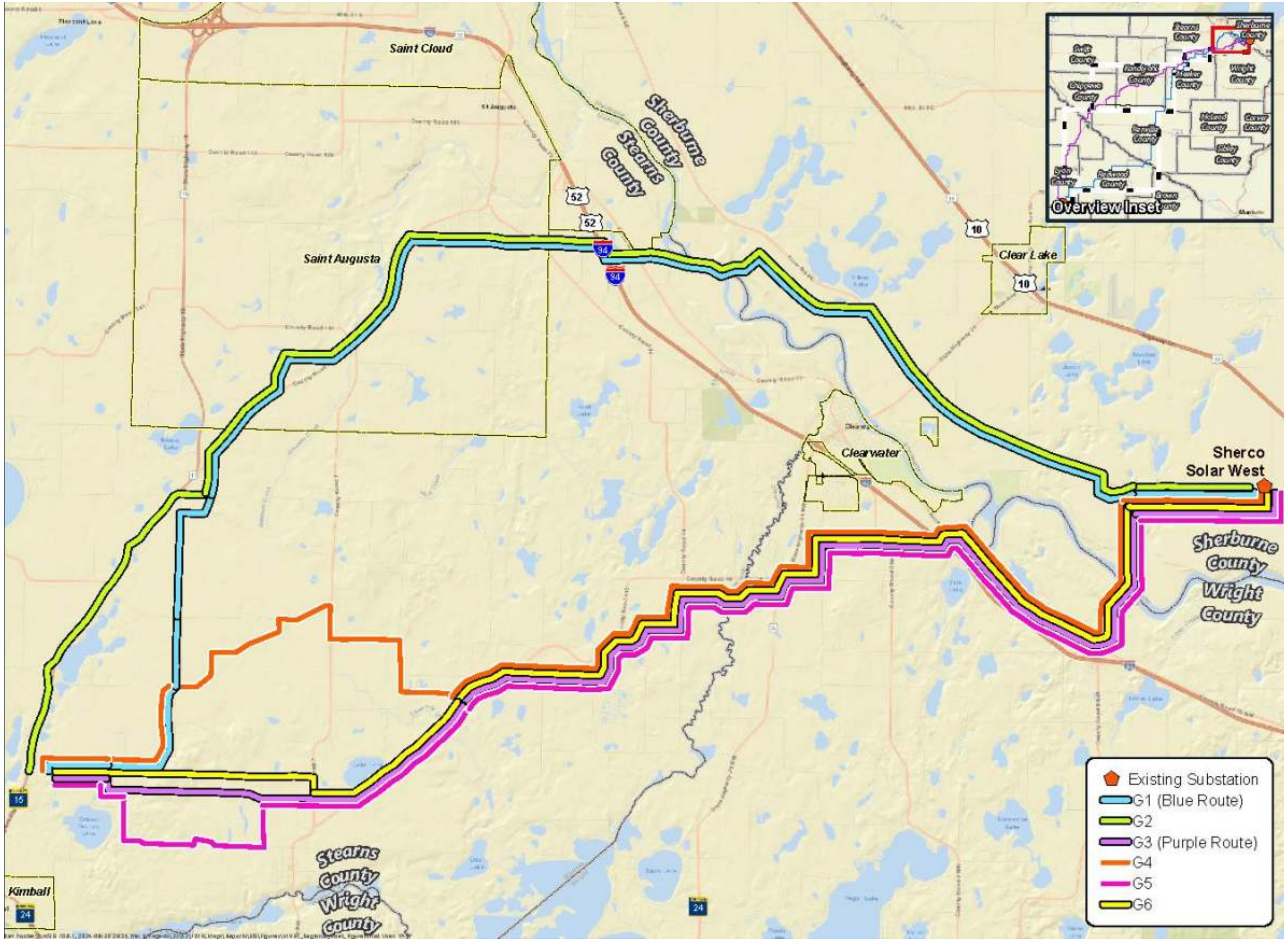
There are no refinements in Region F. In other words, all route segment that were included in the scoping decision were incorporated into Route Segments F1 through F8.

12 Region G - Potential Impacts and Mitigation

Chapter 12 describes potential impacts in Region G, which is the northern-most region and is in Stearns, Sherburne, and Wright Counties (Map 2). The six route segments in Region G are shown in Figure 12-1 and described below.

- Route Segment G1 is the applicant's proposed Blue Route. It is 25.4 miles long.
- Route Segment G2 is a variation of the Blue Route. It is 24.6 miles long. It includes Route Segment 234b (proposed as an alternative to follow road ROW) and a portion of the applicant's proposed Blue Route.
- Route Segment G3 is the applicant's proposed Purple Route. It is 22.7 miles long.
- Route Segment G4 is a variation of the Blue Route to Purple Route. It is 25 miles long. It includes a portion of the applicant's proposed Blue Route, Route Connector 115, and a portion of the applicant's proposed Purple Route. Route Connector 115 was proposed by the DNR to avoid more residences while minimizing wetland, shoreland, and floodplain impacts to Fairhaven Creek which is crossed by Route Segment G3 (Purple Route).
- Route Segment G5 is a variation of the Purple Route. It is 24.3 miles long. It includes Route Segment 241 which was proposed as an alternative to proposed by the DNR as an alternative to avoid Fairhaven Creek which is crossed by Route Segment G3 (Purple Route).
- Route Segment G6 is a variation of the Blue Route to Purple Route. It is 22.7 miles long. It includes a portion of the applicant's proposed Blue Route, Route Connector 111, and a portion of the applicant's proposed Purple Route. Route Connector 111 was proposed to more closely follow parcel lines to avoid cutting across farmland.

Figure 12-1 Region G Route Segments



12.1 Environmental Setting

Region G includes agriculture and commercial use in its western half, and agricultural and natural areas along the Mississippi River in its eastern half (Map 6). Major waterways crossed by the route alternatives within Region G include the Mississippi River, Clearwater River, Fairhaven Creek, Johnson Creek, and Threemile Creek (Map 14).

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. Under this classification system, Region G is in the Minnesota and NE Iowa Morainal section of the Eastern Broadleaf Forest Province (Map 15). This section is further broken down into subsections, including the Hardwood Hills and Anoka Sand Plain Subsections. These subsections are used below to classify the environmental setting of the project.

The Hardwood Hills Subsection is characterized by steep slopes, high hills, and lakes formed in glacial end moraines and outwash plains. The Alexandria Moraine forms a high ridge that is the headwaters region of many rivers and streams flowing east and west. Most of this subsection is covered in 100 to 500 feet of glacial drift over diverse bedrock. Loamy soils are dominant, with loamy sands and sandy loams on outwash plains as well as loams and clay loams on moraines. Woodland and forest were common within this subsection prior to pre-European contact, with some forests remaining adjacent to lakes or steep landscapes. Wetlands and lakes in poorly-drained potholes provide opportunities for recreation or wildlife habitat in this subsection with tourism opportunities, especially in areas around lakes (reference (212)).

The Anoka Sand Plain Subsection is characterized by broad sandy lake plain, which contains small dunes, kettle lakes, and tunnel valleys with level to gently rolling topography. There are small inclusions of ground moraine and end moraine. The other important landform in the subsection is a series of sandy terraces associated with historic levels of the Mississippi River and other terraces are associated with major tributaries of the Mississippi. Surface glacial deposits are usually less than 200 feet thick. Soil is mostly sandy but there are organic soils in the ice block depressions and tunnel valleys, and poorly drained prairie soils along the Mississippi River. Tree cover along the northern edge of the substation, brushland along the sandplain, upland prairie along the Mississippi River, and floodplain forests were common within this subsection prior to pre-European contact. The area is currently expanding with urban development and sod and vegetable crops are grown on drained peat and muck areas (reference (213)).

Region G is the northern-most region and is in Stearns, Sherburne, and Wright Counties (Map 2). Major communities nearest the route alternatives include Clearwater and Becker; Saint Augusta and St. Cloud are crossed by the route alternatives (Map 2). Existing transmission lines are prevalent throughout the region. One railroad traverses the northeast part of the region. Region G is generally bound by State Highway 15 on the western half and Federal Highway 94 which traverses the eastern part of the region. Interstate 10 is located east of the region (Map 9). County and Township roads are present within Region G.

12.2 Human Settlement

12.2.1 Aesthetics

The ROI for aesthetics is the local vicinity. HVTLs alter a viewshed (Section 5.2.1.2). Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes. 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, and 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 HVTL 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. Additional details that are regarding potential impacts to aesthetics and potential mitigation measures is provided in Section 5.2.1.

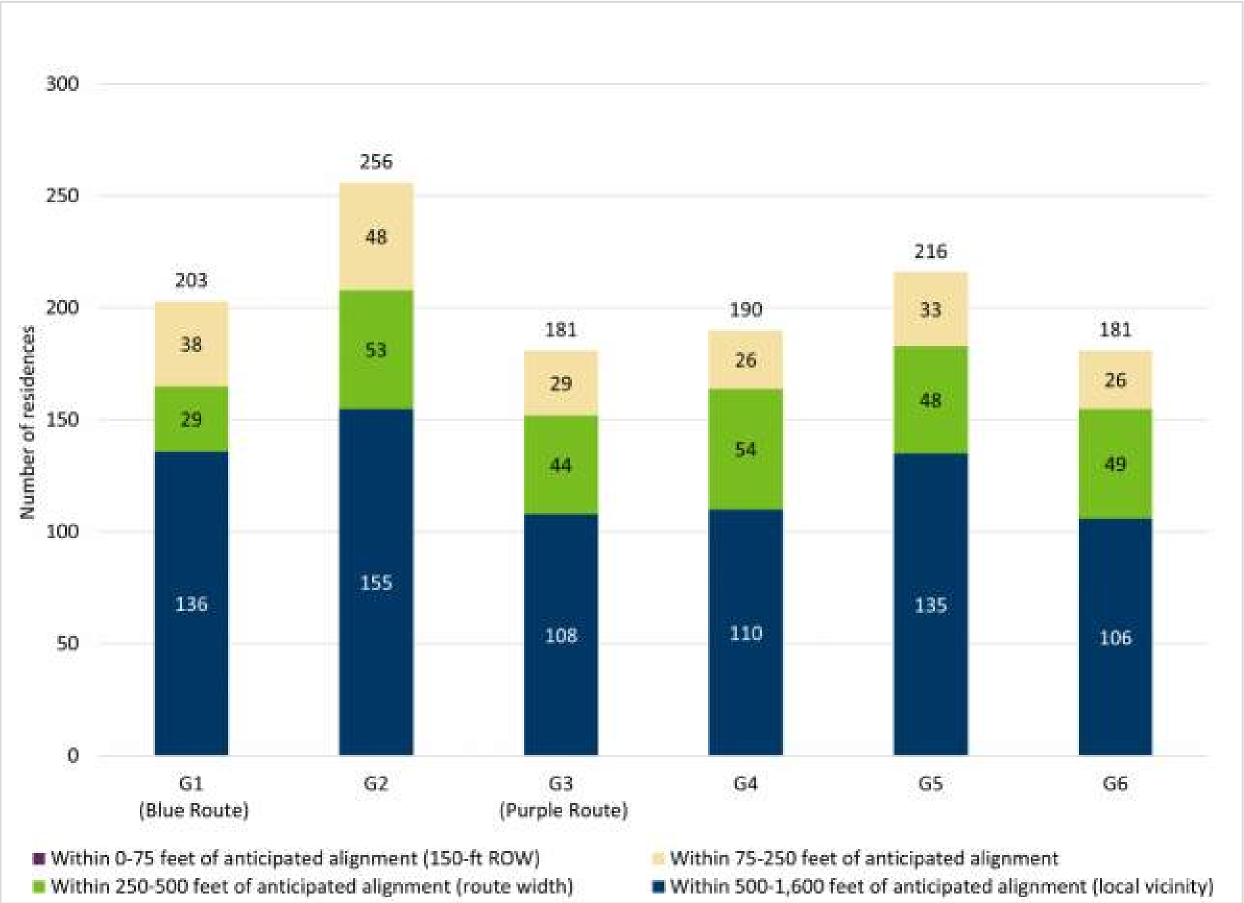
Route Segments would cross the Great River Road National Scenic Byway (Map 5.10) as well as the highly traveled Interstate 94 (I-94) (Map 9).

The Great River Road National Scenic Byway follows the Mississippi River and spans 565 miles across 20 counties (reference (214), Map 5.10). Route Segments G1 (Blue Route) and G2 would cross the scenic byway and the Mississippi River on the border of Stearns County and Sherburne County, just east of Interstate 94 and around two miles north of the City of Clearwater (Map N.204). The Mississippi River is a designated state water trail, which promotes water recreation (Minnesota Statutes § 85.31), and a wild and scenic river (Minnesota Statutes § 103F.305), which falls under certain protections put in place in Minnesota's 1973 Wild and Scenic Rivers Act. At the scenic byway location for Route Segments G1 (Blue Route) and G2, no existing transmission lines are present but existing development is present north of the anticipated alignments. Similarly, there are no existing transmission lines present where Route Segments G1 (Blue Route) and G2 cross the Mississippi River and trees would need to be removed from the shoreline (Map N.205). Given the lack of development at the watercourse crossing, aesthetic impacts would be anticipated to be significant.

Route Segments G3 (Purple Route), G4, G5 and G6 would parallel the Great River Road National Scenic Byway, on its south side, before crossing the Mississippi River (Map N.219 and Map N.220). For the portion that parallels the scenic byway, aesthetic impacts would be greatest on the northern portion where the areas near Fish Creek is largely undeveloped. Where the route segments cross the river, they would be parallel an existing transmission line ROW.

Appendix N shows human settlement features (for example, residences and nursing homes) in the local vicinity of the route segments. The proximity of residential structures (homes) and non-residential structures to route segments is shown in Figure 12-2 and Table 12-1, respectively. Route Segments G3 (Purple Route) and G6 would have the least number of residences within 250 feet (26) and the local vicinity (181). Route Segment G2 has the most residences within the local vicinity (256). Route segments have between 3 and 6 non-residential structures present within the ROW and over 300 non-residential structures within their local vicinities (Table 12-1).

Figure 12-2 Region G, Route Segments, Proximity of Residential Structures



For total count of residential structures within the route width, combine residential structures within 75-250 feet and residential structures within 250 and 500 feet.

For total count of residential structures within the local vicinity, combine residential structures within each distance; this number is also stated at the top of each bar.

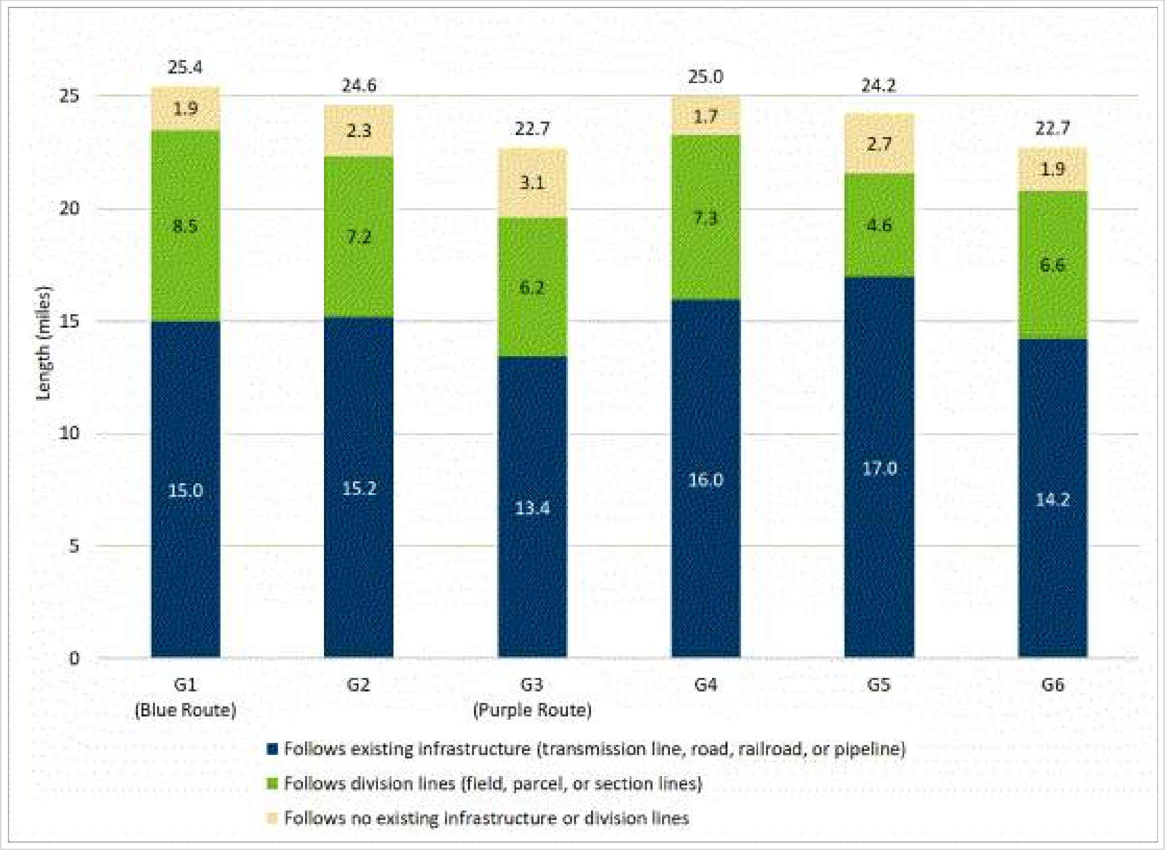
Table 12-1 Region G Route Segments Proximity of Non-Residential Structures

Non-Residential Structures	Route Segment					
Distances from Anticipated Alignment	G1 (Blue Route)	G2	G3 (Purple Route)	G4	G5	G6
0-75 feet (150-foot-ROW)	5	5	6	3	6	3
75-250 feet	71	63	35	44	42	38
250-500 feet (generally route width)	79	113	78	108	96	88
500-1,600 feet (local vicinity)	146	162	218	268	241	210
Total	302	344	337	423	385	339

Non-residential structures include churches, schools (public and private), daycares/child-care centers/pre-schools, hospitals, nursing homes, and commercial and non-residential structures.

Each route segment would parallel with existing infrastructure or division lines as shown in Figure 12-3 and Table 12-2. In some cases, portions of a route segment might parallel ROW with more than one of these existing features at the same time. Map 9 illustrates where ROW paralleling occurs and shows existing infrastructure and division lines in the region. All route segments follow existing transmission line for a portion of their length. Route Segments G3 (Purple Route), G4, G5, and G6 parallel the most ROW with existing transmission line (3.4 miles, 14 to 15 percent of their lengths). Route Segment G5 would parallel the most existing infrastructure (17.0 miles and 70 percent of its length).

Figure 12-3 Region G, Route Segments, ROW Paralleling of Existing Infrastructure and/or Division Lines Summary



The total mileage at the top of each route segment represents that route segment's total length. Numbers may not sum due to rounding.

Table 12-2 Region G, Route Segments, Route Segments, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

Infrastructure and/or Division Lines	Route Segments					
	G1 (Blue Route)	G2	G3 (Purple Route)	G4	G5	G6
Follows existing transmission line (miles, percent)	2.5 (10)	2.5 (10)	3.4 (15)	3.4 (14)	3.4 (14)	3.4 (15)
Follows existing roads (miles, percent)	13.9 (55)	14.1 (57)	12.6 (55)	15.1 (60)	16.1 (66)	13.3 (59)
Follows existing railroad (miles, percent)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Follows existing pipelines (miles, percent)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Total ROW paralleling (w/transmission line, road, and railroad) (miles, percent)	15.0 (59)	15.2 (62)	13.4 (59)	16.0 (64)	17.0 (70)	14.2 (63)
Follows Field, parcel, and Section Lines (miles, percent)	22.9 (90)	21.2 (86)	19.3 (85)	23.0 (92)	20.9 (86)	20.5 (90)
Total- All (miles, percent) [1]	23.5 (92)	22.3 (91)	19.6 (86)	23.3 (93)	21.6 (89)	20.8 (92)

Totals might not sum to 100 percent due to rounding.
[1] This total is indicative of the full length of the route segment that parallels existing infrastructure ROW and/or division lines. For Region G, there is some linear feet that parallel existing infrastructure that was not also deemed as following existing division lines. Therefore, the total for this row sums the total linear length that follows existing infrastructure and division lines.

12.2.2 Cultural Values

Potential impacts to cultural values are discussed for the entire project in Section 5.2.2. The assessment was completed for the project as a whole because existing conditions are better understood at a broader scale than the regional level. Impacts to cultural values are independent of the route selected.

12.2.3 Displacement

The ROI for displacement is the ROW. Displacement occurs when a residence or building is required to be removed for construction of the project. Residential buildings within the ROI would require removal, whereas non-residential buildings could stay within the ROI if the activities taking place in these buildings are compatible with the safe operation of the line. Additional details regarding displacement and potential mitigation measures are provided in Section 5.2.3.

There are no residences within the ROI for the route segments within Region G. Route Segment G3 (Purple Route) and G5 include six non-residential structures within its ROW. Route Segments G1 (Blue Route) and G2 include five non-residential structures within their ROW (Table 12-1). The structures within the ROW for this region appear to be agricultural buildings (Map N.204, Map N.207, Map N.208, Map N.212, Map N.214, and Map N.218).

12.2.4 Environmental Justice

No EJ areas were identified in Region G. See Section 5.2.4 for the assessment on environmental justice in Region G.

12.2.5 Land Use and Zoning

Potential impacts to land use and zoning are discussed in Section 5.2.5. If Route Segment G1 (Blue Route) or Route Segment G2 is selected, potential impacts would occur to a planned residential development as discussed in Section 5.2.5.

The assessment for land use and zoning was completed for the project as a whole because existing conditions are determined by jurisdictional areas (counties) and do not coincide with the project's regional boundaries.

12.2.6 Noise

Potential impacts from noise are discussed for the entire project in Section 5.2.6. The assessment for noise was completed for the project as a whole because there is limited variability in the potential for noise across the route alternatives.

12.2.7 Property Values

Potential impacts to property values are discussed for the entire project in Section 5.2.7. The assessment for property values was completed for the project as a whole because there is limited variability in the potential for property value impacts across the route alternatives.

12.2.8 Recreation

The ROI for recreation is the route width. 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 5.2.8.2). 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 would vary based on individual perspectives and experiences. Impacts to recreation are assessed through identification of recreational resources within the ROI. The project is not anticipated to directly impede recreational activities within the ROI such as snowmobiling, golfing, canoeing, hunting, or fishing. Additional details regarding potential impacts to recreation and potential mitigation measures for the project is provided in Section 5.2.8.

Route segments in Region G do not cross any public land-based trails. State water trails, a wild and scenic river, a scenic byway, and snowmobile trails are present (Map 5; Table 12-3).

The Mississippi River is designated as a state water trail and a wild and scenic river as described in Section 5.2.8 and is crossed by each of the route segments in Region G. (Map N.220 and Map N.205). Aesthetic impacts to the river are discussed in Section 12.2.1.

The Great River Road Scenic Byway (CR 75 NW) is south of the Mississippi River and is crossed by all the route segment in Region G. Aesthetic impacts to the scenic byway crossings are discussed in Section 12.2.1.

Multiple snowmobile trails are present in Region G including Sherburne County Snowmobile Trails, Stearns County Snowmobile Trails, and Wright County Trails. Route Segments G1 (Blue Route) and G2 cross twice, while the others cross 5 times. Route Segments G1 (Blue Route) and G2 also have the least amount of snowmobile trails within their route widths (0.5 miles) compared to the other routes which each have 2.6 miles present within their route widths.

Public lands, including Waterfowl Production Areas and Wildlife Management Areas, are publicly accessible and can be used for recreational purposes. Public lands used for wildlife management (Waterfowl Production Areas and Wildlife Management Areas) are discussed in Section 12.6.12.

Table 12-3 Region G Route Segments Recreational Resources within Route Width

Recreational Resource	Unit	Route Segment					
		G1 (Blue Route)	G2	G3 (Purple Route)	G4	G5	G6
Mississippi River State Water Trail and Wild and Scenic River	Crossings (linear feet) [1]	1 (3,478)	1 (3,478)	1 (1,008)	1 (1,008)	1 (1,008)	1 (1,008)
Great River Road Scenic Byway	Crossings (linear feet)	1 (1,141)	1 (1,141)	3 (12,344)	3 (12,344)	3 (12,344)	3 (12,344)
Snowmobile Trail[2]	Crossings (miles) [1]	2 (0.5)	2 (0.5)	5 (2.6)	5 (2.6)	5 (2.6)	5 (2.6)

[1] Linear feet totals are taken from the DNR Minnesota State Water Trails Dataset
[2] Snowmobile trails within Region G include: Sherburne County Snowmobile Trails, Stearns County Snowmobile Trails, Wright County Trails

12.2.9 Socioeconomics

Potential impacts to socioeconomics are discussed for the entire project in Section 5.2.9. This is because the assessment was completed at the county-level which does not always align with regional boundaries.

12.2.10 Transportation and Public Services

Potential impacts to transportation and public services are discussed for the entire project in Section 5.2.10. The assessment was completed for the project as a whole and not carried forward at the regional level because there is limited variability in across the route alternatives. Potential impacts to private airstrips are discussed in land-based economies.

12.3 Human Health and Safety

The impacts to human health and safety are discussed generally for the entire project in Section 5.3. The assessment was completed for the project as a whole and not carried forward at the regional level because there is limited variability across the route alternatives and generally impacts would be minimized by appropriate placement and adhering to applicable transmission line standards and codes**.**

12.4 Land-based Economies

Land-based economies are assessed by considering four elements: agriculture, forestry, mining, and tourism (Section 5.4). Impacts to three elements of land-based economies are anticipated to be minimal and independent of the route segment selected in Region G. These elements are:

- **Forestry –** There are no known forestry operations in the ROI (Section 5.4.1.3).
- **Tourism –** Recreational resources, including a state water trail and scenic byways, are present within the ROI. However, the project is not anticipated to adversely affect the recreational resources. Therefore, any direct impacts to the recreation that would cause an indirect impact to tourism-based economies are anticipated to be negligible (Section 5.4.2.4).

12.4.1 Agriculture

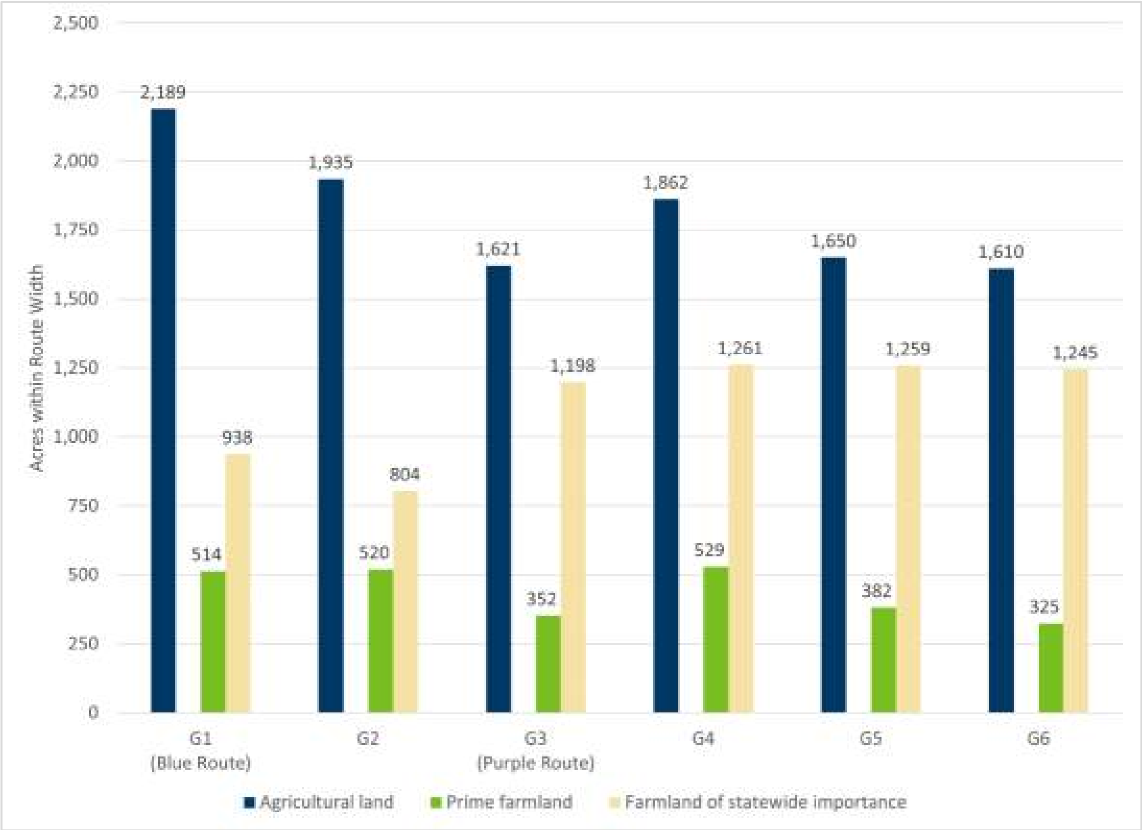
The ROI for the land-based economy of agriculture is the route width. Construction and operation of a HVTL impacts agriculture (Section 5.4.2.1). During construction, impacts would include the limited use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Permanent impacts would also occur when the footprint of the HVTL structures directly impedes agricultural production and/or impedes efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields.

Prudent routing (paralleling existing infrastructure and/or paralleling division lines) could help minimize potential impacts. Implementation of the AIMP (Appendix K), would minimize and mitigate impacts to agriculture. Additional details regarding potential impacts to agriculture and potential mitigation measures is provided in Section 5.4**.**

Figure 12-4 summarizes the total acres within the route widths of Region G route segments that is designated as agricultural land use, as well as prime farmland and farmland of statewide importance. Most land (more than 50%) within the route widths of the route segments in Region G is designated as agricultural land use (cultivated crops and hay/pasture; see Section 12.6.10) for cultivated crops. Route Segment G4 has the most prime farmland and farmland of statewide importance. Route Segment G6 has the least prime farmland. Route Segment G2 has the least farmland of statewide importance.

As noted in Table 12-2, Route Segment G5 parallels the most existing infrastructure (70% of its total length) and the other route segments parallel a similar amount (59-64% of their total lengths). Route Segments G2, G3 (Purple Route) and G5 have the greatest distance that does not follow existing infrastructure or division lines at 2.3 miles, 3.1 miles and 2.7 miles respectively (Figure), while the other segments have 1.9 miles or less that does not follow existing infrastructure or division lines.

**Figure 12-4	Region G Route Segments, Acres of Agricultural Lands and Prime Farmland within Route Widths**



Source: Agricultural land, NLCD and prime farmland/farmland of statewide importance, SSURGO (Appendix C)

Multiple center pivot irrigation systems (21 total) are present in Region G (Map 11.9 through Map 11.25). Route Segments G4 and G5 have 4 crossings that exceed 1,000 feet, while the others have 3 crossings. Center pivot irrigation systems could be avoided by using their refinements and/or if alignments avoid the systems at final design.

12.4.2 Mining

The ROI for the mining land-based economy is the route width. Impacts to aggregate mine could include interference with access to aggregate resources or the ability to successfully mine these reserves (Section 5.4.2.3). If future geophysical surveys are planned, the surveying technology could also be impacted. Potential impacts are assessed through identification of known, existing and prospective mining operations and assessing potential impacts to those current or potential future operations. If the potential for impacts to mining operations would occur, the applicant would be required to coordinate those impacts with the mining operator (Section 5.4.3**).**

Two potentially active gravel pits were identified in Region G. The first gravel pit is located east of Highway 15 and north of 150th Street (Map N.198). The gravel pit is noted as inactive in the DNR dataset. The applicant noted in the route permit application that the gravel pit appeared to be active and committed to coordinating with the owner of mining operation ASIS ID 73164 so that construction does not interfere with access to the mining operation. During scoping, a comment was received (#36) that noted that “the gravel pit on the east side of highway 15 just north of Kimball was required to plant the cedar trees as a noise barrier and to block the view from highway 15. If the power line would go through here, they would remove them.”

The location of ASIS ID 73164 is shown in Figure 12-5. Potential impacts to the gravel pit could include interference with access or removal of the cedar trees. Access from the west side of the parcel could be impacted if Route Segment G2 were selected. Access from the south side of the parcel could be impacted by route segments in Region F if Route Segment F1 (Purple Route), F5, F7, or F8 were selected. Given the expectation for coordination between the applicant and the gravel pit operators, potential impacts are anticipated to be minimal.

Figure 12-5 MnDOT ASIS Number 73164 Gravel Pit

The second active gravel pit (MNDOT ASIS Number 73035) is present within the route width of Route Segments G1 (Blue Route) and G2. It is located east of 43rd Avenue and west of CR 7 (Map N.202). However, the anticipated alignment avoids impacts because it is located east of CR 7 which is across the road from the gravel pit. While the driveway to the gravel pit is within the ROI, the gravel pit itself is outside of the ROI. Impacts are anticipated to be negligible.

12.5 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 (Section 5.5.2). 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. Indirect 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. Additional details concerning potential impacts and mitigation for the project as a whole regarding archaeological and historic resources are provided in Section 5.5.3.

Documented archaeological and historic resources within Region G are summarized in the following tables.

- Table 12-4 summarizes the number of archaeological and historic resources within the project area (which is within one mile of the anticipated alignments).
- Table 12-5 summarizes the number of archaeological and historic resources within the ROI (route width) for each of the Region G, route segments.
- Table 12-6 provides descriptions of the resources located within the route widths.

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

Table 12-4 Region G, Route Segments, Number of Archaeological and Historic Resources within the Project Area

Route Segment	Archaeological Resources	Historic Architectural Resources	Historic Cemeteries
G1 (Blue Route)	16	35	5
G2	17	36	5
G3 (Purple Route)	8	33	4
G4	8	33	3
G5	10	36	4
G6	8	33	4

Table 12-5 Region G, Route Segments, Number of Archaeological and Historic Resources within the Route Width

Route Segment	Archaeological Resources	Historic Architectural Resources	Historic Cemeteries
G1 (Blue Route)	4	5	1
G2	6	6	2
G3 (Purple Route)	0	12	1
G4	0	12	1
G5	0	12	2
G6	0	12	1

Table 12-6 Region G, Route Segments, Archaeological and Historic Resources within the Route Width Summary

Route Segment(s)	Site / Resource Number	Resource Type	Resource Name/Description	NRHP Status	Description
G1 (Blue Route), G2	21SH0058	Archaeological Site	Lee Pioneer Burial/ post-contact mortuary (historic burial site)	Unevaluated	Site 21SH0058 is a post-contact mortuary which consists of two burials dated 1860 and 1872, as recorded on headstones (reference (215)).
G1 (Blue Route), G2	21SH0088	Archaeological Site	Post-contact single artifact find	Unevaluated	Site 21SH0088 consists of a single lead bullet (reference (216)).
G1 (Blue Route), G2	21SHj	Archaeological Site	Lithic Scatter (Alpha Site)	Unevaluated	Site 21SHj is alpha site consisting of four projectile points (reference (217)).
G2	21SN0080	Archaeological Site	Pre-contact single lithic artifact find	Unevaluated	Site 21SN0080 consists of a single pre-contact chert core (reference (218)).
G2	21SNaw	Archaeological Site	Historic artifact scatter (Alpha Site)	Unevaluated	Site 21SNaw is an alpha site consisting of a post-contact artifact scatter (reference (219)).
G1 (Blue Route), G2	21SNp	Archaeological Site	Historic Mill (Alpha Site)	Unevaluated	
G5	Fairhaven Cemetery	Historic Cemetery	Fairhaven Cemetery (mapped at Section level)	N/A	-
G3 (Purple Route), G4, G5, G6	Highland Cemetery	Historic Cemetery	Highland Cemetery (mapped at PLS forty level)	N/A	-
G1 (Blue Route), G2	Lee Pioneer Burials	Historic Cemetery	Lee Pioneer Burials (mapped at PLS forty level: archaeological site contains specific location)	N/A	-
G2	Maine Prairie Cemetery	Historic Cemetery	Maine Prairie Cemetery (mapped at PLS forty level)	N/A	-

Route Segment(s)	Site / Resource Number	Resource Type	Resource Name/Description	NRHP Status	Description
G1 (Blue Route), G2	SH-CLT-00004	Historic Architecture	Halfway house/correction facility	Unevaluated	-
G1 (Blue Route), G2	SH-CLT-00005	Historic Architecture	W.G. White Farmhouse	Unevaluated	-
G1 (Blue Route), G2	SH-CLT-00006	Historic Architecture	District School No. 23	Unevaluated	-
G1 (Blue Route), G2, G3 (Purple Route), G4, G5, G6	SH-CLT-00011	Historic Architecture	Fort Ripley Military Road: Clear Lake Twp. Segment	Unevaluated	-
G2	SN-MPR-00004	Historic Architecture	Maine Prairie Corners Historical Marker	Not Eligible	-
G1 (Blue Route), G2	SN-SAT-00003	Historic Architecture	School	Unevaluated	-
G3 (Purple Route), G4, G5, G6	WR-CWT-00006	Historic Architecture	Merrill Farmstead	Unevaluated	-
G3 (Purple Route), G4, G5, G6	WR-CWT-00007	Historic Architecture	Unknown Structure	Unevaluated	-
G3 (Purple Route), G4, G5, G6	WR-CWT-00016	Historic Architecture	Barn	Unevaluated	-
G3 (Purple Route), G4, G5, G6	WR-SCK-00014	Historic Architecture	House	Unevaluated	-
G3 (Purple Route), G4, G5, G6	WR-SCK-00015	Historic Architecture	House and Garage	Unevaluated	-
G3 (Purple Route), G4, G5, G6	WR-SCK-00016	Historic Architecture	House and Garage	Unevaluated	-
G3 (Purple Route), G4, G5, G6	WR-SCK-00017	Historic Architecture	Institutional Property/Fire Station or Public Works Building	Unevaluated	-

Route Segment(s)	Site / Resource Number	Resource Type	Resource Name/Description	NRHP Status	Description
G3 (Purple Route), G4, G5, G6	WR-SCK-00018	Historic Architecture	House and Garage	Unevaluated	-
G3 (Purple Route), G4, G5, G6	WR-SCK-00021	Historic Architecture	House and Outbuildings	Unevaluated	-
G3 (Purple Route), G4, G5, G6	WR-SCK-00022	Historic Architecture	Hasty Inn	Unevaluated	-
G3 (Purple Route), G4, G5, G6	WR-SCK-00023	Historic Architecture	House	Unevaluated	-

12.5.1 Archaeological Resources

Six previously documented archaeological resources are present within the route widths of the route segments within Region G (Table 12-6). None of the sites have been evaluated for listing on the NRHP. Based on the Minnesota Department of Transportation's predictive model, the highest potential for the presence of archaeological sites in this region is along the Mississippi River (reference (208)), which is where most of the sites in this region are concentrated.

Route Segments G3 (Purple Route), G4, G5 and G6 contain no archaeological sites within the route widths. Route Segment G1 (Blue Route) contains four unevaluated archaeological resources, while Route Segment G2 contains six unevaluated archaeological resources.

12.5.2 Historic Architectural Resources

Twenty-one historic resources are present within the route widths of the route segments in Region F; these include one ineligible resource and 16 unevaluated resources (Table 12-6).

Route Segment G1 (Blue Route) and G2 both contain five unevaluated resources. Route Segments G3 (Purple Route), G4, G5, and G6 each contain 12 unevaluated resources.

12.6 Natural Environment

12.6.1 Air Quality

Potential impacts to air quality are expected to be similar to those discussed for the entire project in Section 5.6.1. The assessment for air quality was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

12.6.2 Climate

Potential impacts to climate are expected to be similar to those discussed for the entire project in Section 5.6.2. The assessment for climate was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

12.6.3 Geology and Topography

Potential impacts to geology and topography are expected to be similar to those discussed for the entire project in Section 5.6.3. The assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

12.6.4 Greenhouse Gases

Potential impacts to greenhouse gases are expected to be similar to those discussed for the entire project in Section 5.6.4. The assessment for greenhouse gases was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected given their similar lengths.

12.6.5 Groundwater

Potential impacts to groundwater are expected to be similar to those discussed for the entire project in Section 5.6.5. The assessment for geology and topography was not carried forward at the regional level because impacts are anticipated to largely be independent of the route selected.

12.6.6 Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands often involve unique resources intended for protection and/or preservation and would be subject to short and long-term impacts depending upon their use (Section 5.6.6.2). Public and designated lands within the ROI are first identified and then further reviewed to better understand potential impacts such as vegetation clearing. Occupying public and designated lands would require coordination with the landowner (Section 5.6.6.3).

Route Segments G1 (Blue Route) and G2 cross a state Wild and Scenic River Bank; a total of 30 acres of the easement area is located within the ROI. Wild and Scenic River Banks are state scenic easements that are permanently protected private lands adjacent to state-designated Wild and Scenic Rivers with limited land alteration, vegetation removal, building, dumping, and placement of structures (reference (164)).

A state game refuge and Waterfowl Production Area are also present within the ROI and discussed in Section 12.6.12.

12.6.7 Rare and Unique Natural Resources

Rare and unique natural resources encompasses 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 construction and operation-related impacts to protected species and sensitive ecological resources are discussed in Section 5.6.7.4. 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. 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.

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 that 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, are described in Section 5.6.7.5.

Sensitive ecological resources within Region G are shown on Map 12. To protect federally and state protected species from exploitation or destruction, documented locations of these species are not identified on maps.

12.6.7.1 Protected Species

According to the NHIS database, between two and three protected species have been documented within 1 mile of each route segment in Region G; these are summarized in Table 12-7. Some of these protected species have been documented within the route width or ROW; that information is discussed below and provided in Appendix M. In addition, several state special concern species have been documented within 1 mile of the route segments in Region G; these are summarized in Appendix M.

Table 12-7 Region G Route Segments Natural Heritage Information System Database Documented Records of Protected Species within One Mile

Scientific Name	Common Name	Type	State / Federal Status [1]	Route Segment					
				G1 (Blue Route)	G2	G3 (Purple Route)	G4	G5	G6
Juglans cinerea	Butternut	Vascular plant	Endangered / not listed	X	X				
Lanius ludovicianus	Loggerhead shrike	Bird	Endangered / not listed	X	X	X	X	X	X
Emydoidea blandingii	Blanding's turtle	Turtle	Threatened / not listed	X	X	X	X	X	X

[1] The status of the species is provided at the state level prior to the dash and the status of the species is provided at the federal level after the dash.

Butternut trees have been documented within 1 mile of Route Segments G1 (Blue Route) and G2; however, no records of this species are located within their ROW or route width. Loggerhead shrike have been documented within 1 mile of all route segments in Region G; however, no records of this species are located within their ROW or route width. Blanding's turtles have been documented within a mile of all route segments in Region G and within the ROW of Route Segments G3 (Purple Route), G4, G5, and G6 and within the route width of Route Segments G1 (Blue Route) and G2.

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 ROW or route width of the route segments. Prior to construction, the applicant could be required to conduct field surveys in coordination with the USFWS and/or DNR for the potential presence of protected species.

12.6.7.2 Sensitive Ecological Resources

The route width of all route segments in Region G would intersect Sites of Biodiversity Significance (Table 12-8; Map 12), with Route Segment G4 intersecting the most acreage and Route Segments G3 (Purple Route), G5, and G6 intersecting the least and only intersecting Sites of Biodiversity Significance ranked "below". The anticipated alignments of all route segments in Region G would cross Sites of

Biodiversity Significance ranked “below”. Route Segments G3 (Purple Route) through G6 would cross the edge of a Site of Biodiversity Significance in an area wider than 1,000 feet and might require placement of one or more structures within it.

Table 12-8 Region G, Route Segments, Sensitive Ecological Resources within Route Width

Resource	Units	Route Segment					
		G1 (Blue Route)	G2	G3 (Purple Route)	G4	G5	G6
Sites of Biodiversity Significance	Moderate rank (acres)	5	5	0	37	0	0
	Below rank (acres)	32	32	13	13	13	13
	Total acres	37	37	13	50	13	13

12.6.8 Soils

The ROI for soils is the ROW. Common soil impacts include rutting, compaction, and erosion (Section 5.6.8.2). Potential impacts would be short-term during construction and localized. Impacts 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 vehicles trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored a suitable location. Disturbed areas would be promptly seeded after construction. Additional details regarding potential impacts to soils and potential mitigation measures is provided in Section 5.6.8.

Map 13 shows the surface soil textures across the region. Soil types within the ROW were reviewed to identify soil characteristics that could be more prone to impacts in some areas versus others (Table 12-9). Soils within the ROW of the route segments of Region G include soils prone to compaction (generally more than half of ROW), soil susceptible to erosion (less than 10 percent of ROW), hydric soil (2 percent of ROW), and soil with revegetation concerns (generally one-third of ROW). Most soils within the ROW of the route segments of Region G have a moderate or severe rutting hazard rating.

Table 12-9 Region G Route Segments NRCS Mapped Soils Within ROW

Soil Data	Unit	Route Segment					
		G1 (Blue Route)	G2	G3 (Purple Route)	G4	G5	G6
Area within Route Segment ROW	Acres	463	448	413	455	441	414
Hydric Soils [1]	Acres	9	7	9	10	10	9
Compaction Prone [2]	Acres	220	208	257	304	271	273
Rutting Hazard [3]	Acres	460	445	410	451	438	411
Erosion Hazard (Off-Road, Off-Trail) [4]	Acres	6	8	29	32	32	38
Revegetation Concerns [5]	Acres	0	0	130	130	130	130

[1] Hydric soil includes hydric soils (100%) and predominantly hydric soils (67-99%).
[2] Soils considered to be compaction-prone soils include those with a rating of "Medium" or higher.
[3] Soils considered susceptible to Rutting Hazards include those with a rating of "Moderate" or "Severe."
[4] Soils considered susceptible to erosion hazard soils include those with a rating of "Medium," "Severe," or "Very Severe."
[5] Soils considered to have revegetation concerns include soils with a non-irrigated land capability classification of 3 or greater.

12.6.9 Surface Water

The ROI for surface water is the route width. Potential impacts to surface waters are discussed in Section 5.6.9.2. Direct impacts caused by structures placed in surface waters would be avoided by spanning the 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 or waterbodies and/or special or impaired waters.

Impacts would be mitigated by using BMPs. 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. Additional details regarding potential impacts to surface waters and potential mitigation measures, including those provided in the DNR's Natural Heritage Review response, is provided in Section 5.6.8.3.

Map 14 shows the waterbodies and watercourses across the region. Each route segment includes one waterbody within their route width.

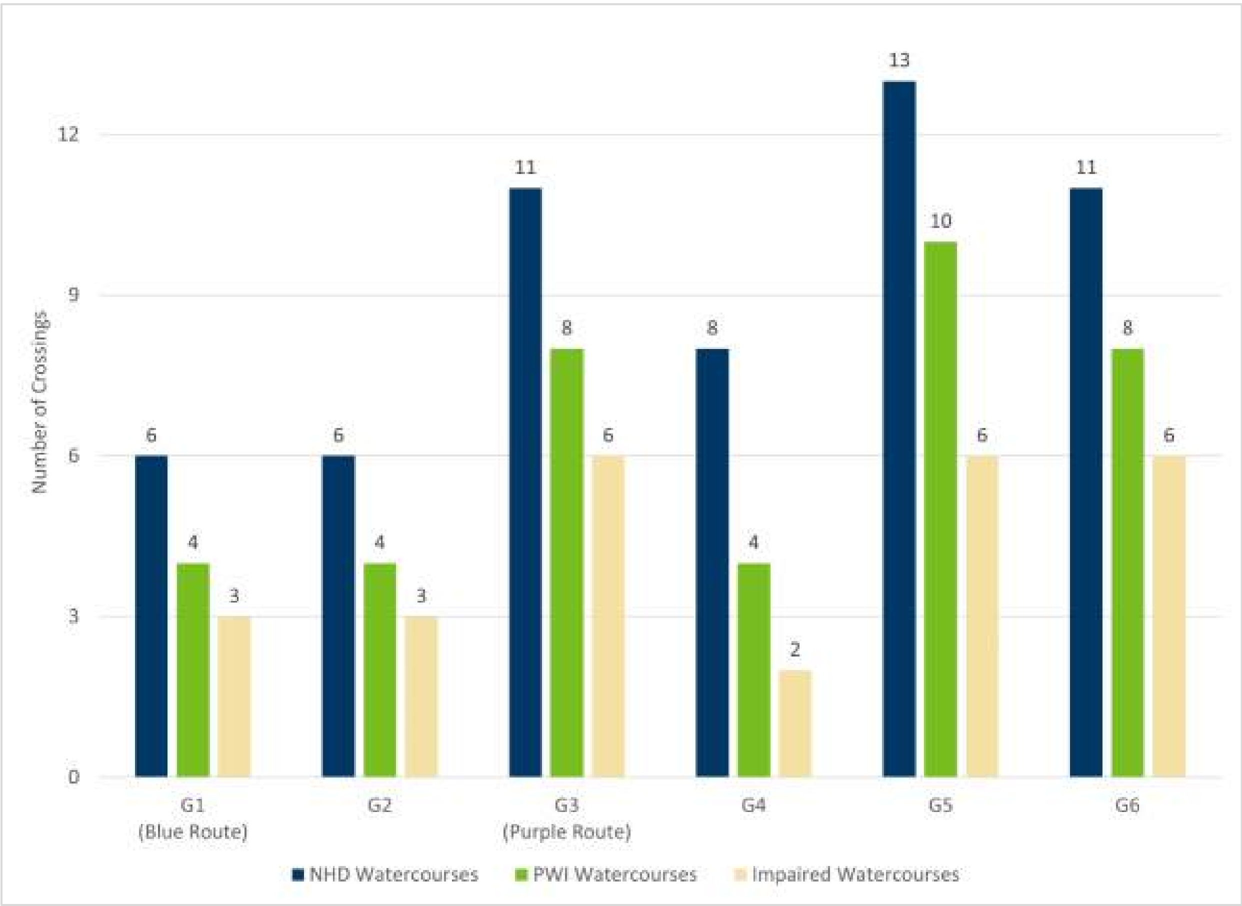
Two trout streams, Johnson Creek and Fairhaven Creek, are crossed by the route segments in the region (Map N.202 and Map N.211). Route segments also cross the Mississippi River, which is a state-designated outstanding resource value water and a state-designated wild, scenic, and recreational river.

The total count of watercourse crossings by the anticipated alignments of route segments within Region G varies between 6 and 13 (Figure 12-6), most of which are classified as perennial streams. Route Segments G1 (Blue Route) and G2 have the fewest watercourse crossings while Route Segment G5 has the most watercourse crossings.

The route segments have between 4 and 10 PWI watercourse crossings; G5 has the most PWI watercourse crossings. The route segments have between 2 and 6 impaired watercourse crossings; Route Segment G4 has the least impaired watercourse crossings. PWI watercourses crossed in Region G include the Mississippi River, Clearwater River, Fairhaven Creek, Threemile Creek, and three unnamed streams.

All route segments, with the exception of Route Segment G4 cross a designated trout stream, Johnson Creek or Fairhaven Creek (Map N.202 and Map N.211). Specifically, Route Segments G1 and G2 cross Johnson Creek and Route Segments G3, G5 and G6 cross Fairhaven Creek.

Figure 12-6 Region G, Route Segments, Number of Watercourse Crossings by Type



12.6.10 Vegetation

The ROI for vegetation is the ROW. Potential construction and operation-related impacts to vegetation are discussed in Section 5.6.10.2. 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. 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, as described in Section 5.6.10.3.

Map 7 provides an overview of landcover types across Region G, and Table 12-10 summarizes the landcover types within the ROW of each route segment in Region G. Agricultural vegetation, particularly cultivated cropland, represents the dominant vegetative landcover type within the ROW of each route segment in Region G. Forested vegetation, primarily upland deciduous forest, is also present in the ROW of each route segment in Region G, with Route Segments G3 (Purple Route) and G5 intersecting the most. As discussed in Section **5.6.10.2**, the applicant would clear forested vegetation from the ROW during construction, and the ROW would be maintained with low-growing vegetation during operations to minimize potential interference with the transmission line.

Herbaceous vegetation, primarily wetlands, is present in the ROW of all route segments in Region G, with G4 and G5 having the most. Minimal amounts (up to 1 acre) of shrub vegetation is also present in the ROW of Route Segments G3 (Purple Route), G4, G5, and G6.

Table 12-10 Region G, Route Segments, Landcover Types in the ROW

Landcover Type	Route Segment					
	G1 (Blue Route)	G2	G3 (Purple Route)	G4	G5	G6
Agricultural (cultivated crops and hay/pasture) (acres in ROW [%of ROW])	281 (61%)	261 (58%)	256 (62%)	297 (65%)	263 (60%)	257 (62%)
Forest (upland and wetland) (acres in ROW [%of ROW])	29 (6%)	29 (7%)	44 (11%)	30 (7%)	41 (9%)	36 (9%)
Herbaceous (upland and wetland) (acres in ROW [%of ROW])	14 (3%)	14 (3%)	19 (5%)	24 (5%)	23 (5%)	19 (5%)
Shrub/scrub (acres in ROW [%of ROW])	0 (0%)	0 (0%)	1 (<1%)	1 (<1%)	1 (<1%)	1 (<1%)
Open water (acres in ROW [%of ROW])	4 (1%)	4 (1%)	2 (1%)	2 (0%)	2 (1%)	2 (1%)
Developed (low-high intensity; open space) (acres in ROW [%of ROW])	135 (29%)	140 (31%)	90 (22%)	101 (22%)	111 (25%)	98 (24%)

Source: NLCD (Appendix C)
Totals might not sum to 100 percent due to rounding.

Potential impacts to agricultural vegetation and wetlands are discussed Section **5.4.2** and **5.6.11.2**, respectively.

12.6.11 Wetlands

The ROI for wetlands is the route width. Short-term and long-term potential impacts to wetlands are discussed in Section 5.6.11.2. Impacts to wetland 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 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.

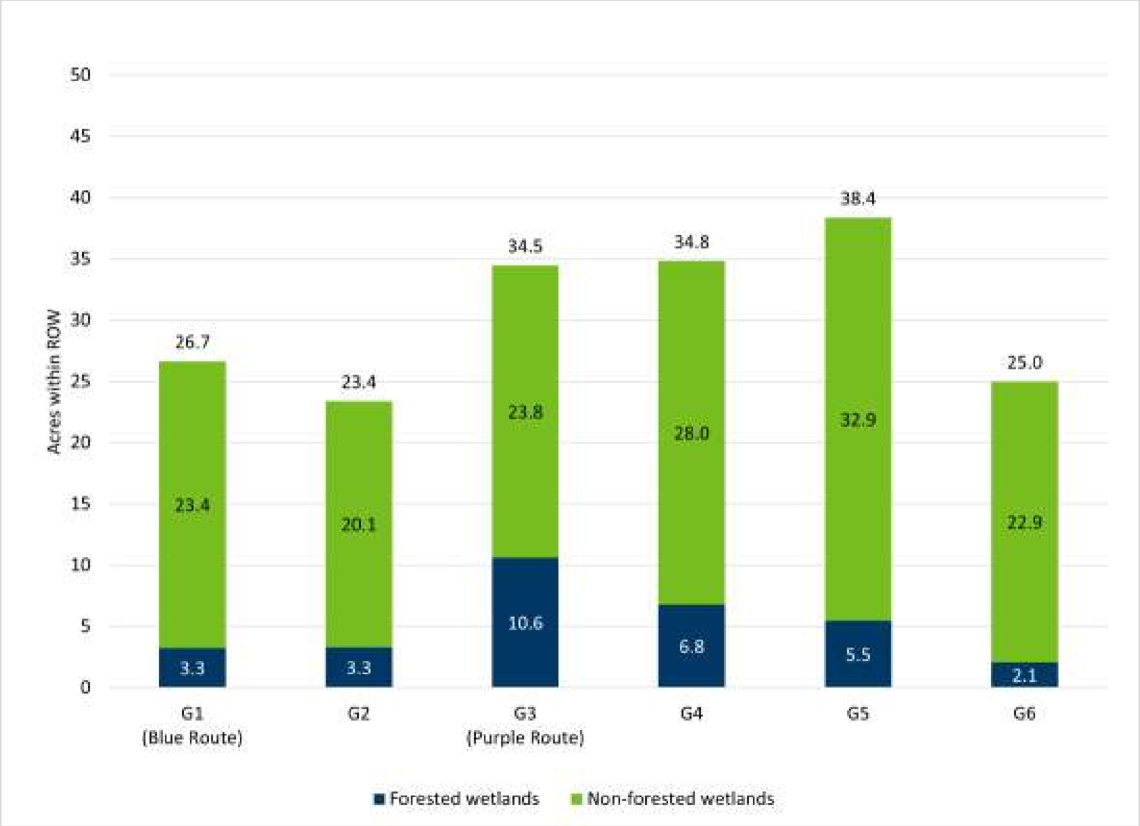
Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width. Wetland impacts would be regulated as described in 5.6.11.1.1. Additional details regarding potential impacts to wetlands, including those provided in the DNR's Natural Heritage Review response, and potential mitigation measures is provided in Section 5.6.11.3.

Map 14 shows the mapped wetlands within the ROI. Direct wetland impacts would occur within the construction workspace (within or adjacent to the ROW); not all wetland areas within the ROI would be subject to direct impacts as most could be spanned. Wetlands in the Region G ROI consist mainly of emergent wetlands but also lake, aquatic bed, forested, scrub-shrub, unconsolidated bottom, and riverine wetlands. Total acres of wetlands within the route widths of the route segments are provided in Appendix E.

The route width of Route Segment G1 (Blue Route) would include the least wetland area (200.7 acres). The route width of Route Segment G4 would include the most wetland area (331.7 acres). Route Segments G1 (Blue Route), G2, and G6 would each include a wetland crossing longer than 1,000 feet. Route Segments G3 (Purple Route), G4, and G5 would each include two wetland crossings longer than 1,000 feet. Two PWI wetlands are mapped within the route width of Route Segments G1 (Blue Route), G3 (Purple Route), G4, G5, and G6. Five PWI wetlands are mapped within the route width of Route Segment G2.

Forested wetlands subject to permanent impacts due to their conversion would be contained within the ROW. Route Segment G6 has the least amount of forested wetland (2.1 acres) within the ROW and Route Segment G3 (Purple Route) has the most (10.6 acres) (Figure 12-7).

Figure 12-7 Region G Route Segments, Acres of Wetland by Type within ROW



12.6.12 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. Potential construction and operation-related impacts to wildlife and wildlife habitat are discussed in Section 5.6.12.2. Potential short-term, localized impacts could occur from displacement during construction or maintenance activities. Potential long-term impacts could occur as a result to 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, as described in Section 5.6.12.3.

Map 16 provides an overview of resources across Region G and Table 12-11 summarizes the wildlife resources within the route width of each route segment in Region F.

The Mississippi River, which provides habitat for waterfowl and other wildlife, intersects Region G and all route segments in Region G would cross the river. However, Route Segments G3 (Purple Route), G4, G5, and G6 would minimize new impacts to waterfowl, as the anticipated alignments for these route segments would cross the Mississippi River following an existing transmission line ROW, while Route Segments G1 (Blue Route) and G2 would require the construction of a new transmission line corridor to cross the river.

Route Segment G2 is the only route segment in Region G with a Wildlife Management Area and Waterfowl Production Area within its local vicinity. The route width of Route Segment G2 would not intersect the Wildlife Management Area. The Waterfowl Production Area is located within the route width of Route Segment G2; however, its anticipated alignment would not cross it.

A state game refuge is located within the route widths and local vicinity of all route segments in Region G. The route width of Route Segment G1 (Blue Route) would intersect the most acres of the state game refuge, while Route Segment G4 (Purple Route) would intersect the least. All of the anticipated alignments for the route segments in Region G except Route Segment G4 (Purple Route) would cross a state game refuge and would do so in areas with and without an existing transmission line ROW present (Map N.206 and Map N.209).

Grassland Bird Conservation Areas are widespread across Region G and are located within the route width and local vicinity of all route segments in Region G. The route widths of the route segments in Region G would intersect between 1,784 and 2,145 acres of Grassland Bird Conservation Areas, with Route Segment G5 intersecting the least and Route Segment G2 intersecting the most. The anticipated alignments of all route segments in Region G would cross Grassland Bird Conservation Areas in areas with and without an existing transmission line ROW present.

Wildlife Action Network corridors are located within the local vicinity of all route segments in Region G but only in the route widths of Route Segments G3 (Purple Route), G4, G5, and G6. The route widths of these route segments would intersect the same acreage of Wildlife Action Network corridors and all of their anticipated alignments would cross Wildlife Action Network corridors. The route widths of Route Segments G1 (Blue Route) and G2 would avoid Wildlife Action Network corridors.

Important Bird Areas are in the local vicinity of Route Segments G3 (Purple Route), G4 G5, and G6; however, none of these areas are located within their route widths.

DNR-identified shallow wildlife lakes are located within the local vicinity of Route Segments G3 (Purple Route) and G5; however, neither route width would intersect a shallow wildlife lake.

The route segments in Region G would parallel existing road rights-of-way for more than half of their lengths (55 to 66%) and transmission line rights-of-way for a small portion of their lengths (10 to 15%). All route segments in Region G would traverse some wildlife areas along new transmission line corridors, which could increase potential impacts to avian species traveling through these areas. As discussed in Section **5.6.12.3**, avian impacts can be minimized through use of bird flight diverters.

Table 12-11 Region G Route Segments Wildlife Management and Conservation Areas within Route Width

Resource Area	Unit	Route Segment					
		G1 (Blue Route)	G2	G3 (Purple Route)	G4	G5	G6
Waterfowl Production Areas	Acres	0	51	0	0	0	0
State Game Refuge	Acres	238	194	155	44	190	161
Grassland Bird Conservation Areas	Acres	1,807	1,784	1,964	1,662	2,145	1,958
Wildlife Action Network corridors	High or medium-high rank (acres)	0	0	36	36	36	36
	Medium rank (acres)	0	0	158	158	158	158
	Low or medium-low rank (acres)	0	0	158	158	158	158
	Total acres	0	0	352	352	352	352

Totals might not sum to 100 percent due to rounding.

12.7 Costs that are Dependent on Design and Route

Costs of the route segments are generally proportional to length with the exception of the additional factors described in Section 5.9. Costs for route segments in Region G are included in Section 12.8 and are also provided in Appendix O.

12.8 Relative Merits of Route Segments

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 Route Segments G1 through G6 with the exception of some elements of resource categories that are considered to have minimal impacts that might not vary significantly throughout the regions and/or the routing factors are not applicable. These include:

- Impacts on human settlements (factor A)— cultural values, environmental justice, land use and zoning, 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 land-based economies (factor C)— forestry and tourism.
- Impacts on the natural environment (factor E) – air quality, climate, geology and topography, floodplains, and groundwater.

With respect to routing factor G, it is assumed that all route alternatives are equal with regard to maximizing energy efficiencies and accommodating expansion of transmission capacity. With respect to environmental impacts, the examination of such impacts suggested by routing factor G is included in the discussion of other routing factors and elements that more specifically address an environmental impact (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 Section 15.

A relative merits analysis was completed to compare Route Segments G1 through G6 using these routing factors. The analysis uses graphics (Table 12-12) 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 12-13 summarizes the relative merits analysis of Route Segments G1 through G6 for the routing factors that are anticipated to vary amongst route alternatives.

Table 12-12 Guide to Relative Merits Analysis

Consistency with Routing Factor or Anticipated Impacts	Symbol
Route alternative is consistent with the routing factor OR Impacts are anticipated to be negligible to minimal or the impact is positive	
Route alternative 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 alternative 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	

Table 12-13 Relative Merits for Route Segments G1 through G6

Routing Factor / Resource	G1 (Blue Route)	G2	G3 (Purple Route)	G4	G5	G6	Summary
Factor A Human Settlement							
Aesthetics	◯	◯	◯	◯	◯	◯	Aesthetic impacts are anticipated to be significant. All route segments would result in aesthetic impacts at the Mississippi River crossing locations and nearby scenic byways. Route segments have at least 26 residences within 500' of the anticipated alignments and 181 or more within the local vicinity. All route segments parallel existing transmission line for 2.5 or 3.4 miles, and the total percentages that parallel existing infrastructure ranges from 59 to 70%. The HVTL will also cross Interstate 94.
Displacement	◒	◒	◒	●	◒	●	Route Segment G3 (Purple Route) and G5 has six non-residential structures within the ROW. There are five non-residential structures within the ROW of G1 (Blue Route) and G2. The other segments do not have structures within the ROW.
Recreation	◒	◒	●	●	●	●	Route segments in Region G do not cross any land-based public trails. All route segments cross the Mississippi River, which is a designated state water trail and a wild and scenic river. Route Segments G1 (Blue Route) and G2 cross the Great River Road Scenic Byway once, while the other segments cross three times. Regional recreational resources in Region G include snowmobile trails and impacts are anticipated to be minimal.
Factor C Land-Based Economies							
Agriculture	◒	◒	◒	◒	◒	◒	Most of the land included in Region F is agricultural. Impacts cannot be avoided but can be mitigated. Prudent routing (parallelling existing infrastructure and/or paralleling division lines) could help minimize impacts. Route Segment G6 has the least prime farmland. Route Segment G2 has the least farmland of statewide importance. As noted in Table 12-12, Route Segment G5 parallels the most existing infrastructure (70% of its total length), and the other route segments parallel a similar amount (59-64% of their total lengths). Multiple (21) center pivot irrigation systems are present throughout Region G but could be avoided through use of refinements and/or avoidance of the final alignment.
Mining	●	●	●	●	●	●	There are two potentially active gravel pits present within Region G. Regional G2 would potentially impact an active gravel pit in the area by clearing trees used as a sound barrier. Coordination between the applicant and the gravel pit operators would be required to confirm no impacts to access of the gravel pits.
Factor D Archaeological and Historic Resources							
Archaeological	◒	◒	●	●	●	●	There are no known archaeological sites (unevaluated for the NRHP) present within the route widths of G3 (Purple Route), G4, G5, G6. There are four archaeological sites within the route width of G1 (Blue Route) and six in the route width of G2.
Historic	◒	◒	◒	◒	◒	◒	Route Segments G3 (Purple Route), G4, G5 and G5 have 12 unevaluated historic architectural resources within the route widths. G1 (Blue Route) and G2 have five unevaluated resources in their route widths.
Factor E Natural Resources							
Public and Designated Lands	●	●	●	●	●	●	Designated lands with existing easements located within the route widths include 30 acres of a Wild and Scenic River bank crossed by Route Segments of G1 (Blue Route) and G2. Region F has no public land within the route width, except for Waterfowl Production Areas and a state game refuge which are discussed in wildlife
Soils	●	●	●	●	●	●	Nearly all of the soils in the region have a moderate or severe rutting hazard rating and approximately half are prone to compaction. Impacts could be minimized with BMPs or mitigated if long-term re-vegetation impacts extend beyond construction. Impacts to soils would be independent of the route selected.
Surface Water	◒	◒	◯	◒	◯	◯	The total count of watercourse crossings by the anticipated alignments of route segments within Region G varies between 6 and 13, most of which are classified as perennial streams. All route segments cross the Mississippi River, a state-designated outstanding resource value water. All route segments, except G4, cross a trout stream. Route segments cross between 4 and 10 PWI watercourses each, including the Mississippi River, Fairhaven Creek, Three Mile Creek, Clearwater River, and three unnamed streams. Each route segment includes one waterbody within the route width. Route Segments G1 (Blue Route) and G2 cross the fewest perennial watercourses (2 each), total watercourses (6 each), and PWI watercourses (4 each). All waterbodies and watercourses could be spanned by the project. No in-water work would occur.

Routing Factor / Resource	G1 (Blue Route)	G2	G3 (Purple Route)	G4	G5	G6	Summary
Vegetation	◓	◓	◓	◓	◓	◓	Route segments have between 29 acres (G1 [Blue Route] and G2) and 44 acres (Route Segment G3) of forested vegetation in the ROW.
Wetlands	●	●	◓	◓	◓	◓	The route width of Route Segment G1 (Blue Route) would include the least wetland area (200.7 acres). The route width of Route Segment G4 would include the most wetland area (331.7 acres). Route Segments G1 (Blue Route), G2, and G6 would each include a wetland crossing longer than 1,000 feet. Route Segments G3 (Purple Route), G4, and G5 would each include two wetland crossings longer than 1,000 feet. Route Segments G1 (Blue Route) and G2 would contain the least acres of forested wetlands within the ROW.
Wildlife and Wildlife Habitat	● ◓	● ◓	● ◓	● ◓	● ◓	● ◓	A Waterfowl Production Area is in the route width of Route Segment G2 but its anticipated alignment does not cross it. Route width and anticipated alignments of all route segments would intersect/cross Grassland Bird Conservation Areas. The anticipated alignments for all route segments except Route Segment G4 (Purple Route) would cross a state game refuge. Route widths and anticipated alignments of Route Segments G3 (Purple Route), G4, G5, and G6 would intersect/cross Wildlife Action Network corridors. Important Bird Areas are in the local vicinity of Route Segments G3 (Purple Route), G4, G5, and G6; none of these areas are located within their route widths. Route Segments G3 (Purple Route) and G5 have a shallow wildlife lake in their local vicinity but not within route width.
Factor F Rare and Unique Natural Resources							
Rare and Unique Natural Resources	●	●	●	●	●	●	All route segments have two to three documented records of state threatened/endangered species within 1 mile. The route width of all route segments would intersect Sites of Biodiversity Significance, with Route Segment G4 intersecting the most acreage and Route Segments G3 (Purple Route), G5, and G6 intersecting the least and only intersecting Sites of Biodiversity Significance ranked "below". The anticipated alignments of all route segments in Region G would cross Sites of Biodiversity Significance ranked "below". Route Segments G3 (Purple Route) through G6 would cross the edge of a Site of Biodiversity Significance in an area wider than 1,000 feet and might require placement of one or more structures within it.
Minnesota Statute 216E.03 - Subpart 7 (15e) *(transmission lines)*							
Paralleling Existing Transmission Line [1]	◓	◓	◓	◓	◓	◓	Route Segments G3 (Purple Route), G4, G5, and G6 all parallel between 14 and 15% of existing transmission line. G1 (Blue Route) and G2 parallel 10% of existing transmission line.
Minnesota Statute 216E.03 - Subpart 7 (8) *(roads/railroads)*							
Paralleling Roads and Railroads	●	●	●	●	●	●	Route Segment G5 parallels roads for 16.1 miles and 66% of its length. The rest of the Route Segments parallel roads for between 55 and 60% of their lengths. All route segments parallel roads for between 55 and 66% of their lengths.
Factor H Paralleling Division Lines							
Paralleling existing survey lines, natural division lines, and agricultural field boundaries	●	●	●	●	●	●	All Route Segments parallel division lines for 85% or more of their length.
Factor J Paralleling Existing Infrastructure							

Routing Factor / Resource	G1 (Blue Route)	G2	G3 (Purple Route)	G4	G5	G6	Summary
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.							Route Segment G5 parallels existing ROW for 17 miles and 70% of its length, and 14% of that is existing transmission line. Route Segment G1 (Blue Route) and G3 (Purple Route) parallel existing ROW the least amount for 59% of their lengths (15 and 13.4 miles, respectively).
Factor L Costs							
Costs Dependent on Design and Route	$109,690,000	$106,391,000	$102,563,000	$113,766,000	$109,625,000	$102,672,000	As noted in Section 12.7, costs generally coincide with the length of the line. The anticipated costs for route segments in Region G are within one another's margin of error.

[1] Minnesota Statute 216E.03 - Subpart 7 (15e) requires the Commission to consider locating a route for a high-voltage transmission line on an existing high-voltage transmission route. The summarized here indicates where ROW paralleling to existing transmission lines occurs but does not distinguish between HVTLs and other transmission lines that might not meet the definition of a HVTL (for example, distribution lines). Highways are included in the assessment provided for Minnesota Statute 216E.03 - Subpart 7 (8).

12.9 Potential Refinements

A refinement is a route segment that was included in the scoping decision but not included within Route Segments G1 through G6. For purposes of analysis, refinements are considered in standalone comparisons against Purple Route or Blue Route equivalents. Table 12-14 summarizes the refinements in Region F and indicates which alternative the refinement would replace. Map 3.15 through Map 3.19 provide the locations of the refinements in Region G. Data tables for the refinements are provided in Appendix E.

Table 12-14 Region F Refinements Summary

Refinement	Route Segment					
	G1 (Blue Route)	G2	G3 (Purple Route)	G4	G5	G6
Route Segment 235			X	X		
Route Segment 236			X	X		
Route Segment 237	X					
Route Segment 238			X	X		
Route Segment 239			X	X		
Route Segment 240			X	X		
Route Segment 242			X			X
Route Segment 243			X			X
Route Segment 244	X	X				
Route Segment 245	X	X				
Route Segment 246	X	X				
Route Segment 247			X	X	X	
Route Segment 248			X	X	X	
Route Segment 249 (previously 113) [1]				X		
Route Segment 250 (previously 112) [1]				X		

[1] These two route segments were numbered as standalone route connectors in the scoping summary. In the EIS, they're included as standalone route segments that could serve as refinements for Route Segment G4.

12.9.1 Route Segments 235, 236, 237, 238, 239, 240

To allow for equivalent comparisons, a common start and end point was assigned to Route Segments 235, 236, 237, 238, 239, and 240 (Figure 12-8).

Figure 12-8 Route Segments 235, 236, 237, 238, 239, and 240

Route Segment 235 departs the Purple Route continuing north at the western border of T122N, R29W, S25, it turns east three quarters through the section, then continues north a quarter through the section, then through T122N, R29W, S24 until it rejoins the Purple Route (Map N.198 and Map N.199). This Route Segment was proposed to reduce the impact of the project by reducing the amount of new disturbances and minimizes the impact of some dwellings.

Route Segment 236 departs the Purple Route at 73rd Avenue and traverses north. It turns east at 163rd Street until it rejoins the Purple Route (Map N.198 and Map N.199). This Route Segment was proposed due to concern for potential shocking, arching, prolonged exposure. Proximity to dwelling. Mental health impacts. Interference with pacemaker, cardiac arrythmia, and cancer. Removal of wildlife habitat, mature forests, native vegetation and wildlife.

Route Segment 237 departs the Blue Route at 73rd Avenue and traverses north. It turns east halfway into T122N, R28W, S19 until it rejoins the Blue Route (Map N.198 and Map N.199). This Route Segment was proposed due to concern for potential shocking, arching, prolonged exposure. Proximity to dwelling. Mental health impacts. Interference with pacemaker, cardiac arrythmia, and cancer. Removal of wildlife habitat, mature forests, native vegetation, and wildlife.

Route Segment 238 departs the Purple Route at 73rd Avenue and traverses north. It turns east at 152nd Street until it rejoins the Purple Route (Map N.198). This Route Segment was proposed with concern of the impact the Blue Route would have on nearby dwellings, high voltage exposure, cancer, mental health impacts, impacts to farm animals. How this would affect the commentors contract with Conservation Reserve Program through the USDA and Stearns County Farm Service Agency and the financial impacts that would follow this, and the devaluation of the property.

Route Segment 239 departs the Purple Route a quarter of the way through T122N, R28W, S30 and traverses north. It turns east at 152nd Street until it rejoins the Purple Route (Map N.198). This Route Segment was proposed due to concern for potential shocking, arching, prolonged exposure. Proximity to dwelling. Mental health impacts. Interference with pacemaker, cardiac arrythmia, and cancer. Removal of wildlife habitat, mature forests, native vegetation and wildlife.

Route Segment 240 departs the Purple Route a quarter of the way into T122N, R28W, S30 and traverses north. It turns east three quarters through the section until it rejoins the Purple Route (Map N.198). This Route Segment was proposed due to concern for potential shocking, arching, prolonged exposure. Proximity to dwelling. Mental health impacts. Interference with pacemaker, cardiac arrythmia, and cancer. Removal of wildlife habitat, mature forests, native vegetation and wildlife.

Table 12-15 summarizes differences in potential impacts of Route Segment 235, 236, 237, 238, 239, 240 compared against their equivalent.

Table 12-15 Route Segments 235 through 240 vs Their Equivalent Impact Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 235 through 240 and their equivalent parallel existing infrastructure for 40 to 98 percent of their lengths; Route Segment 240 parallels the most existing infrastructure (and Route Segment 237 parallels the least existing infrastructure.
Human Settlement	Route Segment 237 has the least residences within 250 to 500 feet (3) and Route Segments 235 and 238 have the most (7). Route Segments 236 and 237 have the least residences within 250-500 feet (1); Route Segments 235, 238, and the equivalent have the most (4). All route segments and the equivalent have 6-8 residences within 500 to 1,600 feet with the exception of Route Segment 235 which has 34 residences, which are concentrated around Carnelian Lake.
Land-Based Economies, Agriculture	Route Segment 238 has the least acres of prime farmland (26 acres) followed by Route Segment 239. These two route segments also have the least acreages of center pivot irrigation systems within their route widths (Map 11.9).
Natural Environment - Vegetation	According to the NLCD, the ROW of each of these route segments and their equivalent would traverse up to an acre of forested landcover. The Purple Route equivalent contains the most forested land cover within its ROW.
Natural Environment – Surface Waters and Wetlands	Route Segments 239 and 240 contain the most wetland acreage within their ROWs.
Natural Environment – Wildlife and Wildlife Habitat	The route widths of all of these route segments and their equivalent intersect over 200 acres of a Grassland Bird Conservation Area and all of their anticipated alignments cross the Grassland Bird Conservation Area. The route widths of all route segments and their equivalent intersect a State Game Refuge. Route Segment 235 intersects the least (4 acres) and the other route segments, and their equivalent intersect 44 acres. Except for Route Segment 235, the anticipated alignments of the other route segments and their equivalent would border the northern part of the State Game Refuge.
Rare and Unique Natural Resources	There are no documented records of federal or state threatened or endangered species within the ROW or route width of any of these route segments or their equivalent.

12.9.2 Route Segment 244

Route Segment 244 departs the Blue Route at the southern border of T123N, R28W, S32 and traverses east. It turns north at almost halfway through T123N, R28W, S33 continues northeast at CR 142 until it rejoins the Blue Route (Map N.201). This route segment was proposed to avoid impacts to natural habitats, trout streams, public waters, floodplains, and wildlife. The Blue Route could alter the viewshed of the impacted area and require tree removal adjacent to watercourses. Table 12-16 summarizes differences in potential impacts of Route Segment 244 compared against its equivalent.

Table 12-16 Route 244 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	The equivalent of Route Segment 244 parallels more existing infrastructure (0.9 miles or 44%) than Route Segment 244 (0.3 miles or 14%).
Human Settlement	Route Segment 244 has a residence within 75 to 250 feet while the equivalent does not have any at this distance. The equivalent has 3 residences within 250 to 500 feet, while Route Segment 244 does not have any at this distance. Route Segment 244 has more residences within 500 to 1,600 feet than the equivalent (6 versus 3).
Land-Based Economies, Agriculture	Both Route Segment 244 does not cross any center pivot irrigation systems, but its equivalent crosses one.
Land-Based Economies, Forestry	After the scoping decision, a member of the public contacted EERA to inform them of the presence of a Christmas tree farm within the route width of Route Segment 244. Potential impacts to the Christmas tree farm (including tree clearing) are discussed in Section 5.4.2.3. Mitigation, in the form of potential compensation for the lost economic value of the Christmas trees would be negotiated between the applicant and landowner should Route 244 be selected.
Natural Environment – Surface Waters and Wetlands	Route Segment 244 does not cross any watercourses or waterbodies; it includes 3 acres of NWI wetlands (<1 of which are forested). Route Segment 244's equivalent crosses 1 watercourse and has 2 acres of NWI wetlands (1 acre of which are forested wetlands)
Natural Environment - Vegetation	According to the NLCD, the ROW of Route Segment 244 would intersect approximately 2 acres of forested landcover, and its equivalent would intersect 8 acres of forested landcover.
Natural Environment – Wildlife and Wildlife Habitat	The route widths of Route Segment 244 and its equivalent intersect a Grassland Bird Conservation Area, with Route Segment 244 intersecting 250 acres and its equivalent intersecting 132 acres. Both of their anticipated alignments would cross the Grassland Bird Conservation Area.

12.9.3 Route Segment 245 and 246

Route Segment 245 departs the Blue Route at Franklin Road and traverses north. It turns east at the southern border of T34N, R30W, S5, continues northeast at the southwest corner of T34N, R30W, S4, and continues southeast at CR 8SE until it rejoins the Blue Route (Map N.204 through Map N.207). This route was proposed to avoid a decrease in property values to those who live along the river who expressed concern about aesthetic impacts.

Route Segment 246 departs the Blue Route at Franklin Road and traverses north following the curve of the road. It continues north about 1,200 feet at the western border of T123N, R27W, S8 then continues northeast. It turns east at the halfway parallel of T35N, R30W, S32, then continues southeast at River Road SE following the curve of the road until it rejoins the Blue Route (Map N.204 through Map N.207). This route was proposed for the same reasons as Route Segment 245.

Route Segment 245 is 4.2 miles long and Route Segment 245 is 6.9 miles long. The equivalent is 3.5 miles long. Table 12-17 summarizes differences in potential impacts of Route Segment 245 and 246 compared against their equivalent.

Table 12-17 Route 245 and 246 vs Their Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 246 parallels the most existing infrastructure (96%) followed by Route Segment 245 (75%). Their equivalent does not parallel existing infrastructure.
Human Settlement	The equivalent does not have any residences within 75-250 feet, while Route Segment 245 has 10 and Route Segment 246 has 25. Route Segment 246 has the most residences at every distance, while the equivalent has the least.
Land-Based Economies, Agriculture	Route Segment 246 intersects 2 more center pivot irrigation systems than the equivalent. Route Segment 245 intersects the same number of center pivot irrigation systems as the equivalent. The equivalent includes more acres of prime farmland but would likely result in less impacts to center pivot irrigation systems (Map 11.9).
Natural Environment – Surface Waters and Wetlands	Route Segment 245 crosses 1 watercourse; it also includes 4 acres of NWI wetlands (<1 acres of which are forested wetlands). Route Segment 246 crosses one watercourse and has 1 acre of NWI wetlands. The equivalent crosses two watercourses and one waterbody; it also includes 4 acres of NWI wetlands.
Natural Environment - Vegetation	According to the NLCD, the ROW of Route Segments 245, 246, and their equivalent would traverse approximately 9, 10, and 12 acres of forested landcover, respectively.
Natural Environment – Wildlife and Wildlife Habitat	The route widths of Route Segments 245, 246, and their equivalent intersect a Grassland Bird Conservation Area, with Route Segment 246 intersecting the most acreage (726 acres) and their equivalent intersecting the least (310 acres). All of their anticipated alignments cross the Grassland Bird Conservation Area. The route widths of Route Segments 245 and 246 intersect a Wildlife Action Network corridor polygon but neither of their anticipated alignments would cross it. The route width of their equivalent route avoids the Wildlife Action Network corridor polygon. The route widths of Route Segments 245, 246, and their equivalent intersect a State Game Refuge. The anticipated alignments for Route Segments 245 and 246 would traverse the northern edge of the State Game Refuge, while their equivalent would cross through the middle of it.

12.9.4 Route Segment 242

Route Segment 242 departs the Purple Route at County Highway 7 and traverses south. It turns northeast at County Highway 45 until it rejoins the Purple Route (Map N.212). This Route Segment was proposed to minimize impacts to irrigation systems, wildlife refuges, and agricultural lands. Table 12-18 summarizes differences in potential impacts of Route Segment 242 compared against its equivalent.

Table 12-18 Route 242 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 242 parallels more existing infrastructure ROW (1.1 miles or 99%) compared to its equivalent (<0.1 miles or 2%). Route Segment 242 includes a total of <0.1 miles that does not parallel existing infrastructure or division lines; the equivalent to Route Segment 242 includes a total of 0.6 miles that does not parallel existing infrastructure or division lines.
Human Settlement	Route Segment 242 has more residences within 250 to 500 feet (5) compared to its equivalent (two).
Land-Based Economies, Agriculture	Route Segment 242 includes less acres of center pivot irrigation systems (less than 1 acre) within its ROW compared to its equivalent (4 acres) (Map 11.9).
Natural Environment – Wildlife and Wildlife Habitat	The route widths of Route Segment 242 and its equivalent intersect a Grassland Bird Conservation Area, with Route Segment 242 intersecting 86 acres and its equivalent intersecting 22 acres. Both of their anticipated alignments would cross the Grassland Bird Conservation Area. The route widths of Route Segment 242 and its equivalent intersect a State Game Refuge, with Route Segment 242 intersecting 63 acres and its equivalent intersecting 70 acres. The anticipated alignment for Route Segment 242 would traverse the western and southern boundaries of the refuge, while its equivalent would cross through the refuge.

12.9.5 Route Segment 243

Route Segment 243 departs the Purple Route three quarters of the way through T122N, R28W, S26 and traverses east. It turns north at 13th Avenue until it rejoins the Purple Route (Map N.213). This route Segment was proposed to avoid residences Table 12-19 summarizes differences in potential impacts of Route Segment 243 compared against its equivalent.

Table 12-19 Route 243 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	The equivalent to Route Segment 243 parallels more existing infrastructure ROW (1.2 or 71%) compared to Route Segment 243 (0.8 or 35%).
Human Settlement	The equivalent has more residences within 75 to 250 feet (2) and 250 to 500 feet (4) than Route Segment 243, which does not have any residences within 75 to 250 feet and has 2 within 250 to 500 feet.
Land-Based Economies, Agriculture	Route Segment 243 intersects the same number of center pivot irrigation systems as its equivalent Map 11.
Natural Environment – Surface Waters and Wetlands	Route Segment 243 crosses one watercourse; it also includes 7 acres of NWI wetlands (2 of which are forested). Route Segment 243's equivalent crosses four watercourses and has 2 acres of NWI wetlands.
Natural Environment - Vegetation	According to the NLCD, the ROW of Route Segment 243 would intersect approximately 2 acres of forested landcover, and its equivalent would intersect less than 1 acre of forested landcover.

Resource	Summary
Natural Environment – Wildlife and Wildlife Habitat	The route widths of Route Segment 243 and its equivalent intersect a Wildlife Action Network corridor polygon, with Route Segment 243 intersecting 60 acres and its equivalent intersecting 2 acres. Only the anticipated alignment of Route Segment 243 would cross the Wildlife Action Network corridor polygon. The route width of Route Segment 243 intersects a Site of Biodiversity Significance, but its anticipated alignment does not cross it. The route width for the equivalent to Route Segment 243 does not intersect the Site of biodiversity Significance.

12.9.6 Route Segment 247 and 248

Route Segment 247 departs the Purple Route halfway up the eastern border of T122N, R27W, S17 and traverses east about 1,000 feet. From there, it turns north until it reaches CR 46, and continues east on CR 46 until it rejoins the Purple Route (Map N.217). The DNR proposed Route Segment 247 to avoid forested area, a public watercourse, floodplain, and habitat fragmentation.

Route Segment 248 departs Route Segment 247 west of Iten Circle NW and heads south for approximately 0.27 mile before rejoining the Purple Route (Map N.217). The DNR proposed Route Segment 248 to avoid 160th Street NW/ County State Aid Highway (CSAH) 46, while minimizing wetland, shoreland, and floodplain impacts by crossing the Clearwater River at the existing bridge.

Table 12-20 summarizes differences in potential impacts of Route Segment 247 & 248 compared against their equivalent.

Table 12-20 Route 247 and 248 vs Their Equivalent Impact Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segments 247 and 248 parallel more existing infrastructure ROW (1.4 miles and 71% and 1.2 miles and 51%, respectively) compared to their equivalent (0.4 miles and 22%). Route Segments 247 and 248 each include a total of 0.4 miles that do not parallel existing infrastructure or division lines; their equivalent includes a total of 0.7 mile that does not parallel existing infrastructure or division lines.
Human Settlement	Route Segment 247 has a residence within 0 to 75 feet, while Route Segment 248 and the equivalent do not have any residences at this distance. The equivalent has fewer residences within 75 to 250 feet, within 250 to 500 feet, and within 500 to 1,600 feet compared to Route Segments 247 and 248, which have approximately double the residences at every distance.
Land-Based Economies, Agriculture	Route Segment 247 does not cross any center pivot irrigation systems. Route Segment 248 crosses one less center pivot irrigation system (two) than their equivalent (one) (Map 11).
Natural Environment – Surface Waters and Wetlands	Route Segments 247 and 248 cross a watercourse whereas their equivalent does not. Route Segments 247 and 248 also have more acres of wetland within the ROW (8 and 10 acres, 4 of which are forested) compared to their equivalent (5 acres, 1 of which is forested).
Natural Environment - Vegetation	According to the NLCD, the ROW of Route Segments 247, 248, and their equivalent would traverse approximately 3, 4, and 8 acres of forested landcover, respectively.
Natural Environment – Wildlife and Wildlife Habitat	All of their anticipated alignments cross the Grassland Bird Conservation Area for their entire varied lengths. The route widths of Route Segments 247, 248, and their equivalent intersect a Grassland Bird Conservation Area. Route Segment 248 intersects the most acreage (290 acres) and their equivalent intersects the least (244 acres). The route widths of Route Segments 247, 248, and their equivalent intersect Wildlife Action Network corridors. Route Segment 248 intersects the most acreage (282 acres) and their equivalent intersects the least (235 acres).

12.9.7 Route Segment 249

DNR proposed Route Segment 249, which was originally introduced in the scoping decision as various route connector options, including Route Connectors 112, 113, 114, and 115. For purposes of comparison, Route Segment 249 (Map 3.15) was designated at the time of the EIS and is compared to its equivalent (versus considering multiple configurations for route connectors). Table 12-21 summarizes differences in potential impacts of Route Segment 249 compared against its equivalent.

Table 12-21 Route 249 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 249 parallels more existing infrastructure ROW (2.5 or 100%) compared to its equivalent (0.3 miles or 14%). The equivalent to Route Segment 249 includes a total of 0.3 miles that does not parallel existing infrastructure or division lines.
Human Settlement	Route Segment 249 has 5 residences within 75 to 250 feet, while its equivalent does not have any residences at this distance. The equivalent has more residences within 500 to 1,600 feet (8) compared to Route Segment 249 (5).
Land-Based Economies, Agriculture	Route Segment 249 intersects the same number of center pivot irrigation systems as its equivalent (Map 11.10 through Map 11.12).
Natural Environment – Designated Lands	Neither Route Segment 249 nor its equivalent contain any conservation easements with the route width
Natural Environment – Surface Waters and Wetlands	Route Segment 249 does not cross any watercourses or waterbodies; it includes 1 acre of NWI wetlands. Route Segment 249's equivalent does not cross any watercourses or waterbodies and has 1 acre of NWI wetlands (1 acre of which are forested wetlands).
Natural Environment - Vegetation	According to the NLCD, Route Segment 249 would not intersect forested landcover, while its equivalent would intersect less than 1 acre.
Rare and Unique Natural Resources	The route width of the Route Segment 249 equivalent intersects a Site of Biodiversity Significance; however, its anticipated alignment does not cross it. The route width of Route Segment 249 avoids the Site of Biodiversity Significance.

12.9.8 Route Segment 250

DNR proposed Route Segment 250, which was originally introduced in the scoping decision as various route connector options, including Route Connector 112, 113, 114, and 115. For purposes of comparison, Route Segment 250 (Map 3.15)was designated at the time of the EIS and is compared to its equivalent (versus considering multiple configurations for route connectors). Table 12-22 summarizes differences in potential impacts of Route Segment 250 compared against its equivalent.

Table 12-22 Route 250 vs Its Equivalent Impacts Summary

Resource	Summary
Paralleling Existing Infrastructure	Route Segment 250 parallels more existing infrastructure ROW (1.3 miles or 100%) compared to its equivalent (0.5 miles or 34%). Neither Route Segment 250 nor its equivalent have any length that do not parallel division lines.
Human Settlement	Route Segment 250 has a residence within 75 to 250 feet, while its equivalent does not have any residences at this distance. Route Segment 250 has more residences within 250 to 500 feet (5) than its equivalent (3). However, the equivalent has more residences within 500 to 1,600 feet (6) compared to Route Segment 250 (2).
Land-Based Economies, Agriculture	Route Segment 250 intersects the same number of center pivot irrigation systems as its equivalent (Map 11.10 through Map 11.12).
Natural Environment – Designated Lands	Neither Route Segment 250 nor its equivalent contain any conservation easements with the route width.
Natural Environment – Surface Waters and Wetlands	Route Segment 250 does not cross any watercourses or waterbodies; it includes 7 acres of NWI wetlands (1 of which are forested). Route Segment 250's equivalent does not cross ant watercourses or waterbodies and has 3 acres of NWI wetlands.
Natural Environment - Vegetation	According to the NLCD, Route Segment 250 and its equivalent would intersect less than 1 acre of forested landcover.
Rare and Unique Natural Resources	The state threatened Blanding's turtle has been documented within the route width but not within the ROW of Route Segment 250. There are no documented records of federal or state threatened or endangered species within the ROW or route width or ROW of the equivalent to Route Segment 250. However, given the proximity and similarity of habitats, Blanding's turtles could also be found in the vicinity of the equivalent to Route Segment 250.

12.10 Alternative Alignment

There is one proposed alternative alignment in Region G. Alternative Alignment 3 would provide an alternative placement to the applicant's proposed alignment. Data tables for the alternative alignments are provided in Appendix E.

Alternative Alignment 3 is in Stearns County (Map N.216). Alternative Alignment 3 was proposed in a scoping comment Mr. Greg Potthoff. The alternative alignment was proposed to minimize impacts to farming activities. Alternative Alignment 3 would go around an agricultural field, instead of diagonally crossing it, but it would be closer to a shallow wildlife lake and PWI waterbody than the applicant's equivalent.

13 Green Route Segment

The Green Route Segment serves as the interconnection from the Sherco Substation to the Sherco Solar West Substation (Map 1). As such it is common to both the Purple and Blue Routes. No alternatives to the Green Route Segment were proposed during scoping. Should the Commission issue a route permit for the project it must select the Green Route Segment.

The Green Route Segment would not require additional ROW but adds a second circuit to the applicant's existing Line 5651 gen-tie line between the Sherco Solar West Substation and the Sherco Substation. The Green Route Segment begins at the Sherco Substation and travels north/northwest out of the substation, generally paralleling 125th Avenue toward CR 8. The Green Route Segment then crosses CR 8 and turns west paralleling the county road toward CR 53. At CR 53, the Green Route Segment travels north along the east side of the county road for a short stretch, crosses to the west side of the county road, and enters the Sherco Solar West Substation.

The route factors (Section 2.2.1) would be well met for the Green Route Segment given the minimal amount of disturbance required for adding a second circuit to the applicant's existing line for construction and negligible change during operation to the currently existing conditions.

13.1 Potential Impacts

Potential impacts would be similar to but of a lesser intensity than the HVTL potential impacts discussed in Chapter 5. Less disturbance would be required given that no new foundations would be needed. Limited sensitive resources are present within the Green Route Segment's route width (Map N.222 and Map N.223). Some forested land is present, but it is on the opposite side of the existing roadway from the Green Route Segment. Most land present is agricultural or developed land. Existing ROW already exists so no additional clearing, beyond operational maintenance practices, would be necessary.

The Green Route Segment includes two residential structures and three non-residential structures in the route width (Map N.222). One residence is near the existing Sherco Solar West substation, and another is on the opposite side of the road from the existing HVTL. The non-residential structures appear to be agricultural buildings and are also located on the opposite side of the road from the existing HVTL.

13.2 Mitigation

Mitigation measures to construct the Green Route Segment would be similar to those discussed in Chapter 5 for the HVTL.

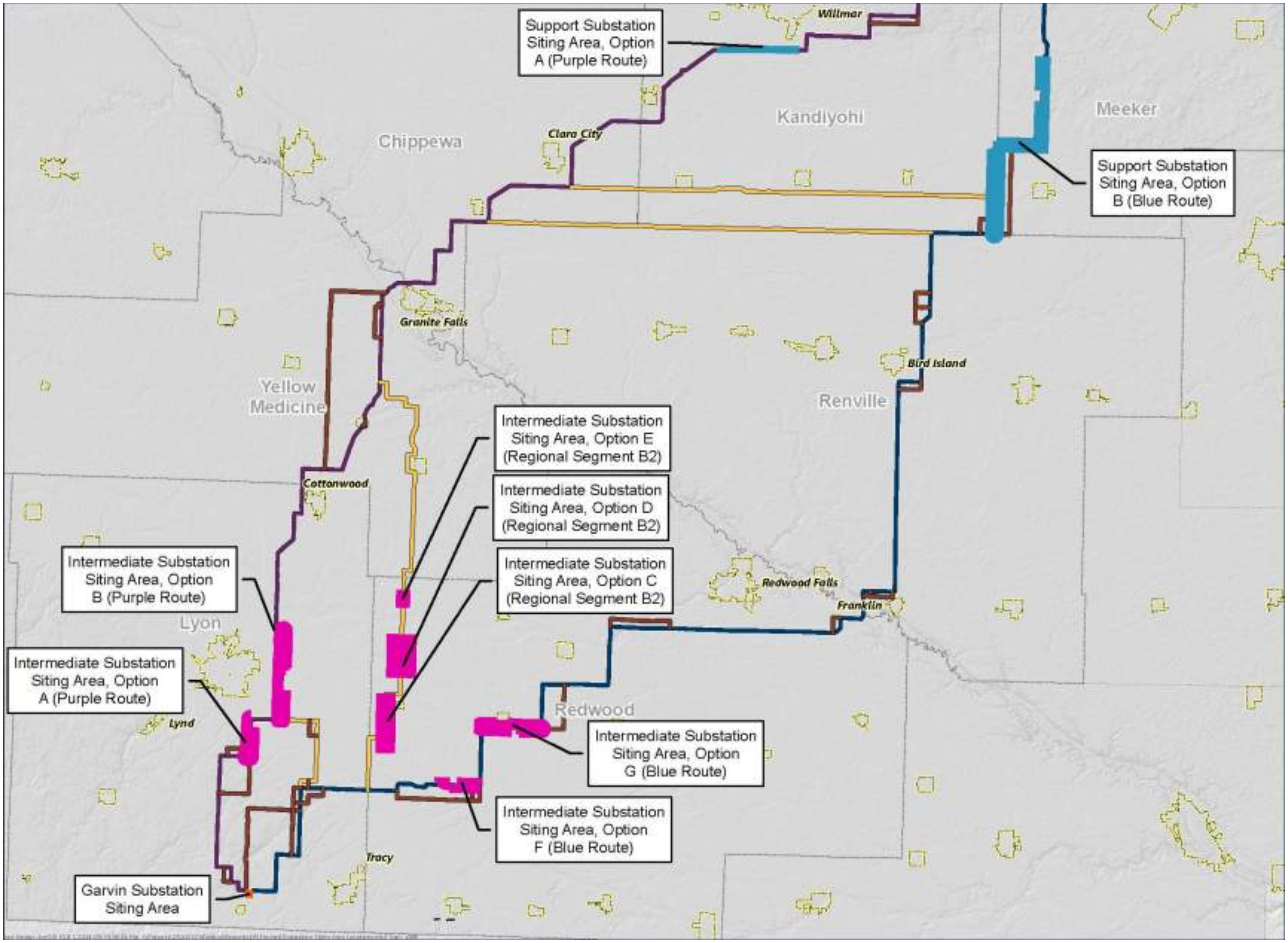
14 Substations

This chapter provides an overview of the human and environmental resources that could be affected by the project substations and associated mitigation measures. This chapter primarily focuses on the new substations; staff understands that the applicant intends to purchase property to site the proposed substations.

Modifications would also be made to the existing Sherco Solar West Substation and the existing Sherco Substation. The Sherco Solar West Substation would require expansion entirely on applicant property and installation of new substation equipment such as breakers, switches, CVTs, arresters, and bus work. Modifications at the Sherco Substation would also be necessary to accommodate termination of the second circuit between the Sherco Substation and the Sherco Solar West Substations as part of this project. Like the Sherco Solar West Substation, no expansion would be required as all additional equipment would be installed within the existing fence line. Human and environmental impacts associated with the modifications and the continued operation of the substations would be incremental and blend with current operations. As such, potential impacts are anticipated to be negligible and are not further discussed.

As indicated in Section 3.2.4, three new substations would be constructed for the project: the Garvin Substation (Section 14.3), an intermediate substation (Section 14.4), and a support substation (Section 14.5). New substations would be sited within their corresponding siting areas as illustrated in Figure 14-1. The exact placement of the substations depends on the route segment chosen by the Commission in the final route permit. If issued a route permit, the applicant would microsite the substations to minimize and avoid potential impacts to the extent feasible. Human and environmental impacts and mitigation for the construction and operation of the substations are discussed in Sections 14.1 and 14.2. Resources present within the siting areas are summarized in Sections 14.3, 14.4, and 14.5. Resources data is also summarized in tables for the substation siting areas in Appendix P.

Figure 14-1 Substation Siting Area Locations



14.1 Potential Impacts

Potential impacts for the Garvin Substation, intermediate substation, and support substation would be similar. Thus, EERA staff believes that the substation locations should not be an overriding consideration when determining a route should the Commission issue a route permit for the project.

Construction of new substations would result in long-term impacts to aesthetics by altering the viewshed, displacement if residences or non-residential structures are located, and thereby purchased by the applicant, within the substation siting area, and increased noise levels during both construction and operation. 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. EMF associated with the project substations would be below Commission permit requirements and state and international guidelines. Potential impacts associated with construction of new substations would be long-term and localized. There are also electrocution risks from unauthorized entry into the substations during operation. The applicant would restrict access with security fence and confirm to NESC standards to avoid these safety risks.

Construction and operation of the new substations would result in the discontinuation of existing land uses. The existing environment would be changed to include new impervious surfaces which would replace existing vegetation and alter the existing topography. Typically, sensitive resources such as wetlands and watercourses would be avoided during final siting. Wetlands, if unavoidable, would require fill to construct the substation, which would result in loss of wetland acreage and potentially function. Watercourses, if unavoidable, would require temporary crossings during construction activities and/or permanent re-routing. Substations would not be constructed over other waterbodies such as waterbodies or ponds. Short-term, localized impacts would occur to wildlife due to displacement; long-term loss of wildlife habitat would also occur. Substations would implement appropriate erosion prevention and sediment control practices as recommended by the MPCA construction stormwater program. A National Pollutant Discharge Elimination System/State Disposal System Construction Stormwater Permit from the MPCA would be required. This permit requires development of a Stormwater Pollution Prevention Plan that describes methods to control erosion and runoff.

14.2 Mitigation

Measures to mitigate potential impacts caused by construction and operation of substations would be similar to mitigation measures for the HVTL described in Chapter 5. Where applicable, the applicant would coordinate with landowners in the substation siting area. Mitigation measures for displacement are further discussed in Section 5.2.3.3. Land within the siting area is mostly prime farmland; mitigation measures for impacts to prime farmland are discussed in 5.4.3. Mitigation measures for wildlife and wildlife habitats are discussed in Section 5.6.12. If wetlands cannot be avoided, impacts can be minimized by a variety of strategies such as: using construction mats and silt tubes; conducting construction and maintenance activities during winter months when the ground is frozen; spreading spoils from structure placement outside the wetland or disposing spoil off ROW; assembling structures on upland areas prior to installation; and transporting crews and equipment, to the greatest extent possible, over improved roads and via access routes which minimize travel over wetlands. If permanent fill is required in wetlands, and/or watercourses require re-routing, those permanent impacts would be permitted with the applicable agencies. Wetland mitigation is further discussed in Section 5.6.11.3.

14.3 Garvin Substation

The Garvin Substation would be at the southern starting point of the HVTL in Lyon County, approximately 1 mile north of the town of Garvin (Figure). The applicant requested a wider route width (0.48-mile-wide) to accommodate the Garvin Substation siting area (Map 17). The Garvin Substation would be approximately 40 acres in size and would include the installation of two 116/-58 MVAR synchronous condensers, shunt reactors, breakers, switches, CVTs, arresters, and bus work. A control building and access road would also be constructed at the site.

The applicant secured purchase options with two landowners, and no residences are currently within the siting area that would be displaced. The total siting area is 153 acres (Map 17) that could be used for selecting the final 40–acre substation site to provide siting flexibility, to meet setbacks from residences outside the siting area, and to accommodate interconnections from future renewable generation in the area.

Nearly all land within the Garvin Substation siting area is agricultural land use (152 of the 153-acre siting area) and all is designated as prime farmland. No center pivot irrigation systems are located within the siting area. There are also no residences, public lands, or conservation easements located within the siting area.

Natural resources within the Garvin Substation siting area include 2 acres of wetland, of which none are forested. There are no watercourses or waterbodies within the substation siting area.

Within the substation siting area there are 95 acres of Grassland Bird Conservation Areas and all 153 acres of the siting area as Wildlife Action Network corridors. Although the USFWS has designated these 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, and similarly the DNR has designated these acres for the Wildlife Action Network, the NLCD designates 152 acres of this area as currently in use by cultivated crops. There are no records of any Important Bird Areas, Wildlife Management Areas, state game refuges, Waterfowl Production Areas, or shallow wildlife lakes in the Garvin Substation siting area.

The Garvin Substation has no records of a state threatened or endangered species, sites of biodiversity significance, railroad rights-of-way prairie, prairie bank easements, or lakes of biological significance within the siting area.

14.4 Intermediate Substation

The intermediate substation would be approximately 20 miles north of the Garvin Substation (Figure). If the Purple Route (or a variation of it) is selected, the intermediate substation would be sited at either Option A or B. The applicant requested a wider route width (1.25-mile-wide) to accommodate Options A or B (Map 17). If Route Segment B2 is selected, the intermediate substation would be sited at either Option C, D or E. A wider route width (0.9 to 1.3-miles-wide) was proposed during scoping to accommodate Options C, D, or E. If the Blue Route (or a variation of it) is selected, the intermediate substation would be sited at either Option F or G.

A control building and road access would also be constructed at the site. The applicant would seek to purchase private property that is approximately 40 to 80 acres in size to accommodate both the substation footprint and additional acreage that may be needed for future line connections, including connections for new generators. The intermediate substation would occupy an approximately 20-acre footprint and facilitate the interconnection of renewable resources to that substation.

14.4.1 Intermediate Substation Siting Area, Option A (Purple Route)

Option A (Purple Route) totals 2,511 acres (Map 18.1). Most of the land within the siting area is cultivated crops (2,115 acres) or hay/pasture (181 acres) with 2,062 acres designated as prime farmland. No center pivot irrigation systems are located within the siting area. There are also no public lands or conservation easements located within the siting area.

There are 15 residences within Option A's entirety.

Natural resources within the siting area include 115 acres of wetlands of which 21 acres are forested. A total of 72,868 feet of watercourses are present within the siting area; there are no waterbodies within the siting area. Lake Marshall is adjacent to the siting area. A floodplain overlaps the northern part of the Option A siting area; avoidance of the floodplain would be required.

Within the substation siting area, there are 342 acres of Grassland Bird Conservation Areas and 1,475 acres of Wildlife Action Network corridor. The Option A siting area does not cross any important bird areas, wildlife management areas, state game refuges, waterfowl production areas, or shallow wildlife lakes.

Rare and unique natural resources within the Option A siting area include one record of a state threatened aquatic vascular plant species, the waterhyssop (*Bacopa rotundifolia*), 149 acres of Sites of Biodiversity Significance ranked as moderate, and 37 acres of native plant communities. There are no records of federally listed species, railroad rights-of-way prairie, prairie bank easements, or Lakes of Biological Significance in the Option A siting area.

14.4.2 Intermediate Substation Siting Area, Option B (Purple Route)

Option B (Purple Route) totals 5,108 acres (Map 18.2). Most of the land within the siting area is cultivated crops (4,865 acres) with 4,894 acres designated as prime farmland. No center pivot irrigation systems are located within the siting area. There are also no public lands or conservation easements located within the siting area.

There are eight residences within Option B's entirety. Three residences are within the route width, and five residences are within the broader substation siting area and outside of the route width.

Natural resources within the Option B siting area include 112 acres of wetlands, of which 3I acres are forested. Approximately 1 acre of a waterbody is present in the siting area. There is a total of 20,845 feet of watercourses present within the siting area. A floodplain traverses the northern part of the siting area; avoidance of the floodplain would be required.

Within the substation siting area there are 100 acres of Grassland Bird Conservation Areas. There are also 43 acres of Wildlife Management Areas within the route width. The Option B siting area does not cross any Important Bird Areas, state game refuges, Waterfowl Production Areas, shallow wildlife lakes, or Wildlife Action Network corridors.

Rare and unique natural resources within the Option B siting area include 42 acres of Sites of Biodiversity Significance which is primarily (38 acres) contained within the route width and ranked as moderate. There are no records of threatened or endangered species, native plant communities, railroad rights-of-way prairie, prairie bank easements, or Lakes of Biological Significance in the Option B siting area.

14.4.3 Intermediate Substation Siting Area, Option C (Route Segment B2)

Option C (Route Segment B2) totals 3,302 acres (Map 18.3). Most of the land within the siting area consists of cultivated crops (3,154 acres) with 3,184 acres designated as prime farmland. No center pivot irrigation systems are located within the siting area. There are also no public lands located within the siting area.

There are eight residences within Option C's entirety. Two residences are within the route width, and six residences are within the broader substation siting area outside of the route width.

There are 27 acres of RIM conservation easements on the western edge of the Option C siting area; it is anticipated that these easements could be avoided. If they are not able to be avoided, conservation easement mitigation measures are discussed in 5.6.6.3. There are no CREP conservation easements within the Option C siting area.

Natural resources within the Option C siting area include 36 acres of wetland, 1 acre of which is forested wetland, and 8 acres of waterbodies. There are a total of 18,932 feet of watercourses present within the Option C siting area.

The Option C siting area does not cross any Grassland Bird Conservation Areas, Important Bird Areas, state game refuges, Waterfowl Production Areas, shallow wildlife lakes, or Wildlife Action Network corridors, Sites of Biodiversity Significance, native plant communities, railroad rights-of-way prairie, prairie bank easements, or Lakes of Biological Significance. There are no records of threatened or endangered species within the Option C siting area.

14.4.4 Intermediate Substation Siting Area, Option D (Route Segment B2)

Option D (Route Segment B2) totals 3,694 acres (Map 18.4). Most of the land within the siting area is cultivated crops (3,420 acres) with 3,406 acres designated as prime farmland. No center pivot irrigation systems are located within the siting area.

There are five residences within Option D's entirety. Four residences are within the route width and one residence is within the broader substation siting area outside of the route width.

Natural resources within the Option D siting area include 48 acres of wetland, none of which are forested wetlands, and 4 acres of waterbodies. There are a total of 36,746 feet of watercourses present within the Option D siting area.

Within the Option D siting area there are 68 acres of Grassland Bird Conservation Areas. Less than 1 acre of a Sites of Biodiversity Significance is also in the Option D siting area.

The Option D siting area does not cross any Important Bird Areas, state game refuges, Wildlife Management Areas, Waterfowl Production Areas, shallow wildlife lakes, or Wildlife Action Network corridors, native plant communities, railroad rights-of-way prairie, prairie bank easements, or lakes of biological significance. There are no records of threatened or endangered species in the Option D siting area.

14.4.5 Intermediate Substation Siting Area, Option E (Route Segment B2)

Option E (Route Segment B2) totals 715 acres (Map 18.5). Most of the land within the siting area is cultivated crops (694 acres) and the entire siting area is designated as prime farmland. No center pivot irrigation systems are located within the Option E siting area. There are also no public lands or conservation easements located within the Option E siting area.

There is one residence within Option E's entirety, outside of the route width.

Natural resources within the Option E siting area include 7,857 feet of watercourses; there are no wetlands or waterbodies.

Within the Option E siting area there are 13 acres of Grassland Bird Conservation Areas and less than 1 acre of a Wildlife Action Network corridor.

The Option E siting area does not cross any Important Bird Areas, state game refuges, Wildlife Management Areas, Waterfowl Production Areas, shallow wildlife lakes, Sites of Biodiversity Significance, or native plant communities, railroad rights-of-way prairie, prairie bank easements, or Lakes of Biological Significance. There are no records of threatened or endangered species in the Option E siting area.

14.4.6 Intermediate Substation Siting Area, Option F (Blue Route)

Option F (Blue Route) totals 1,657 acres (Map 18.6). Most of the land within the siting area is cultivated crops (1,547 acres) with 1,557 acres designated as prime farmland. No center pivot irrigation systems are located within the siting area. There are also no public lands within the siting area.

There are five residences within Option F's entirety. Three residences are within the route width and two residences are within the broader substation siting area outside of the route width.

There are approximately 18 acres of CREP conservation easements within Option F's entirety, all of which are within the broader substation siting area; it is anticipated that these easements could be avoided. If they are not able to be avoided, conservation easement mitigation measures are discussed in 5.6.6.3. There are no RIM conservation easements within the Option F siting area.

Natural resources within the siting area include acres of 11 wetlands, none of which are forested wetlands, and 1 acre of waterbodies in the Option F siting area, near the anticipated alignment. One watercourse totaling 10,814 feet in length is present within northeastern corner of the Option F siting area. The Cottonwood River is located directly south of the Option F siting area.

Within the Option F siting area there are 987 acres of Grassland Bird Conservation Areas. There is also less than 1 acre of a Site of Biodiversity Significance.

The Option F siting area does not cross any important bird areas, state game refuges, Wildlife Management Areas, Waterfowl Production Areas, shallow wildlife lakes, Wildlife Action Network corridors, or native plant communities, railroad rights-of-way prairie, prairie bank easements, or Lakes of Biological Significance. There are no records of threatened or endangered species in the Option F siting area.

14.4.7 Intermediate Substation Siting Area, Option G (Blue Route)

Option G (Blue Route) totals 3,775 acres (Map 18.7). Most of the land within the siting area is cultivated crops (3,584 acres) with 3,653 acres designated as prime farmland. No center pivot irrigation systems are located within the siting area. There are also no public lands located within the siting area.

There are five residences within Option G's entirety. One residence is within the route width and four residences are within the broader substation siting area outside of the route width.

There are approximately 6 acres of CREP conservation easements on the edge of the Option G siting area and within the route width; it is anticipated this easement area could be avoided. If they are not able to be avoided, conservation easement mitigation measures are discussed in 5.6.6.3. There are no RIM conservation easements within the Option G siting area.

Natural resources within the Option G siting area include 11 acres of wetlands, none of which are forested wetlands. There are a total of 53,227 feet of watercourses present within the Option G siting area.

The Option G siting area does not cross any Grassland Bird Conservation Areas, Important Bird Areas, state game refuges, Wildlife Management Areas, Waterfowl Production Areas, shallow wildlife lakes, or Wildlife Action Network corridors, Sites of Biodiversity Significance, native plant communities, railroad rights-of-way prairie, prairie bank easements, or Lakes of Biological Significance. There are no records of threatened or endangered species in the Option G siting area.

14.4.8 Intermediate Substation Siting Areas Summary

There are a total of seven options for the intermediate substation siting areas.

Two options are applicable if the Purple Route or a variation of it is selected (Options A and B). Both options contain primarily agricultural land and residences. Similar total acreages of wetlands are present, and Option B contains a waterbody whereas Option A does not. Both options include potential to impact Grassland Bird Conservation Areas and Site of Biodiversity Significance. Option A includes one record of a state threatened or endangered species (no federally listed) and native plant communities. Option B includes a Wildlife Management Area and Site of Biodiversity Significance.

Three options are applicable if Route Segment B2 is selected (Options C, D, and E). All options contain primarily agricultural land and Option C includes a RIM conservation easement. Option E does not include any waterbodies or wetlands while Option C and D do. Options D and E contains Grassland Bird Conservation Areas, Wildlife Action Network corridors, and/or Sites of Biodiversity Significance while Option C does not.

Two options are applicable if the Blue Route or a variation of it is selected (Options F and G). Both options contain primarily agricultural land, residences, CREP easements, waterbodies, and wetlands. Option F contains Grassland Bird Conservation Areas, and a small area designated as a Site of Biodiversity Significance while Option G does not.

14.5 Support Substation

The support substation would be located approximately 80 miles south of the Sherco Solar West Substation, near the approximate midpoint of the HVTL (Figure). Its final location would be determined by the final route selection. If the Purple Route (or a variation of it) is selected, the intermediate substation would be sited at Option A (Section 14.5.1). The applicant requested a wider route width (0.5-mile-wide) to accommodate Option A (Map 4). If the Blue Route (or a variation of it) is selected, the intermediate substation would be sited at Option B (Section 14.5.2). The applicant requested a wider route width (1.25-mile-wide) to accommodate Option B (Map 4).

For the support substation, the applicant proposed to include a Series Capacitor and one 150 MVAR STATCOM system per line. Selection of voltage support equipment would be dependent on the technologies available at the time of construction and the resources selected to interconnect to the line. A control building and access road would also be constructed at the site.

The support substation footprint would be approximately 30 acres in size. The applicant would seek to purchase private property that is approximately 40 to 80 acres in size to accommodate both the substation footprint and additional acreage that may be needed for transmission line connections.

14.5.1 Support Substation Siting Area, Option A (Purple Route)

Option A (Purple Route) totals 2,511 acres (Map 19). Most of the land within the siting area is cultivated crops (1,569 acres) or hay/pasture (18 acres) with 1,688 acres designated as prime farmland. No center pivot irrigation systems are located within the siting area. There are also no public lands or conservation easements located within the siting area.

There are 13 residences within Option A's entirety. Seven residences are within the route width and six residences are within the broader substation siting area outside of the route width.

Natural resources within the siting area include 28 acres of wetlands, none of which are forested wetlands. A total of 17,764 feet of watercourses are present within the siting area; there are no waterbodies.

Within the substation siting area Option A, there are 31 acres of Grassland Bird Conservation Areas.

The siting area does not cross any Important Bird Areas, state game refuges, Wildlife Management Areas, Waterfowl Production Areas, shallow wildlife lakes, or Wildlife Action Network corridors, native plant communities, railroad rights-of-way prairie, prairie bank easements, Sites of Biodiversity Significance, or Lakes of Biological Significance. There are no records of threatened or endangered species.

14.5.2 Support Substation Siting Area, Option B (Blue Route)

Option B (Purple Route) totals 10,535 acres (Map 19). Most of the land within the siting area is cultivated crops (10,022 acres) or hay/pasture (11 acres) with 9,709 acres designated as prime farmland. No center pivot irrigation systems are located within the siting area. There are also no public lands located within the siting area.

There are 15 residences within Option B's entirety. Six residences are within the route width and nine residences are within the broader substation siting area outside of the route width.

There are 4 acres of CREP conservation easements within the entirety of the substation siting area, all of which are in the broader substation siting area. There are no RIM conservation easements within support substation siting area's Option B.

Natural resources within the siting area include 149 acres of wetlands, 9 acres of which are forested wetlands, and 4 acres of waterbodies. A total of 139,031 feet of watercourses are present within the siting area.

Within substation siting area Option B there are 72 acres of Waterfowl Production Areas, nearly all of which are contained within the route width.

The siting area does not cross any Grassland Bird Conservation Areas, Important Bird Areas, state game refuges, shallow wildlife lakes, Wildlife Management Areas, Wildlife Action Network corridors, native plant communities, railroad rights-of-way prairie, prairie bank easements, Sites of Biodiversity Significance, or Lakes of Biological Significance. There are no records of threatened or endangered species.

15 Irreversible and Unavoidable Impacts

This chapter describes unavoidable impacts and irreversible and irretrievable commitments of resources.

15.1 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 to an industrial use (substation locations)
- GHG emissions

Unavoidable adverse impacts associated with the operation of the proposed project include:

- Visual impact of structures, conductors, and substations
- Change in landscape character at the substation locations
- Loss of land use for other purposes, such as agriculture, where structures and the substations 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

15.2 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, especially at the substation.

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.

16 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.

Cumulative effects are discussed here for projects that are currently happening or are planned with construction schedules that would overlap the project's or are otherwise foreseeable within the environmentally relevant area. 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 Lyon, Redwood, Yellow Medicine, Renville, Chippewa, Kandiyohi, Meeker, Stearns, Wright, and Sherburne counties and associated Soil and Water Conservation Districts for each county were reviewed; as well as larger municipalities in the area, including St. Augusta, Becker, and St. Cloud.

Current and reasonably foreseeable future projects are summarized in Table 16-1 and shown on Figure 16-1. Most of the projects identified consist of transportation-related projects and generally include routine maintenance and repair activities. The MnDOT website was used identify state-level projects (Districts 3 and 8) 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 project areas of relevant MnDOT projects are shown on Figure 16-1, 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.

As noted in Table 16-1 and shown on Figure 16-1, the foreseeable projects are primarily in Region G. In this area, there are two other long-range transmission line projects that would connect near Becker, Minnesota, including the Alexandria to Big Oaks project, which would connect to the proposed Big Oaks Substation, and the Northern Reliability project, which would connect to the proposed Big Oaks Substation and the retiring Sherco coal plant, approximately 1.5 miles to the northwest of the Big Oaks Substation. Several solar projects are also planned in the area, as well as three data centers, and a gravel operation. Two foreseeable solar projects are also in Region B.

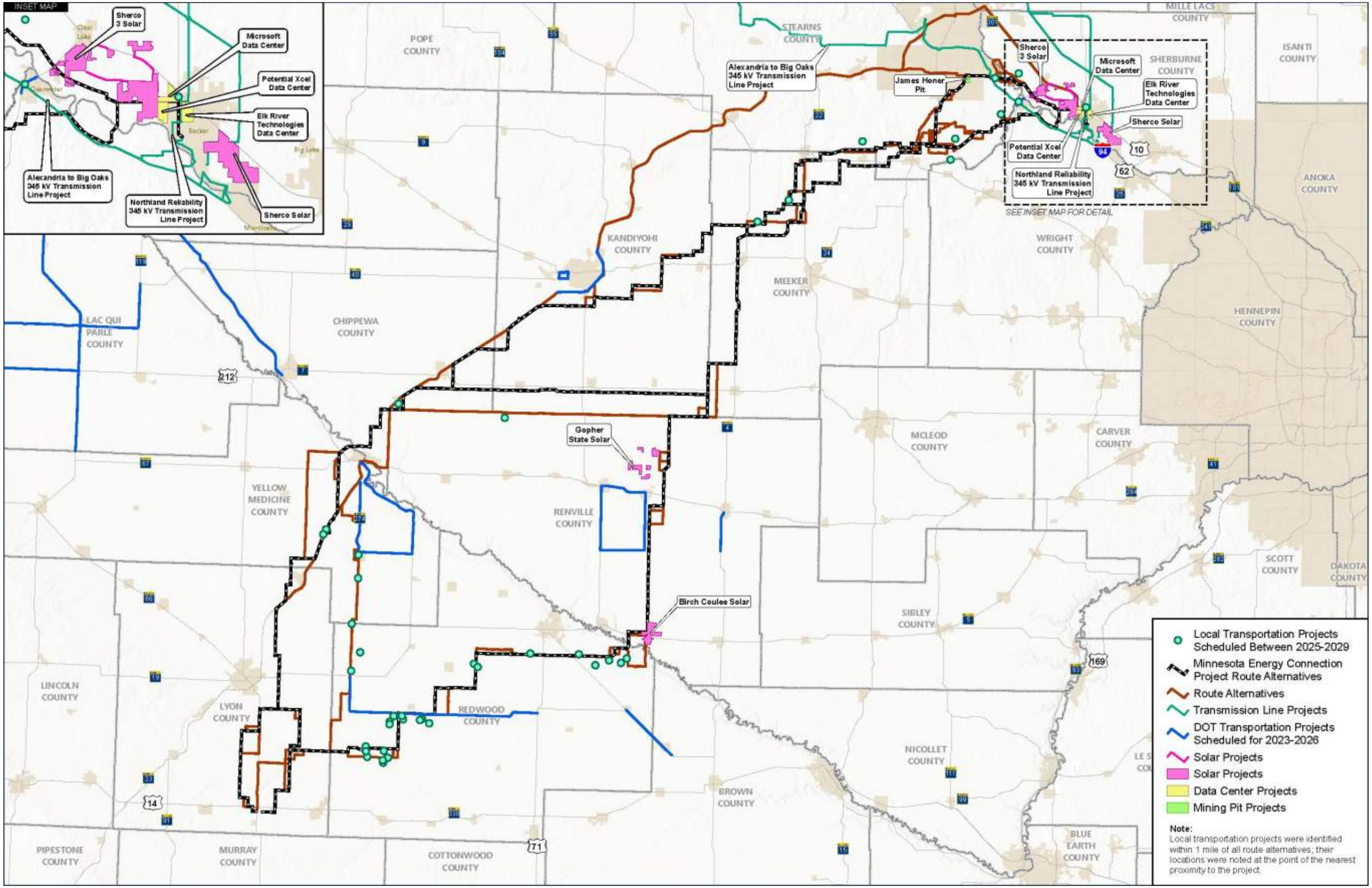
As discussed in Section 1.2, the project would enable the interconnection of more than 4,000 MW of renewable energy generation; as such, additional solar and wind projects are anticipated in the area. It is assumed that the construction-related impacts of these foreseeable projects are short-term, for 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 16-1 Current and Reasonably Foreseeable Future Projects

Project Name	Description	Location	Source
Alexandria to Big Oaks 345 kV Transmission Line Project	Xcel Energy proposes to string approximately 105-108 miles of new transmission line on existing double-circuit capable structures running from the existing Alexandria Substation in Alexandria, Douglas County to Becker, Sherburne County where new transmission lines would cross the Mississippi River to facilitate the proposed Big Oaks Substation. Project is currently in environmental review phase.	Region G, Alexandria (Douglas County) to Becker (Sherburne County); terminating at the new Big Oaks Substation	https://eera.web.commerce.state.mn.us/web/project/15111
Northland Reliability 345 kV Transmission Line Project	Minnesota Power and Great River Energy propose to construct approximately 140 miles of new double-circuit 345 kV transmission line and to replace approximately 40 miles of existing transmission line with double-circuit 345 kV transmission line. The project would connect the existing Iron Range substation, near Grand Rapids, Minn., to a new Big Oaks substation near Monticello, Minn.	Region G, Iron Range Substation in Grand Rapids (Itasca County) to Big Oaks Substation in Becker (Sherburne County).	https://apps.commerce.state.mn.us/web/project/
Sherco 3 Solar Project	Xcel Energy proposes to construct a new 250 MW solar energy project in Sherburne County, Minnesota.	Region G, Between U.S. Highway 10 and the Mississippi River in the City of Clear Lake and Clear Lake Township	https://apps.commerce.state.mn.us/web/project/15104
Sherco Solar Project	Xcel Energy is proposing to construct an up to 460-megawatt solar project and two 345 kilovolt transmission lines to interconnect the Solar Project to the grid. Both transmission lines connect the Solar Project to the existing Sherburne County Substation. The Solar Project will partially replace energy production of the Sherco Generating Plant Unit 2	Region G, Between U.S. Highway 10 and the Mississippi River, and on the east and west sides of the existing Sherco Generating Plant in Becker	https://apps.commerce.state.mn.us/web/project/14335
Microsoft Data Center	Proposed Microsoft data center in Sherburne County near Becker. Microsoft recently purchased 295 acres from Xcel Energy to develop a data center	Region G, Sherburne County	Alexandria to Big Oaks Environmental Assessment
Elk River Technologies Data Center	Proposed data center in Becker, Sherburne County. Elk River Technologies has an option to develop a data center on 348 acres.	Region G, Sherburne County	Alexandria to Big Oaks Environmental Assessment
Potential Xcel Data Center	Proposed data center in Becker, Sherburne County. Xcel Energy is marketing a site to the west of the Sherco plant for a potential data center.	Region G, Sherburne County	Alexandria to Big Oaks Environmental Assessment
James Honer Pit	Aggregate Pit Mine. The mining operations are located on approximately 161 acres and is located east of County State Aid Highway 7 and west of 28th Avenue. Scheduled to start in 2025.	Region G, Sterns County	https://staugustamn.com/wp-content/uploads/2022/03/Honer-EAW-Form_Final-Draft-for-EQB_Clean_20220301.pdf
Coneflower Solar Project	Coneflower Energy, LLC is proposing to construct an up to 235-megawatt solar energy generating facility in Lyon County, Minnesota.	Region A, Lyon County	https://apps.commerce.state.mn.us/web/project/15699
Birch Coulee Solar	Birch Coulee Solar, LLC is proposing to construct a solar energy generating facility in Renville County, Minnesota. The project is proposed on approximately 768.2 acres in Birch Cooley, Camp, and Bandon Townships and the city of Franklin.	Region B, Renville County	https://eera.web.commerce.state.mn.us/web/project/15658
Gopher State Solar	Gopher State Solar, LLC is proposing to construct a new 200 mW solar energy generating facility in Renville County, Minnesota. The proposed project will be in Kingman, Osceola, and Bird Island townships in Renville County, Minnesota.	Region B, Renville County	Project Docket: Gopher State Solar
Highway 71 - Olivia	Install a weigh-in-motion sensor system plus two pull-off locations on Highway 71 south of Olivia between Bayberry Ave and .5 miles south of 790th Ave. Scheduled for construction in 2026.	Region B, Meeker County	Highway 24 Concrete Repair Project - MnDOT (state.mn.us)
Highway 40 - Willmar	Construct a left and right turn lane on Highway 40 from 1,300' east of CR 55, to 1,400' west of CR 5. Scheduled for construction in 2025.	Region C, Kandiyohi County	Highway 40 Willmar - MnDOT (state.mn.us)
Highway 67 - Granite Falls	Guardrail, rumble strips, striping, cul-de-sac addition, and bridge removal. Scheduled for construction in 2024 to 2026.	Region B, Yellow Medicine County	https://www.dot.state.mn.us/d8/projects/hwy67granitefallstoecho/index.html
Highway 71 and Highway 23 - Willmar	Resurface southbound lanes of Highway 71 from the south end of the Highway 23 bypass to the Business Highway 71 split, and Highway 23 from CR 5 to the start of the Highway 23 bypass. Construction to begin late 2025 and completed in 2026.	Region C, Kandiyohi County	Highway 71 and Highway 23 Resurfacing Willmar (state.mn.us)
Southwest District 8 - Ditrictwide Culvert Repairs, Highways 300-694	Repairs to over 130 culverts on highways in Chippewa, Kandiyohi, Lac Qui Parle, Lincoln, Redwood, Renville, and Yellow Medicine Counties.	Region B & C, Kandiyohi, Chippewa, Redwood Counties	Districtwide Culvert Repair Projects - MnDOT (state.mn.us)

Highway 24 - Clearwater	Reconstruct the interchange/bridge over I-94 between 179th St. and Ash St. in Clearwater, Wright County. Project will also evaluate the entire one-mile stretch between Wright Co. Rd. 7 and the Mississippi River bridge to plan for future needs in Clearwater. Scheduled for construction in 2026.	Region G, Wright County	Highway 24 — Clearwater | Let's Talk Transportation - MnDOT (state.mn.us)
Redwood County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays.	Region B, Redwood County	https://redwoodcounty-mn.us/wp-content/uploads/2024/08/2025-Redwood-County-Road-and-Bridge-Construction-Project-Map_V2_2024-08.pdf
Yellow Medicine County Road Construction/Maintenance Projects	Various road improvement projects including milling, paving, and overlays.	Region B, Yellow Medicine County	Data received from Yellow Medicine County officials
Renville County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays.	Region B, Renville County	Data received from Renville County officials
Chippewa County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays.	Region B & C, Chippewa County	https://www.co.chippewa.mn.us/DocumentCenter/View/1666/Approved-2022-5yearplan
Meeker County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays.	Region D, Meeker County	https://www.co.meeker.mn.us/DocumentCenter/View/7251/5-Year-Highway-Construction-Plan-PPT-071624
Stearns County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays.	Region E and G, Stearns County	https://content.civicplus.com/api/assets/37fb4f5c-149d-42bb-abcd-ef186abe15d6?cache=1800
Wright County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays.	Region G, Wright County	https://www.co.wright.mn.us/DocumentCenter/View/32236/5-Year-Construction-Plan-2024-2028
Sherburne County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays.	Region G & H, Sherburne County	https://gis.co.sherburne.mn.us/arcgis/rest/services/PublicWorks/Construction_Projects_Future/MapServer

Figure 16-1 Cumulative Potential Effects



16.1 Human Settlement

This project, combined with the foreseeable projects in Table 16-1, could interact to result in minimal to moderate cumulative effects on aesthetics. Most impacts would occur in Region G, at the northern end of the project where the Alexandria to Big Oaks, Northland Reliability, and Minnesota Energy Connection projects would converge with the new Big Oaks Substation, the Sherco Solar and Sherco 3 Solar projects, the proposed data center projects, and the James Honer Pit gravel operation. In this area, the visual setting would further transition from one that is agricultural and pastoral to one that is more developed and industrial in nature. In Regions A and B, this project, combined with the Coneflower Solar, Gopher State and Birch Coulee solar projects, would alter the currently agricultural landscape with energy infrastructure. Similar impacts would be anticipated for future renewable energy projects in the area.

16.2 Human Health and Safety

This project, in combination with the current and reasonably future projects summarized in Table 16-1, including future renewable energy projects in the area, could interact to result in minimal cumulative effects on public health and safety. This project, in combination with the Alexandria to Big Oaks project and the Northern Reliability project would make the electrical grid more reliable but would also 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 Alexandria to Big Oaks project and the Northland Reliability 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.

16.3 Land-based Economies

This project, combined with the foreseeable projects in Table 16-1 and any future renewable energy projects in the area, 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 agricultural land to industrial and/or energy infrastructure. This project, the Northland Reliability project, and the Alexandria to Big Oaks project would use and/or follow existing transmission line or road rights-of-way to the extent possible, which would reduce land conversions to some degree.

16.4 Archaeological and Historic Resources

This project, combined with the foreseeable projects in Table 16-1, and any future renewable energy projects in the area, 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.

16.5 Natural Environment

This project, combined with the foreseeable projects in Table 16-1, and any future renewable energy projects in the area, 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 in Table 16-1.

This project and the other foreseeable projects would generally 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 upland and wetland vegetation would occur where this project and the other two transmission line projects identified in Table 16-1 cross non-agricultural land. These projects could together result in an increase in vegetation type conversion, an increase in the spread of noxious weeds and other non-native species, and increased soil disturbance in the region.

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

This project, in combination with the foreseeable projects 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.

17 Route Options Relative Merits

So far, this EIS has discussed potential impacts by region. However, the Commission must select a complete route from the Garvin Substation to the Sherco Substation should it issue a route permit for the project. Given the number of routing options, this chapter discusses four example routes that run from the Garvin Substation to the Sherco Solar West Substation which include route segments and route connectors across the seven regions discussed in Chapters 6 through 12. The Green Route Segment travels from the Sherco Solar West Substation to the Sherco Substation. This segment, discussed in Chapter 13, is common to all alternatives; therefore, the discussion is not repeated here.

The route options discussed in this chapter do not represent the only routing possibilities. Rather, they are examples—other full routes could be developed by combining full route segments or portions of route segments, route connectors, and refinements that could create a route connecting the substations noted above. This chapter illustrates how various route segments and route connectors could be selected to build a project route. No option is meant to represent a "best-case scenario" or to be "least impactful overall." For example, the route options presented here could be further improved with the refinements.

The applicant-proposed routes are included as two options: Route Option A (the Purple Route) and Route Option B (the Blue Route). The other two route options were compiled by selecting route segments and route connectors that could be feasibly connected to each other to create a route between the new Garvin Substation and the existing Sherco Solar West Substation. These are referred to as Option C and Option D. These routes are summarized in Table 17-1 and shown on Map 20.

Overall, the analysis concluded that there are relatively small differences in the routing factors between the four route options. For example, there is limited opportunity for paralleling transmission lines (ranging from 6 percent to 10 percent of the route options' total lengths). For three of the four options (Route Options A, B, and D), opportunity for paralleling roads and railroads is similar (ranging from 46 percent to 52 percent). Comparatively, Route Option C, parallels a higher percentage of its overall length (72 percent). Three of the four options (Route Options A, C, and D) also have similar residential counts (507 to 522) and non-residential structure counts (1,363 to 1,409) within the local vicinity. Route Option B (Purple Route) has the lowest count of residences (436) and non-residential structures (1,067).

There is limited differentiation in impacts to public and designated lands, land-based economies, and archaeological and historic resources between the four route options. There are some differences in potential impacts to the natural environment between the four options. For example, Route Option B (Purple Route), has the least amount of watercourse crossings, while Route Option D has the most. Route Option C is the only route option that would not cross a designated trout stream. For wetlands, Route Option A (Blue Route) would intersect the fewest acres of wetland (135 acres versus up to 152 for the other three route options) and have the fewest wetland crossings greater than 1,000 feet. For wildlife and wildlife habitat, all route options would intersect areas managed for wildlife, with Route Option C intersecting the fewest acres of these resources. However, Route Option C is the only route option that would intersect a shallow wildlife lake. Similarly, for rare and unique natural resources, all route options would intersect sensitive ecological resources, with Route Option C intersecting the fewest acres of these resources. Route Option C is also the only route option that would intersect a Lake of Biological Significance.

The potential impacts of the four full route options are summarized in Table 17-2. Additional detail is provided in Appendix Q.

Table 17-1 Example Route Options

Region	Route Segment Choices (by region; refinements)[1]	Route Connector Choices[2]	Route Segment			
			Route Option A	Route Option B	Route Option C	Route Option D
Region A	A1 through A7; Route Segments 204 through 208	NA	A1 (Purple Route)	A3 (Blue Route)	Route Segment A7	Route Segment A2
Region B	B1 through B4; Route Segments 210 through 221	NA	B1 (Purple Route)	B4 (Blue Route)	Route Segment B2	Route Segment B3
Region C	C1 through C4; Route Segments 222 through 225	NA	C1 (Purple Route)	C4 (Blue Route)	Route Segment C2[3] including refinement Route Segment 223	Route Segment C3 [3] including refinement Route Segment 223
Region D	D1 through D7; Route Segment 229	Route Connector 105	D1 (Purple Route)	D4 (Blue Route)	Route Connector 105 Route Segment D2	Route Connector 105 Route Segment D3
Region E	E1 or E2; Route Segments 230 through 232	Route Connector 107	E1 (Purple Route)	E2 (Blue Route)	Route Segment E1[4] including refinement Route Segment 231	Route Segment E2
Region F	F1 through F8; no refinements	Route Connector 108	F1 (Purple Route)	F4 (Blue Route)	Route Segment F7	Route Connector 108 Route Segment F3 to F8[5]
Region G	G1 through G6; Route Segments 235 through 250	NA	G1 (Blue Route)	G3 (Purple Route)	Route Segment G4	Route Segment G5

[1] Two of the 38 refinements were incorporated into the four route options.
[2] This column includes only the route connectors that were not included in a route segment. For a complete list of route connectors that were incorporated into a route segment, refer to Appendix D.
[4] This part of the route option includes a portion Route Segment 231, which is one of two refinements incorporated into the route options. Route Segment 231 was included to allow for additional opportunity to follow existing infrastructure.
[5] This part of the route option includes a part of Route Segment F3 and a part of Route Segment F8. This combination was used to avoid center pivot irrigation systems with the beginning of Route Segment F3 and to avoid spanning an existing active gravel pit by transitioning from Route Segment F3 to Route Segment F8.

Table 17-2 Human and Environmental Impacts of the Full Route Options

Resource	Element	Route Segment			
		Route Option A (Purple Route)	Route Option B (Purple Route)	Route Option C	Route Option D
Length (miles)		170.6	173.9	179.4	177.6
Cost ($)		$657,000,000	$668,000,000	$690,000,000	$683,000,000
ROW Sharing / Paralleling	Transmission line (miles, percent)	16.6 (10)	17.2 (10)	10.6 (6)	9.9 (6)
	Roads and railroads (miles, percent)	82.0 (48)	79.5 (46)	122.6 (68)	91.7 (52)
	Total ROW sharing (transmission line, road, railroad, and pipeline) (miles, percent)	89.3 (52)	85.4 (49)	128.9 (72)	98.1 (55)
	Total ROW Paralleling (Parcel, section, and division lines) (miles, percent)	152.5 (89)	160.3 (92)	170.1 (95)	162.3 (91)
	Total ROW Paralleling (all) (miles, percent)	155.7 (91)	161.1 (93)	172.6 (96)	164.9 (93)
	Total length following no infrastructure or division lines (miles, percent)	14.9 (9)	12.8 (7)	6.8 (4)	12.7 (7)
Human Settlement	Residences within 0 - 500 feet (count)	159	145	191	192
	Residences within 500 - 1,600 feet (count)	363	291	329	315
	Total Residences (count)	522	436	520	507
	Non-residential structures within 0 - 500 feet (count)	413	446	647	637
	Non-residential structures within 500 - 1,600 feet (count)	1,409	1,067	1,414	1,363
	Total Non-residential structures (count)	1,822	1,513	2,061	2,000
Conservation Easements	RIM (acres in route width)	25	32	10	28
	CREP (acres in route width)	143	393	193	123
Land-Based Economies	Agricultural land (acres in ROW)	2,367	2,342	2,314	2,388
	Prime farmland (acres in ROW)	2,317	2,324	2,513	2,438
	Center pivot irrigation systems (acres in ROW)	12,351	19,119	15,059	14,352
Archaeology and Historic Architecture	Archaeological sites in route width (count in ROW, count in route width)	3 6	4 8	6 9	3 5
	Historic architectural resources in route width (count in ROW, count in route width)	33 50	24 35	29 50	30 53

Resource	Element	Route Segment			
		Route Option A (Purple Route)	Route Option B (Purple Route)	Route Option C	Route Option D
Water Resources	NHD stream crossings (count)	123	100	115	125
	PWI stream crossings (count)	41	35	39	42
	Impaired stream crossings (count)	27	25	23	30
	Trout Streams (count)	1	1	0	1
	NHD lake crossings (count)	7	6	6	5
	PWI basin crossings (count)	0	2	1	0
	PWI wetland crossings (count)	7	4	7	4
	Forested wetlands (acres in ROW)	17	17	19	19
	Total wetlands (acres in ROW)	135	152	144	147
	Wetland crossings greater than 1,000 feet (count)	3	6	4	4
Vegetation	Forested landcover in the ROW (acres)	51	47	41	48
Wildlife	Grassland Bird Conservation Areas (acres in ROW, acres in route width)	811 5,462	727 6,301	548 3,693	752 5,059
	Important Bird Areas (acres in ROW, acres in route width)	76 523	64 432	76 523	76 526
	Wildlife Management Areas (acres in ROW, acres in route width)	< 1 67	0 22	0 6	0 66
	State Game Refuges (acres in ROW, acres in route width)	19 155	42 294	5 44	28 190
	Waterfowl Production Areas (acres in ROW, acres in route width)	2 49	1 152	0 78	1 159
	Shallow Wildlife Lakes (acres in ROW, acres in route width)	0 0	0 0	0 1	0 0
	Wildlife Action Network Corridors (acres in ROW, acres in route width)	334 2,250	228 1,555	289 1,970	327 2,162

Resource	Element	Route Segment			
		Route Option A (Purple Route)	Route Option B (Purple Route)	Route Option C	Route Option D
Rare and Unique Natural Resources	State Threatened or Endangered Species (documented records in NHIS database; count in ROW, count in route width)	5 8	2 3	5 8	6 9
	Sites of Biodiversity Significance (acres in ROW, acres in route width)	61 563	91 847	33 275	41 304
	Native Plant Communities (acres in ROW, acres in route width)	8 144	8 58	3 37	3 26
	Railroad Rights-of-way Prairie (feet in the ROW, feet in route width)	718 55,992	154 1,025	0 0	224 3,159
	Prairie Bank Easements (acres in ROW, acres in route width)	0 0	12 46	0 0	0 0
	Lakes of Biological Significance (acres in ROW, acres in route width)	0 0	0 0	2 17	0 0

The route options relative merits analysis uses graphics (Table 17-3) 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 17-4 summarizes the relative merits analysis of the four route options.

Table 17-3 Guide to Relative Merits Analysis

Consistency with Routing Factor or Anticipated Impacts	Symbol
Route alternative is consistent with the routing factor OR Impacts are anticipated to be negligible to minimal or the impact is positive	
Route alternative 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 alternative 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	

Table 17-4 Route Options Relative Merits Analysis

Routing Factor / Resource	Route Segment				Summary
	Route Option A (Purple Route)	Route Option B (Blue Route)	Route Option C	Route Option D	
Factor A Human Settlement					
Aesthetics					Aesthetic impacts are anticipated to be moderate. Route Option B has the fewest residences within the route width (145 versus 159-192 for the other route options) and within the local vicinity (436 versus 507-522 for the other route options). All route options parallel existing transmission lines for 6 to 10% of their lengths. Route Option C follows the most existing infrastructure (72% of its length versus 49 to 55% of the lengths of the other route options).
Displacement					No residential displacements would occur as a result of any of the four route options. Potential displacement of non-residential structures within the ROW would include: Route Option A (11), Route Option B (5), Route Option C (9), Route Option D (14). Route Options A and B have fewer non-residential structures within the route width (413 and 446 structures, respectively) than Route Options C and D (over 600 structures each). Route Option B has the fewest non-residential structures within the local vicinity (1,067 structures); the other route options have between 1,363 and 1,414 structures. Non-residential structures would not necessarily be displaced but would be subject to potential displacement on a case-by-case basis. It is possible some non-residential structures could stay within the ROI if the activities taking place in these structures are compatible with the safe operation of the HVTL.
Recreation					
Factor C Land-Based Economies					
Agriculture					All four route options have similar acreages of agricultural land and prime farmland within the ROW. Route options have between 46 and 66 acres of center pivot irrigation systems in the ROW. Route Option B has the most acres of center pivot irrigation systems in the ROW and crosses some of the systems. The other three options may be able to avoid disruption to operation of center pivot irrigation systems by not crossing them.
Mining					Negligible or minimal impacts are anticipated to existing gravel pits for all four route options. This assumes the applicant coordinates with active gravel pit operators to ensure access to the facilities are not restricted as committed to in the route permit application.
Factor D Archaeological and Historic Resources					
Archaeological					All four route alternatives contain archaeological sites that are unevaluated for listing on the National Register of Historic Places within the route widths, including at least one Native American mortuary site that also intersects the ROW. Route B contains one mortuary site that intersects the ROW, while two are present in the route widths of A and D, and three are present in the route width of Route C. Site 21CP0011 is a pre-contact, Native American burial mound site, consisting of three mounds, two of which are elongated. This site may have been destroyed due to previous disturbance. This site intersects the ROW of Routes A, C, and D. The presence of these sites increases the chance for encountering human remains during construction for all route alternatives. Site 21RW0001 is a Native American burial mound site consisting of one mound, intersecting the ROW of Route B. The site is reported to have been destroyed by the development of a house complex and gravel pit. Site 21HKt is an alpha site consisting of a Native American burial mound that intersects the ROW of Route C. Based on documentation, this site may have been destroyed by agricultural activity. Site 21CPa is a Euroamerican burial site, characterized as the Stanley Minsaas III mortuary site, that intersects the ROW of Routes A, C, and D. This is an alpha site recorded based on documentation, historic accounts, and/or maps, but has not been investigated by a qualified archaeologist. There are six unevaluated archaeological resources that intersect the route width of Route Option A. These include three mortuary sites and three precontact habitation and lithic scatter sites. Eight unevaluated archaeological sites intersect the route width of Route B, including three mortuary sites, three precontact lithic scatters, a historic trading post, a historic mill and a single historic isolate. One additional unevaluated precontact habitation site is within the route width. The route width of Route C contains nine archaeological sites, including three mortuary sites, four precontact lithic/artifact scatters and two historic ghost towns. One additional unevaluated precontact (Archaic period) site is present within the substation siting area, but not within the route width. There are five archaeological sites that intersect the route width of Route D. These include three mortuary sites and three precontact habitation/lithic scatters.

Routing Factor / Resource	Route Segment				Summary
	Route Option A (Purple Route)	Route Option B (Blue Route)	Route Option C	Route Option D	
Historic	●	●	●	●	The route widths of all four route options contain at least one historic architectural resource eligible for listing on the National Register of Historic Places (NRHP), in addition to historic architectural resources that are unevaluated for listing on the NRHP. The route width of Route B contains the fewest eligible and unevaluated resources, while Route D contains the most. Within the route width of Route A, there are two historic architectural resources eligible for listing on the NRHP (XX-RRD-CSP010 Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company: Hastings and Dakota Division Main Line/and XX-RVR-00008/Minnesota River Channel) and 22 unevaluated resources. One eligible resource (XX-RRD-CSP010 Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company: Hastings and Dakota Division Main Line) and 15 unevaluated resources are within the route width of Route B. Two eligible resources (XX-RRD-CSP010 Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company: Hastings and Dakota Division Main Line and XX-RVR-00008/Minnesota River Channel) and 26 unevaluated resources are within the route width of Route C. Two eligible resources (XX-RRD-CSP010 Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company: Hastings and Dakota Division Main Line and XX-RVR-00008/Minnesota River Channel) and 36 unevaluated resources are within the route width of Route D.
Factor E Natural Resources					
Public and Designated Lands	●	●	●	●	Public lands included within the ROIs include state game refuges, Wildlife Management Areas, and Waterfowl Production Areas which are summarized in the wildlife section. Designated lands, including CREP and RIM easements are present within the ROI but could be avoided by the anticipated alignment with one exception for Route Option B where the anticipated alignment crosses RIM reserve land. Overall, impacts would be anticipated to be minimal.
Soils	◒	◒	◒	◒	Potential impacts to soils would be similar for all route options.
Watercourses and Waterbodies	◒	●	◒	◒	Route options have between 100 (Route Option B) and 125 (Route Option D) stream crossings. Route Option B also has the fewest PWI stream crossing and second fewest impaired stream crossings. All watercourses would be spanned. All four route options would cross lakes, with Option D crossing the fewest (5) and Route Option A crossing the most (7). Route Options A and D would not cross PWI lakes, while Route Option B would cross 2 and Route Option C would cross 1. Route Options B and D have the fewest PWI wetland crossings (4) and Route Options A and C have the most (7).
Wetlands	●	◒	◒	◒	Route options would intersect between 135 and 152 acres of wetland, 17 to 19 acres of which are forested. Route options have between 3 and 6 wetland crossings greater than 1,000 feet. Route Option A has the fewest acres of wetland in the ROW and the fewest wetland crossings greater than 1,000 feet.
Vegetation	◒	◒	◒	◒	All four route options would impact forested vegetation, but the amounts would vary little (41 to 51 acres).
Wildlife and Wildlife Habitat	◒	◒	●	◒	The ROW and/or route width of all four full route options would intersect wildlife areas. Route Option C would minimize impacts to Grassland Bird Conservation Areas, Wildlife Management Areas, and state game refuges. Route Options A and C would minimize impacts to Waterfowl Production Areas. Route Options B and C would minimize impacts to Wildlife Action Network corridors. Route Option B would minimize impacts to Important Bird Areas. Route Option C is the only option with a shallow wildlife lake in its route width; the ROW does not intersect this resource.
Factor F Rare and Unique Natural Resources					
Rare and Unique Natural Resources	◒	◒	●	◒	Route options have between 2 and 3 documented records of non-aquatic threatened or endangered species within the ROW and route width. All streams would be spanned; through use of BMPs, indirect impacts to threatened or endangered aquatic organisms (mussels) would be avoided. The ROW and/or route width of all four full route options would intersect sensitive ecological resources. Route Option C minimizes impacts to Sites of Biodiversity Significance, native plant communities, and railroad rights-of-way prairies. However, Route Option C is the only route option with a Lake of Biological Significance in its ROW and route width. Route Option B is the only route option that would intersect a prairie bank easement.
Minnesota Statute § 216E.03 - subdivision 7 (15e) (transmission lines)					
					There is limited opportunity for paralleling transmission lines (ranging from 6 percent to 10 percent of the route options' total lengths).

Routing Factor / Resource	Route Segment				Summary
	Route Option A (Purple Route)	Route Option B (Blue Route)	Route Option C	Route Option D	
Paralleling Existing Transmission Line[1]	◒	◒	◒	◒	
Minnesota Statute § 216E.03 - subdivision 7 (8) (roads/railroads)					
Paralleling Roads and Railroads	◒	◒	●	◒	Route Option C parallels the most roads/railroads (122.6 miles and 68% of its length) compared to the other options which follow between 79.5 to 91.7 miles and 46 to 52% of their lengths.
Factor H Paralleling Division Lines					
Paralleling existing survey lines, natural division lines, and agricultural field boundaries	●	●	●	●	All route options would parallel existing survey lines, natural division lines, and/or agricultural boundaries for the majority of their length (89 to 95%).
Factor J Paralleling Existing Infrastructure					
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.	◒	◒	●	◒	Route Option C would parallel the most existing transportation, pipeline, and electrical transmission systems or rights-of-way (128.9 miles, 72% of its length).
Factor L Costs					
Costs Dependent on Design and Route [2]	$657,000,000	$668,000,000	$690,000,000	$683,000,000	Costs generally coincide with the length of the line. Costs for the four options are within 5% of one another.

[1] Minnesota Statute 216E.03 - Subpart 7 (15e) requires the Commission to consider locating a route for a high-voltage transmission line on an existing high-voltage transmission route. The summarized here indicates where ROW paralleling to existing transmission lines occurs but does not distinguish between HVTLs and other transmission lines that might not meet the definition of a HVTL (for example, distribution lines). Highways are included in the assessment provided for Minnesota Statute 216E.03 - Subpart 7 (8).
[2] Total costs for Options A and B are shown as they were provided in the route permit application. Total costs for Options C and D presented were calculated assuming a consistent cost of approximately $3.8 million per mile (including land acquisition).

Overall, the analysis concluded that there are relatively small differences in the routing factors between the four route options. For example, there is limited opportunity for paralleling transmission lines (ranging from 6 percent to 10 percent of the route options' total lengths). For three of the four options (Route Options A, B, and D), opportunity for paralleling roads and railroads is similar (ranging from 46 percent to 52 percent). Comparatively, Route Option C, parallels a higher percentage of its overall length (72 percent). Three of the four options (Route Options A, C, and D) also have similar residential counts (507 to 522) and non-residential structures (1,363 to 1,409) within the local vicinity. Route Option B (Purple Route) has the lowest count of residences (436) and non-residential structures (1,067).

There is limited differentiation in impacts to public and designated lands, land-based economies, and archaeological and historic resources between the four route options. There are some differences in potential impacts to the natural environment between the four options. For example, Route Option B (Purple Route), has the least amount of watercourse crossings, while Route Option D has the most. Route Option C is the only route option that would not cross a designated trout stream. For wetlands, Route Option A (Blue Route) would intersect the fewest acres of wetland (135 acres versus up to 152 for the other three route options) and have the fewest wetland crossings greater than 1,000 feet. For wildlife and wildlife habitat, all route options would intersect areas managed for wildlife, with Route Option C intersecting the fewest acres of these resources. However, Route Option C is the only route option that would intersect a shallow wildlife lake. Similarly, for rare and unique natural resources, all route options would intersect sensitive ecological resources, with Route Option C intersecting the fewest acres of these resources. Route Option C is also the only route option that would intersect a Lake of Biological Significance.

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