Northern States Power Company – Wisconsin

Application for a Certificate of Authority for the Bayfield Second Circuit Transmission Line Project

To be Located in Bayfield County, Wisconsin

PSC Docket No. 4220-CE-182

March 8, 2019

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Acronyms and Abbreviations

AIS	Agricultural Impact Statement
AM	AM Transmitter Stations
Applicant	Xcel Energy
Application	Joint Application to the PSCW and WDNR for Certificate of Authority
ASNRI	Areas of Special Natural Resource Interest
BCFPD	Bayfield County Forestry and Parks Department
BMPs	Best Management Practices
BNHC	Bureau of Natural Heritage Conservation
BPEA	Bayfield Peninsula Energy Alternatives
CA	Certificate of Authority
CPCN	Certificate of Public Convenience and Necessity
CWA	Clean Water Act
DATCP	Department of Agriculture, Trade and Consumer Protection
DPC	Dairyland Power Company (DPC)
EMF	electric and magnetic fields
ER	Endangered Resources
FAA	Federal Aviation Administration
FCC	Federal Communications Commission
FCL	Forest Crop Law
FM	FM Transmitter Stations
FPP	Farmland Preservation Program
GAP	Gap Analysis Project
GIS	Geographic Information System
GPS	Global Positioning System
IPaC	Information for Planning and Consultation
kV	kilovolt
kV/m	kilovolts per meter
MF	magnetic field
MFL	Managed Forest Law
mG	milliGauss
MISO	Midcontinent Independent System Operator, Inc.
MTEP	MISO Transmission Expansion Planning
MW	Megawatt
NESC	National Electric Safety Code
NHI	Natural Heritage Inventory
NRCS	Natural Resources Conservation Service
NWR	National Wildlife Refuge
OHWM	ordinary high water mark
ORW	Outstanding Resource Water
Project	Bayfield Second Circuit Transmission Line Project
PSCW or	Public Service Commission of Wisconsin

Commission	
PSS®E	Power System Simulator for Engineering
ROW	right-of-way
TCSB	temporary clear span bridge
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WDNR	Wisconsin Department of Natural Resources
WHS	Wisconsin Historical Society
WisDOT	Wisconsin Department of Transportation
WPDES	Wisconsin Pollution Discharge Elimination System
WWI	Wisconsin Wetland Inventory
Xcel Energy	Northern States Power Company, a Wisconsin corporation

EXECUTIVE SUMMARY

Introduction

Northern States Power Company, a Wisconsin corporation (Xcel Energy or Applicant), is proposing to build a new 34.5 kilovolt (kV) transmission line and two new substations in the Bayfield Peninsula area to improve system reliability. Depending on the route selected, the proposed transmission line would extend approximately 19 to 26 miles and connect the two new substations being referred to as Fish Creek and Pikes Creek. The new Fish Creek Substation would be located approximately four miles west of the City of Ashland. The new Pikes Creek Substation is proposed to be located approximately 2 miles west of the City of Bayfield, Wisconsin. The Bayfield Second Circuit Transmission Project (Project) will increase electric reliability by providing a second source of power to the east side of the Bayfield Peninsula and voltage support which will reduce power outages across the Bayfield Peninsula. The proposed 34.5 kV transmission line is called the "second circuit" or "second source" because there is an existing 34.5 kV line extending to Bayfield.

The Project requires a Certificate of Authority (CA) from the Public Service Commission of Wisconsin (PSCW or Commission) and a Utility Permit from the Wisconsin Department of Natural Resources (WDNR). In this joint application to the PSCW and WDNR (Application), Xcel Energy is seeking authorization from the PSCW and the WDNR to construct the new 34.5 kV facilities as described below.

The Application contains two proposed route alternatives, the West Route and the East Route, both located in Bayfield County. This summary provides an overview of the proposal and identifies where detailed information can be found in the Application.

Proposed Facilities

The Applicant proposes constructing and placing in operation the following facilities:

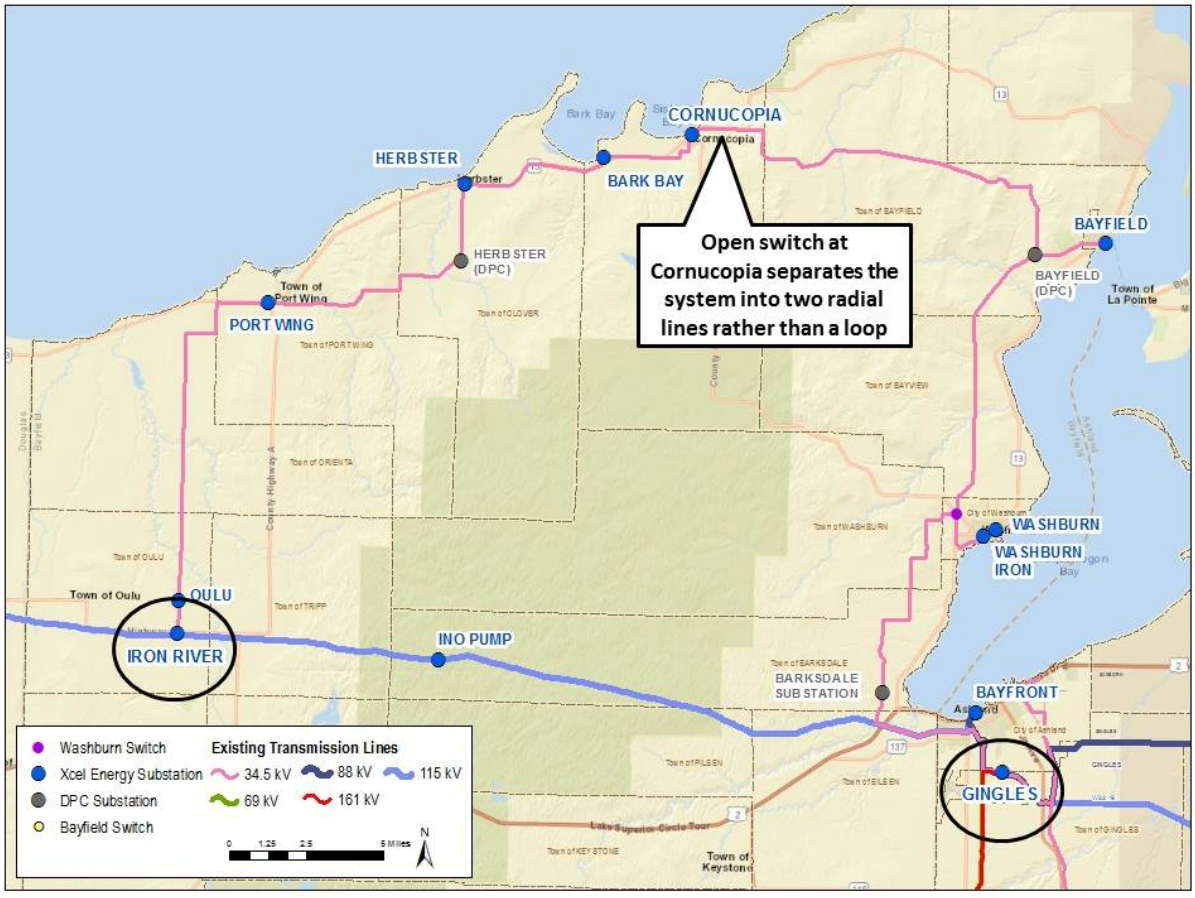
- A new approximately 19- or 26-mile 34.5 kV transmission line (depending on the route selected by the Commission).
- A new 115/34.5 kV transmission substation (Fish Creek Substation) located approximately 4 miles west of the City of Ashland on County Road G near Terwilliger Road on the existing 115 kV Stinson to Bayfront transmission line corridor.
- A new 34.5 kV transmission switching substation (Pikes Creek Substation) approximately 2 miles west of the City of Bayfield on Star Route Road just west of Hatchery Road.

The typical transmission structure will be single-pole wood or weathering steel with horizontal post insulators.

Purpose and Necessity

The Project is needed to improve electric reliability and to provide voltage support to communities on the Bayfield peninsula. The existing 71-mile 34.5 kV line on the Bayfield Peninsula was originally built between 1957 and 1971 and acquired by Xcel Energy in the mid-1980s. The line was built as a loop, connecting to the west side of the peninsula through Cornucopia, Herbster and Iron River. In the approximately 50 years since the line was originally built loads have increased on the peninsula, particularly at Bayfield and Washburn. The area is currently served by a single transmission line connecting two source substations, the Gingles Substation south of Ashland and the 115/34.5 kV Iron River Substation northwest of the Town of Iron River.

Figure ES-1 Existing Bayfield Peninsula Transmission System



Due to the higher electric loads on the east side of the peninsula at Washburn and Bayfield Xcel Energy has operated this system with a switch at Cornucopia normally kept open to prevent system collapse. This essentially separates the loop into two separate radial lines, one from Iron River to Cornucopia, and one from Gingles to Bayfield. There are no transmission loads between Cornucopia and Bayfield. This means that the east side of the peninsula is currently served only

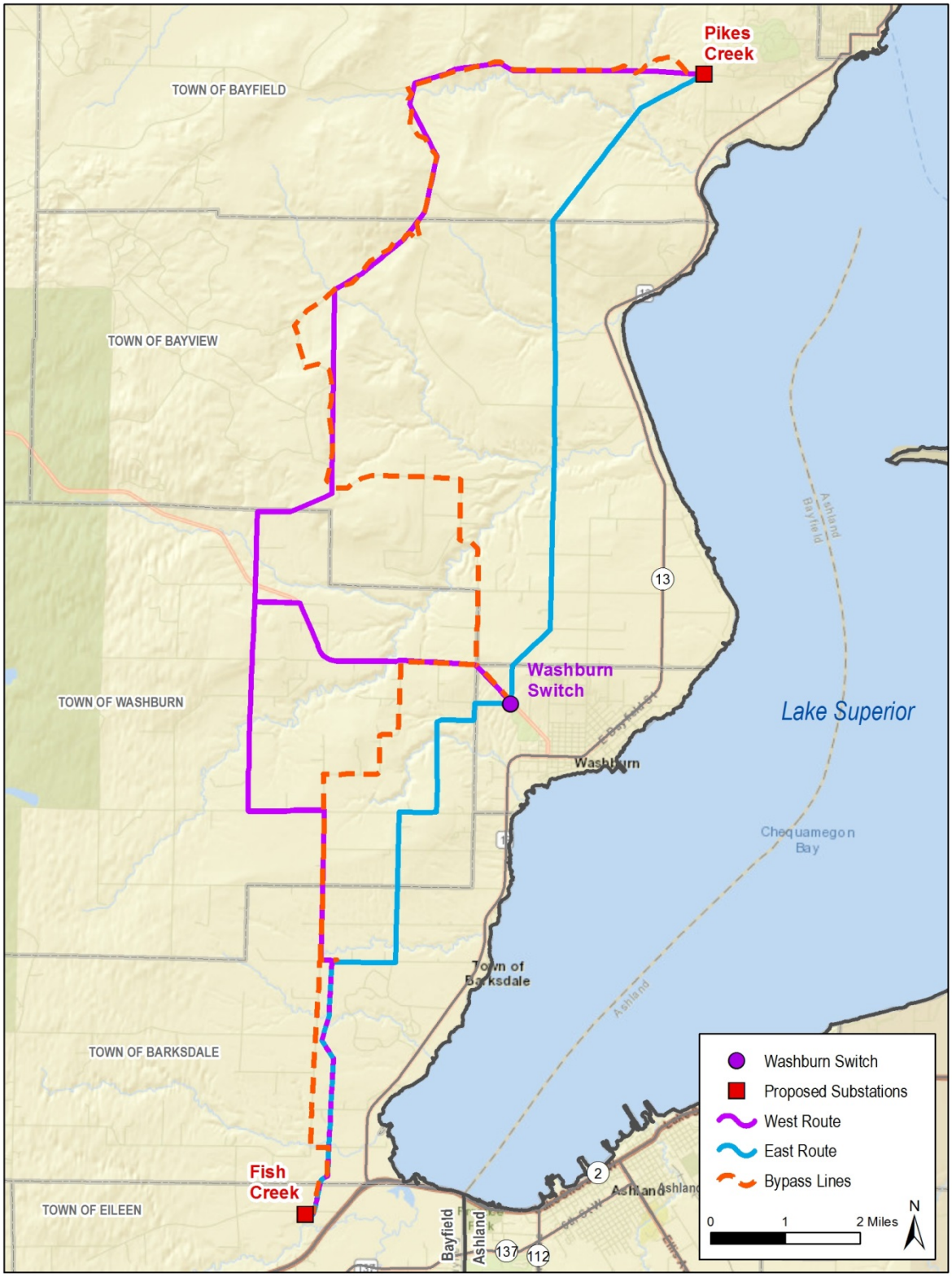
by the single 34.5 kV line from Gingles Substation, and, with no back up line, any failure on the line south of Bayfield or Washburn results in power outages to those communities. Similarly, transmission lines on the Bayfield Peninsula cannot be taken out of service for line maintenance without causing power outages. The load growth over time has also resulted in low voltages at Bayfield during peak load conditions. As voltage levels decrease, the risk of damaging electrical components rises and the flexibility of the grid to meet end user required voltage levels decreases. In addition, some parts of the line on the west side of the peninsula are in poor condition and need of being rebuilt. Xcel Energy is currently rebuilding the segment between Cornucopia and Bayfield Switch which does not serve load because the Cornucopia switch is operated in a normally open condition. Until the Project is constructed, rebuilding the remaining segments of the 34.5 kV line would require prolonged outages to residents because they actively serve load on the west side of the peninsula and there is no back up transmission line. Once the Project is complete, Xcel Energy will be able to rebuild these segments without the need to take prolonged outages.

The Xcel Energy's detailed need analyses are contained in Section 2 and Appendix D.

Proposed Routes

Xcel Energy has developed two route options for the proposed Project, both of which begin at the Fish Creek Substation west of Ashland and terminate at the Pikes Creek Substation west of Bayfield. Detailed maps are included in Appendix A. Constructing the Project on either route will address the reliability Project needs. However, the routes have different configurations, lengths of existing infrastructure corridors that are followed and construction requirements. In addition, the routes differ in the future risk of both 34.5 kV lines being taken out of service by a single weather event.

Figure ES-2 Proposed Route Options



The West Route includes a 21.9-mile 34.5 kV transmission line connecting the proposed Fish Creek Substation and proposed Pikes Creek Substation. The West Route also requires a 4.1-mile 34.5 kV tie line from the West Route to the Washburn Switch. The total length of new transmission line is 26 miles. The first 3.5 miles of the West Route will be double-circuited with the existing 34.5 kV transmission line and therefore that section will require a temporary bypass line during construction. The remaining 22.5 miles of the West Route would be single-circuit along a new transmission utility right-of-way primarily following existing roads and/or distribution lines.

The East Route is an 18.9-mile 34.5 kV transmission line connecting the proposed Fish Creek Substation and proposed Pikes Creek Substation. The East Route will be double-circuited with Xcel Energy's existing 34.5 kV transmission line, almost entirely within existing easements. The tie line connecting the new line with the existing line would be only one span length, rather than the longer tie line needed for the West Route. Because the line will be double-circuited for its entire length, it will be necessary to construct a temporary bypass line between the Bayfield and Gingles Substations to provide power to Washburn and Bayfield during construction of the Project along the East Route. The 26-mile temporary bypass line would follow roads for its entire length. The bypass line would be removed after construction of the Project is complete.

The 4-mile segment between the Fish Creek Substation and Nolander Road is shared by both the East and West Routes. At the north end of this segment the East and West Routes diverge. More detail about each route and the route segments is included in Section 5.3. Table E-1 below shows the length of each line by configuration type (single-circuit and double-circuit) for each proposed route as well as the length of temporary bypass line that will be necessary for construction.

Table ES-1 Length of Route by Configuration and Line Type

	West Route	**East Route**
Permanent Line:		
Double-circuit line	3.5 miles	18 miles
Single-circuit line	22.5 miles	0 miles
Permanent Line Subtotal	**26 miles**	**18 miles**
Temporary Bypass Line:		
Temporary Line needed	**4 miles**	**26 miles**
Total Miles of Transmission Line:		
Permanent + Temporary	**30 miles**	**44 miles**

Route Development

The two new proposed substations constitute the end points for the proposed route alternatives. In identifying the two substations proposed in this Application, Xcel Energy reviewed properties in the vicinity of each of the proposed new substations and assessed them based on engineering and constructability constraints and line routing considerations. Xcel Energy land agents then reached out to owners of the preferred properties for each substation and were able to identify willing sellers for properties that met the needs for both substations.

During initial route development, Xcel Energy looked at multiple options for the new transmission line. Potential routes were evaluated based on overall impacts, then refined to better reflect existing terrain and infrastructure features. Xcel Energy considered the routing criteria in Wis. Stat. § 1.12(6) during the development of the route alternatives. The statute provides that in routing new transmission lines, "it is the policy of this state that, to the greatest extent feasible that is consistent with economic and engineering considerations, reliability of the electric system, and protection of the environment," the following corridors should be utilized: existing utility corridor, followed by highways and railroad corridors, then recreational trails and lastly, new corridors. The proposed West Route and East Route both substantially follow existing roads and utility corridors (distribution and/or transmission). Both the East and West Routes also cross Bayfield County land for which an easement will be required.

The West Route follows existing roads and distribution lines for a majority of its length and, with the exception of the segment between the Fish Creek substation and Nolander Road (which is the same for both East and West Routes), would be a single-circuit line on new poles in a new corridor, providing additional reliability by separating the two circuits physically as well as geographically. As a result, it is unlikely that a single weather event would take both lines out of service. More detail about the West Route is included in Section 5.3.8. Figure 4 in Appendix A shows the segments identified for both of the proposed routes.

The East Route follows a high priority corridor—the existing transmission line—for its entire length. The East Route presents engineering and constructability challenges because the existing line is the only source of power to the east side of the Bayfield Peninsula and must be kept in service during construction of the new second circuit. The existing line also has several segments that are located away from any roads and cross challenging terrain. Xcel Energy evaluated options for construction of the second circuit parallel to the existing transmission line, double-circuited with the existing line, and a hybrid of both configurations. Both the parallel and offset double-circuited lines posed a variety of challenges related to safety, reliability, engineering, and construction access and setup, and would have required additional right-of-way. More detail about these concerns is included in Section 5.1.3 and Appendix I. Ultimately the Project team determined that the most viable way to construct the East Route and maintain safe reliable power during construction would be to build a temporary transmission line, also called a temporary bypass line, separated from the existing line, which would be used to provide power to the area during construction. This would allow the existing line to be de-energized and moved

out of the way before constructing the new double-circuit line. If the East Route were selected, the new line and the existing line would be on a single set of poles, which would mean that it is more likely that a single weather event could take both lines out of service. More detail about the East Route is included in Section 5.3.7.

The Applicant appreciates that CAs typically present a single route for the Commission's consideration. In this unique circumstance, however, the Applicant requests the Commission make a routing decision because it requires the weighing and balancing of multiple policy interests.

As compared to the West Route, a greater length of the East Route follows a higher priority corridor under the state's routing priorities but at a comparatively higher cost, greater temporary impact due to the extent of bypass lines required, and a comparatively greater reliability risk because both 34.5 kV lines that serve the peninsula will be on common towers for the entire length of the line.

As compared to the East Route, the West Route costs less and has less reliability risk because both 34.5 kV transmission lines serving the peninsula will be in different corridors with the exception of a 4-mile segment. The West Route would have a comparatively higher permanent impact because it follows a lower priority corridor thus requiring more new right of way from previously unimpacted landowners.

The Applicant does not have a preference for either route and believes both are permittable and constructible.

Project Cost

The estimated total Project cost if the West Route is selected is approximately $27 million. For the East Route, the estimated total Project cost is $34 million. The estimates are based on a projected 2021 in-service year. Cost estimates include construction of the two substations and bypass lines associated with each route alternative. Project costs are provided in more detail in Section 4.

Regulatory Approvals

In addition to the CA and the Utility Permit, the Project will require approvals and permits from federal and state agencies and units of government. A list of these permits is contained in Section 1.6.

Construction Schedule

Xcel Energy anticipates beginning construction on the transmission line and substations in the 2nd Quarter of 2020. Construction of the substations is expected to take 12 to 15 months and construction of the line approximately 12 to 18 months, depending on the route selected.

Conclusion

As stated above, because of the important policy choices that must be weighted to make a routing decision for this Project, the Applicant requests that the PSCW select the final route.

The requested CA for the Project is a Type III action because the proposal is less than 100 kV (PSCW 4.10(3), Table 3). A Type III action is one that normally does not have the potential to significantly affect the quality of the human environment within the meaning of s. 1.11 (2)(c) and do not normally require an Environmental Assessment or Environmental Impact Statement (PSCW 4.10(3)). Xcel Energy is requesting that the PSCW issue a Notice of Proceeding for this particular project and provide members of the public an opportunity to offer their opinion on the project in person at a public hearing in the project area.

Based on the material included and referenced in this Application and any subsequent material requested by the PSCW or WDNR related to this Application, Xcel Energy requests that the PSCW issue a CA and any other approvals necessary, authorizing the construction of the Project and associated facilities along one of the proposed routes. Xcel Energy also requests that WDNR issue all the permits and authorizations that may be required to construct the transmission facilities in the manner described in this Application within 30 days after PSCW issues its written order on the CA Application.

APPLICATION FOR PSCW CERTIFICATE OF AUTHORITY

This Application has been prepared in accordance with the Public Service Commission of Wisconsin (PSCW or Commission) and Wisconsin Department of Natural Resources (WDNR) *Application Filing Requirements for Transmission Line Projects in Wisconsin*, Version October 2017 (Transmission Application Filing Requirements) and *Application Filing Requirements for Substation Projects*, Version October 2017 (Substation Application Filing Requirement).

1.0 PROJECT OVERVIEW

1.1 Owners and investors of the proposed project including their names, addresses, and percent of ownership (Wis. Admin. Code § PSC 111.55(6)).

Northern States Power Company, a Wisconsin corporation
1414 West Hamilton Avenue, PO Box 8, Eau Claire, Wisconsin 54702

Northern States Power Company, a Wisconsin corporation (Xcel Energy or Applicant) is a Wisconsin corporation and a vertically integrated public utility that provides electric generation, transmission, and distribution services in Wisconsin (including the Bayfield area). The Applicant is obligated to provide adequate and reliable energy service that meets the needs of its customers. The facilities proposed for construction will be owned by Xcel Energy. Once constructed, Xcel Energy will perform the day-to-day operation of the facilities.

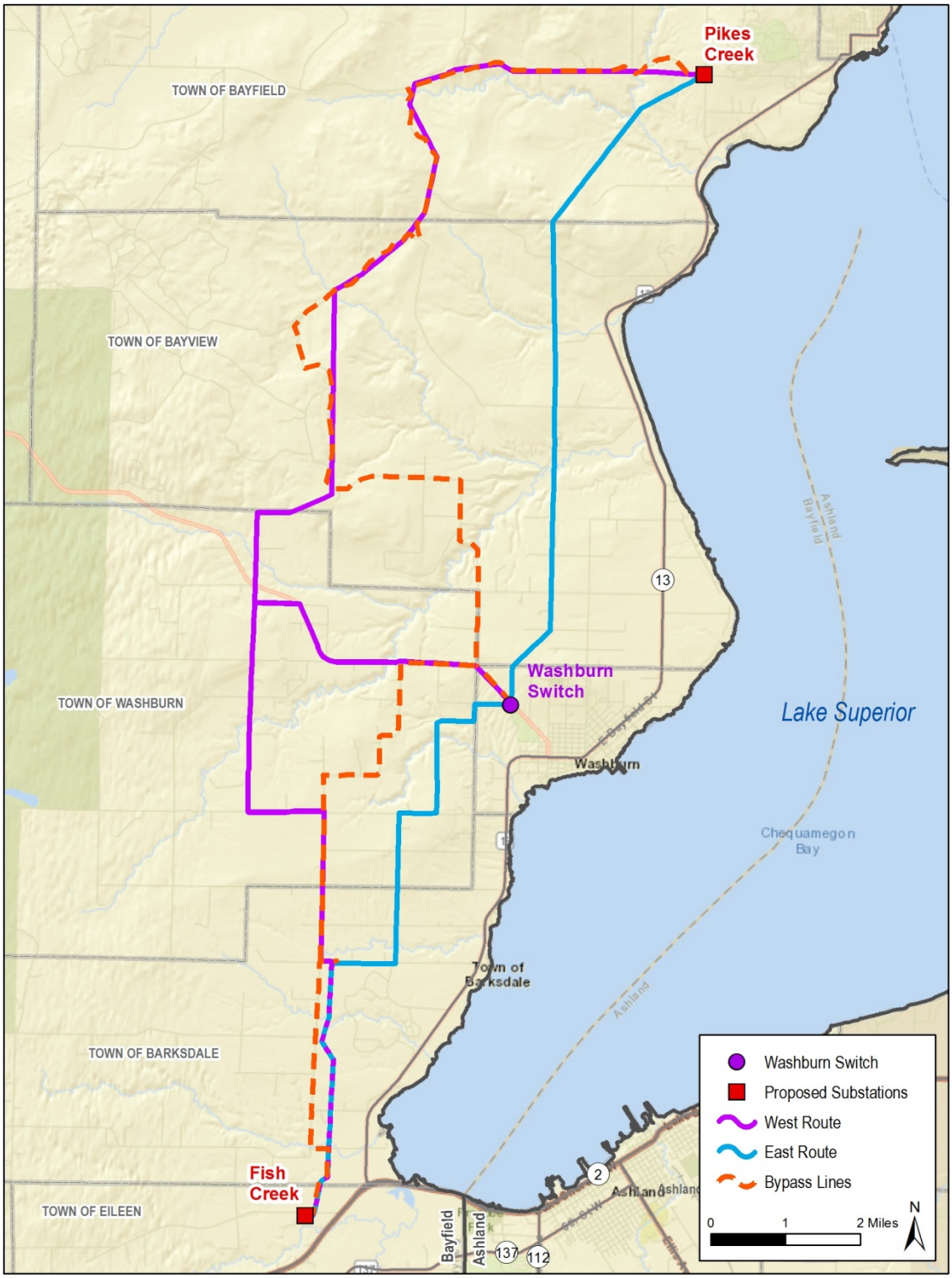
1.2 Contractual agreements between developer and utilities to construct, finance, lease, use or own transmission facilities.

Xcel Energy has not entered into any contracts with any developer to construct, finance, lease, use, or own transmission facilities.

1.3 Proposed project and its end points.

The project proposed in this Application is a new 34.5 kV transmission line in Bayfield County, Wisconsin which would extend from a new Fish Creek Substation approximately four miles west of the City of Ashland to a new Pikes Creek Substation approximately two miles west of the City of Bayfield. The proposal is referred to as the Bayfield Second Circuit Transmission Line Project (Project). The Project includes a connection to the Washburn Switch. The West Route includes a 4.1-mile segment to connect the 34.5 kV line to the Washburn Switch. The East Route connects to the Washburn Switch along the route.

Figure 1.3-1 Bayfield Second Circuit Transmission Project Overview



Throughout this document there are multiple references to the Washburn Switch. This is a three-way switch pole that connects the existing 34.5 kV transmission line that runs from Gingles to Bayfield with a line referred to as the Washburn Tap. This 34.5 kV radial line provides power to the City of Washburn. The connection from the new transmission line to the existing line at a point adjacent to the Washburn Switch allows the new second circuit to serve Washburn in the event of an outage on the existing line between Gingles and Washburn. A lengthy 34.5 kV tie line is not needed as part of the East Route to effect this connection because the new and existing lines are adjacent to each other. More detail is provided in Section 2.1.

Figure 1.3-2 Location of 3-way switch connecting existing line to the City of Washburn

1.4 List of all cities, villages, and townships and their respective counties that the proposed project, any associated facilities, and any potential construction activities would cross or potentially impact

The proposed Project routes and substations are located entirely within Bayfield County, WI. The cities and towns crossed or potentially impacted include:

- City of Bayfield
- City of Washburn
- Town of Barksdale
- Town of Bayfield
- Town of Bayview
- Town of Eileen
- Town of Washburn

1.5 PSCW

Through this Application and pursuant to Wis. Stat. §§ 30.025, Xcel Energy hereby applies to the WDNR for a Utility Permit covering the permits and authorizations necessary to construct the proposed Project. Due to the amount of public interest in this Project, Xcel Energy requests that the Commission issue a Notice of Proceeding for this particular project and provide members of the public an opportunity to offer their opinion on the project in person at a public hearing in the project area during the PSCW review process.

Through the pre-application process required by Wisconsin law, the Applicant conferred with the PSCW and WDNR to assess the Project's scope and persons potentially interested in this Project. Xcel Energy has also been made aware of the information that it is required to submit as part of this Application and the timing for submitting the information.

The Project is not contingent upon or part of a project under another docket number. Xcel Energy is not seeking an expedited review for the Project under Wis. Stat. § 196.491(3b)(a).

1.5.1 State if the application is for a Certificate of Authority (CA) or a Certificate of Public Convenience and Necessity (CPCN) under Wis. Stat. §§ 196.49 and 196.491.

The application is for a CA together with any other authorizations needed to construct the proposed Project.

1.5.2 Identify the expected type of Commission action under Wis. Admin Code § PSC 4.10.

The Project is categorized as a Type III action pursuant to Wis. Admin. Code § PSC 4.10(3)

1.5.3 State if the project qualifies for the CPCN exemption under Wis. Stat.§ 196.491(4)(c)1m.

The Project does not qualify for the CPCN exemption under Wis. Stat. § 196.491(4)(c)1m because it does not meet the threshold for a CPCN.

1.5.4 State if the applicant is seeking an expedited review for the project under Wis. Stat. § 196.491(3b)(a).This application is for a Certificate of Authority under Wis. Stat. §§ 196.49 and 196.491.

The Applicant is not seeking an expedited review for the Project under Wis. Stat. § 196.491(3b)(a).

1.6 Project Details and Project Area Information

1.6.1 Location of Routes and Associated Facilities

Xcel Energy proposes constructing and placing in operation the following facilities:

- A new 19- or 26-mile 34.5 kV transmission line (depending on the route selected by the Commission).

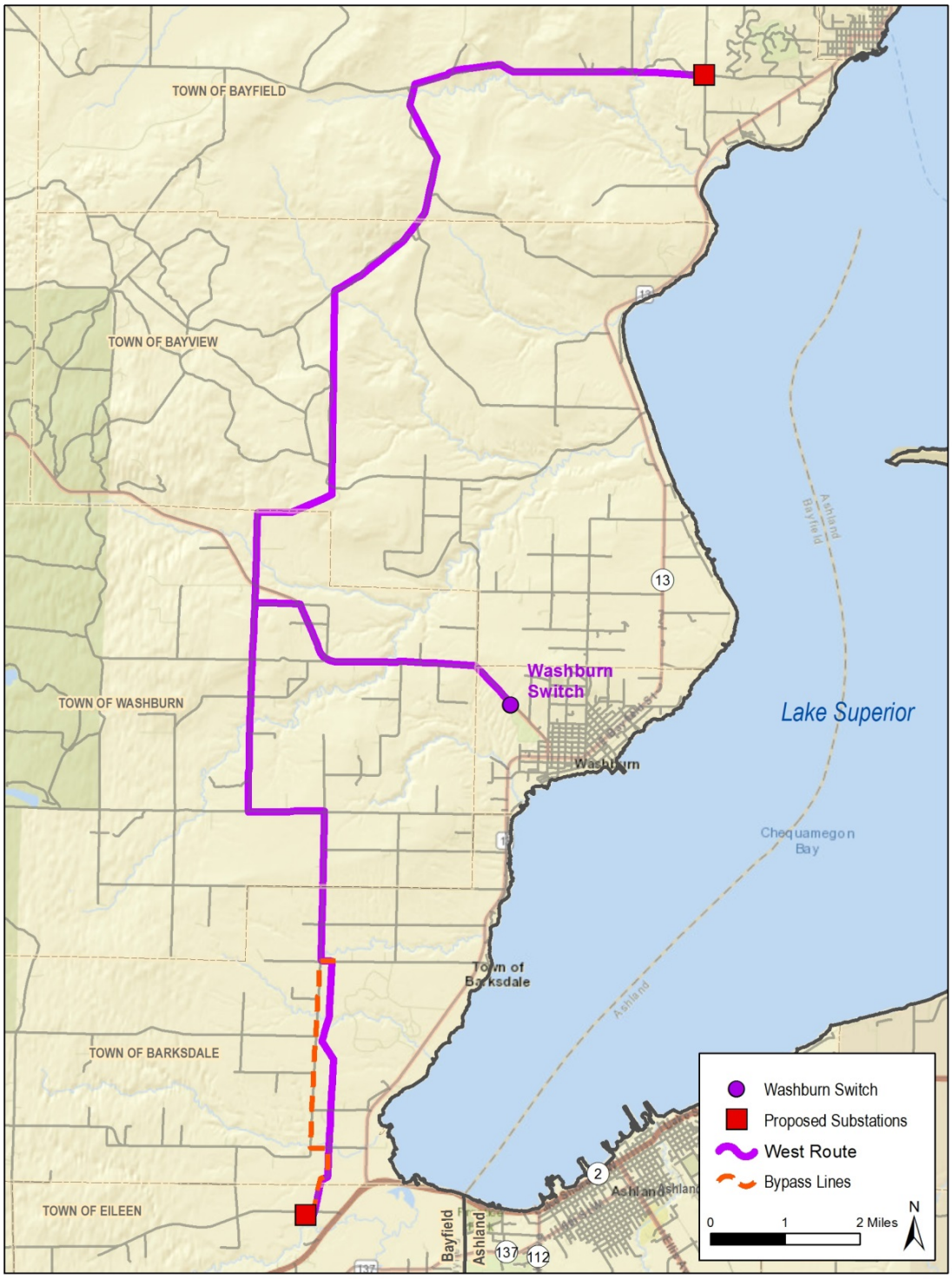
- A new 115/34.5 kV transmission substation (Fish Creek Substation) located approximately 4 miles west of the City of Ashland, WI on County Road G near Terwilliger Road on the existing 115 kV Stinson to Bayfront transmission line.

- A new 34.5 kV transmission switching substation (Pikes Creek Substation) approximately 2 miles west of the City of Bayfield on Star Route Road just west of Hatchery Road.

Xcel Energy developed two potential routes for the proposed Project, both of which begin at the proposed Fish Creek Substation, tie into a radial 34.5 kV tap line that powers the City of Washburn (at the Washburn Switch), and terminate at the proposed Pikes Creek Substation. The two routes, shown in Figure 1.6 below (and in more detail in Appendix A, Figures 1, 4-8), are generally described below:

- The West Route is approximately 26 miles in total length. It includes a 22-mile 34.5 kV line between the Fish Creek and Pikes Creek substations and a 4.1-mile 34.5 kV tie line connecting the West Route to the existing line by the Washburn Switch. The first 3.5 miles of the West Route on the south end would be double circuited with existing transmission. To maintain electric service during construction a 3.5-mile temporary bypass would be needed. More detail about the West Route is included in Section 5.3.7.1.

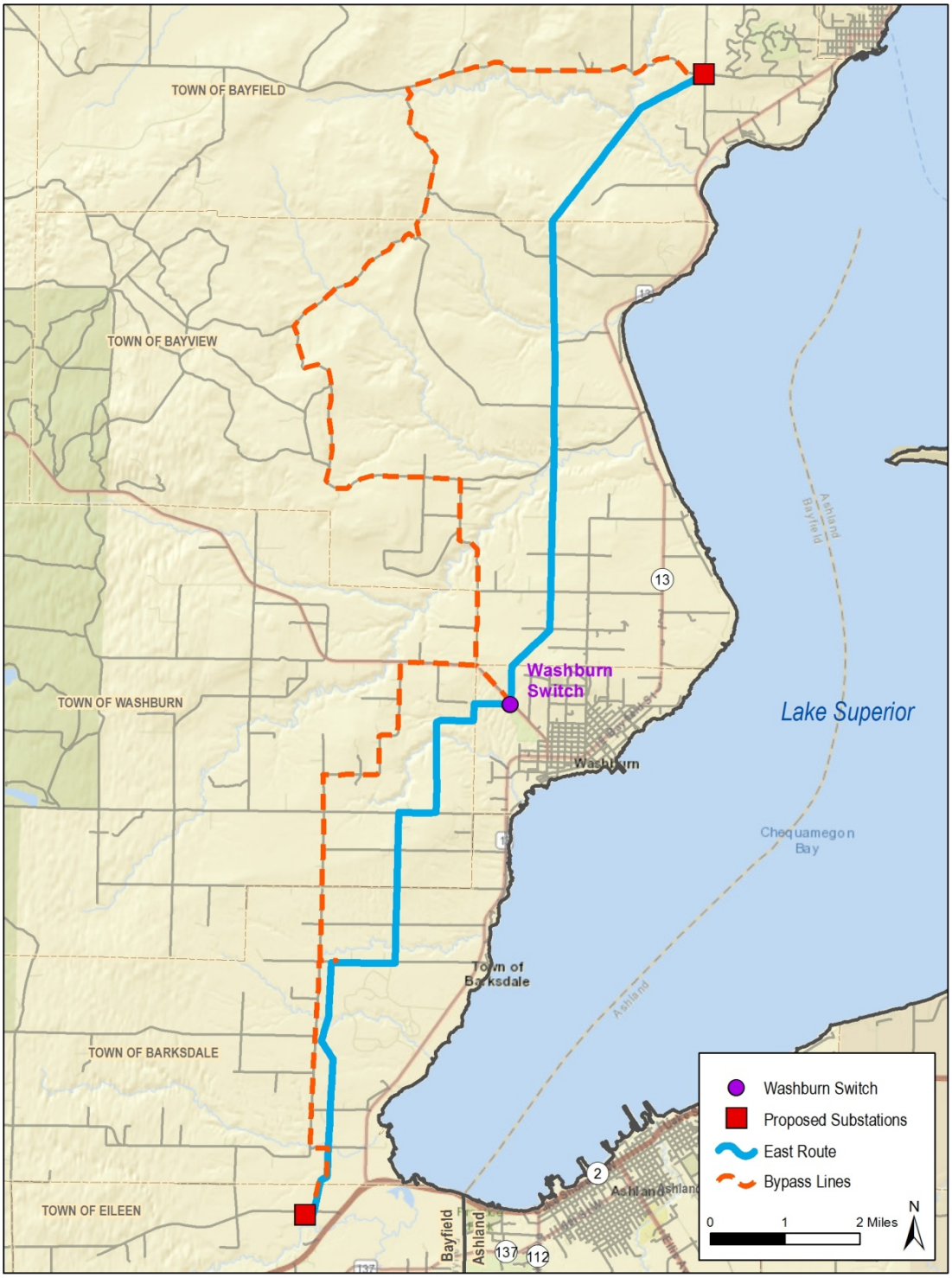
Figure 1.6-1 Proposed West Route



- The East Route is approximately 19 miles in length and would be double-circuited with the existing transmission 34.5 kV transmission line. To maintain electric service during

construction, a 26.4-mile temporary bypass line would be needed. More detail on the East Route is included in Section 5.3.7.2

Figure 1.6-2 Proposed East Route



1.6.2 Footprints of Associated Facilities

The proposed Fish Creek Substation will include an approximately 1.6-acre (70,500 square foot) gravel pad with a fenced-in area of approximately 1.5 acres with a total impacted area of approximately 5 acres of suitable land within a larger parcel. See Appendix C, Figure 1 for the location and size of the proposed substation.

The proposed Pikes Creek Substation will be located on an approximately 1-acre gravel pad with a fenced-in area approximately 0.75 acres in size with a total impacted area of approximately 3.25 acres on an approximately 10-acre parcel. See Appendix C, Figure 2 for the location and size of the proposed substation. More detail on substation design and engineering is provided in Section 5.5.2.

Details on the footprints associated with the transmission line are provided in Sections 1.6.7 Proposed Right-of-Way, and 5.5.2 Construction Impacts.

1.6.3 Generalized Geology, Topography, Land Cover, and Land Use

Wisconsin has been divided into five natural geological regions, with three considered to be upland areas and two being lowland. The general boundaries of the areas were predominantly established based upon the type of the underlying bedrock. The Project is located within the Northern Highland and Lake Superior Lowland regions. The Northern Highland region is an upland area characterized by moderately large hills and valleys, while the Lake Superior Lowland region borders Lake Superior and does not extend more than 20 miles from the Lake Superior Shore.

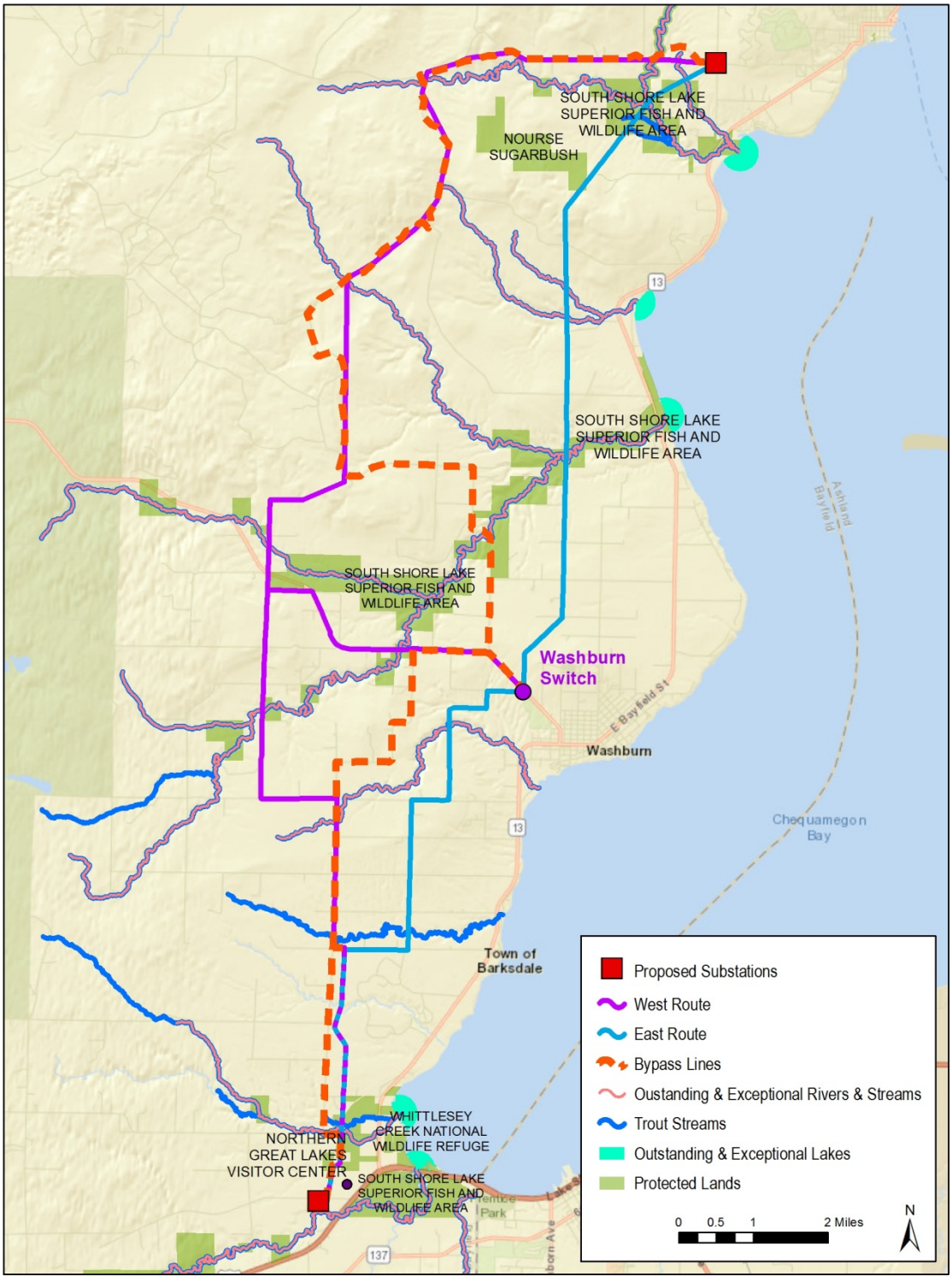
The topography of the Project vicinity is relatively flat in the south portion with elevations ranging from 630 to 680 feet above mean sea level but gets hillier as it moves to the north with elevations ranging from 800 to 1000 feet above mean sea level near the Pikes Creek Substation (Appendix A, Figure 5). Land cover in the Project area is predominantly forested, with agricultural lands interspersed amongst forested areas in the southern portion of the Project. Based on the Bayfield County Land Use Plan, private forest, federal lands (including Red Cliff Reservation), and county lands are the three predominant land uses in Bayfield County (Bayfield County, 2010) (public lands are displayed on Appendix A, Figure 8).

1.6.4 Special or Unique Natural or Cultural Resources

The following summarizes special or unique natural resources that the proposed routes cross. Most of these features are addressed in more detail in other sections of this Application such as Sections 5.4 (Impact Tables), 6.3 (Wetlands), 6.4 (Waterways), 7.7 (Parks and Recreation) and 8.0 (WDNR Wetland/Waterway Permitting). Additionally, archaeological and other culturally sensitive resources can be found throughout the Bayfield Peninsula; however, these areas are generally located along the Lake Superior shoreline. There are no known mapped culturally sensitive sites within any of the proposed Project rights-of-way or temporary access routes.

Natural and cultural resources are shown in maps in Appendix A, Figures 5, 5a and 5b - Environmental Data and Figure 8 - Public Land and Recreation.

Figure 1.6-3 Special or Unique Natural Resources



West Route

The West Route crosses several special or unique natural resources including:

- Whittlesey Creek National Wildlife Refuge (NWR) owned and managed by the U.S. Fish and Wildlife Service (USFWS) (for more information see Section 7.7);
- South Shore Lake Superior Fish and Wildlife Area, owned and managed by the WDNR;
- Several Outstanding Resource Waters (ORWs) and trout streams identified in Section 6.4 (Waterbodies/Waterways).

East Route

The East Route crosses several special or unique natural resources including:

- Whittlesey Creek NWR;
- South Shore Lake Superior Fish and Wildlife Area;
- Nourse Sugarbush State Natural Area, owned and managed by the WDNR; and
- Several ORW and trout streams, regulated by the WDNR and identified in Section 6.4.

More details regarding approvals needed for crossing WDNR and USFWS lands are included in Sections 1.6.7, 5.3 and 7.7.1.

1.6.5 Areas of Residential Concentrations and Urban Centers

Residential concentrations and urban centers near the Project area include the cities of Bayfield, Washburn and Ashland. The Project is outside of the municipal boundaries of Bayfield and Ashland and within the western limits of Washburn.

1.6.6 Transmission Configuration and

1.6.7 Proposed Right-of-Way (ROW)

West Route

The West Route is proposed as a 21.9-mile 34.5 kV overhead transmission line between the proposed Fish Creek Substation and proposed Pikes Creek Substation with an additional 4.1-mile tie line connecting the second circuit to the Washburn Switch. The first 3.5 miles (13.5% of the total route) of the West Route will be double circuited with the existing 34.5 kV transmission line (this segment is common to the East Route) and will not require any additional permanent right-of-way (ROW). This double-circuit segment will also require construction of a temporary bypass line during construction, for which temporary construction easements will be obtained.

The remaining 22.5 miles of the West Route would be single-circuit, though the majority would be co-located with or follow existing corridors. Approximately 43% of this route is co-located

with roads. In these areas 20 feet of the 50-foot-wide transmission ROW will overlap with the road ROW. That is, 30 feet of the ROW will be new and 20 feet will be shared with roads. Another approximately 15% of the route length would share ROW with existing Bayfield Electric distribution lines. The typical easement width of these distribution lines is 40 feet, so an additional 10 feet of width (for a total of 50 feet) will be needed for the new line in those locations and distribution lines will likely be buried (see Section 5.3.7.1). An additional 16% of the West Route generally follows forest roads, but because the forest roads in this area are very curvy, the proposed alignment does not always overlap with road ROW. The remaining 12% of route would be on new corridor, requiring new ROW.

The West Route will also cross parts of the WDNR South Shore Lake Superior Fish and Wildlife Area in multiple locations (see also Sections 1.6.4 and 7.7.1). All of these locations are adjacent to roads, but will require approximately 30 feet of new easement from the WDNR. Xcel Energy will work with the WDNR to determine what reviews and approvals may be required.

The West Route would use new wood or weathering steel single-pole structures and new conductor. During construction, a 3.5-mile bypass line would be needed to maintain service in the area. Temporary construction easements will be obtained for the bypass.

East Route

The proposed East Route is an 18.9-mile overhead double circuit 34.5 kV transmission line within the existing 100-foot-wide ROW of Xcel Energy's 34.5 kV transmission line number 3601 between the proposed Fish Creek Substation and the existing Washburn three-way switch (the Washburn Switch), and Xcel Energy's 34.5 kV transmission line number 3603 between the Washburn Switch and the proposed Pikes Creek Substation. While the East Route will be constructed almost entirely within the existing ROW, additional ROW width will need to be acquired to accommodate longer spans at crossings of the Onion River (approximately 1400 feet long by 150-foot-wide ROW) and Pikes Creek (approximately 1,300 feet by 125 feet). A segment on Bjork Road just north of Nolander Road will shift to the opposite side of the road for three spans and include approximately 700 feet of new ROW (new landowner). Another segment south of Hove Lane will be adjusted to avoid challenging terrain, and will require modification of the existing ROW on the same parcel, and will reduce the total line length by approximately 100 feet. The East Route crosses WDNR and USFWS lands within existing easements and U.S. Forest Service (USFS) land according to terms of a Special Use Permit. Xcel Energy has had preliminary conversations regarding these crossings and will continue to work with each agency to determine what reviews and approvals will be needed in these locations (see Sections 1.6.4 and 7.7.1).

To maintain electric service during construction of the East Route an approximately 26-mile-long temporary bypass line will need to be constructed, which would be utilized throughout construction of the East Route. This temporary bypass line would be single-circuit construction and require an approximately 20-foot-wide corridor partially within and adjacent to the roadways it parallels. Xcel Energy would obtain a utility permit from the appropriate road

authorities for placement of the temporary line within road ROW, and acquire temporary easements, as needed, on private land adjacent to roadways where tree clearing would be required. The temporary bypass line may also cross WDNR lands adjacent to road rights-of-way, and Xcel Energy will work with the WDNR to determine what reviews and approvals may be required. The East Route would be constructed on new poles (single-pole wood or weathering steel) with new conductor. Existing conductor may be reused for one of the two circuits if possible.

A summary comparison of the configuration and ROW for the West and East Routes is included in Table 1.6-1. Routes and route segments are described in more detail in Section 5.3.

Table 1.6-1 Proposed Transmission Line Configuration and Right-of-Way

	West Route	East Route
Permanent Line:		
Double-circuit length	3.5 miles	18 miles
Double-circuit configuration	Single-pole structures opposite horizontal post insulators; shield wire on top	Single-pole structures opposite horizontal post insulators; shield wire on top
Single-circuit length	22.5 miles	0 miles
Single-circuit configuration	Single-pole structures alternating horizontal post insulators; shield wire on top	NA
Temporary Bypass Line:		
Length	4 miles	26 miles
Configuration	Single-pole structures insulators optimized to reduce impacts; no shield wire	Single-pole structures insulators optimized to reduce impacts; no shield wire
Right of way:		
Permanent line ROW width	Typically 50-foot ROW 25 feet to each side of centerline	Typically 100-foot ROW 50 feet to each side of centerline
Shared ROW road	Approximately 20 feet of road ROW, 30 feet new	Varies based on distance of existing transmission line from road
Shared ROW distribution	Typically 40-foot distribution ROW, expands to 50 foot total width	NA
Temporary line width	10-20 feet of temporary clearing	10-20 feet of temporary clearing

1.7 Other Agency Correspondence/Permits/Approvals

1.7.1 Agency Correspondence

Copies of Xcel Energy's correspondence with governmental agencies concerning the Project are included in Appendix F. Xcel Energy mailed letters to federal, state, county, and local government agencies on October 29, 2018 requesting comments on the proposed Project. Details on Xcel Energy's community outreach, including coordination with Bayfield County and local agencies is discussed in Section 7.1.

1.7.2 State and Federal Permits/Approvals Required

All state and federal permits and approvals required for this Project and their status are listed in Table 1.7-1 below or in Section 8.0. WDNR permits and approvals are discussed in Section 8.0.

Table 1.7-1 State and Federal Permits and Approvals

Agency	Activity	Permit Type	Status
FEDERAL AGENCIES			
U.S. Army Corps of Engineers (USACE)	Impacts on Waters of the US	Section 404 of Clean Water Act (CWA)	Applicant will apply for the permit on the ordered route.
	Archaeological Review	Section 106 National Historic Preservation Act	A Cultural Resources assessment has been prepared as part of this Application. Applicant will submit information to USACE once a route has been ordered.
U.S. Fish and Wildlife Service (USFWS)	Federally listed rare species review and activities near eagle nests	Endangered Species Act; Bald and Golden Eagle Protection Act	Applicant has conducted a review of rare species and eagle nests in the Project area and will continue to coordinate with the agency as applicable.
	Construction across Whittlesey Creek National Wildlife Refuge	Special Use Permit	Applicant has been working with USFWS staff to discuss the Project, the need and location for a temporary bypass line and to review existing easements. Will apply for SUP once CA application is submitted.
U.S. Forest Service (USFS)	Construction across USFS property west of Northern Great Lakes Visitor Center	Special Use Permit	Applicant will work with the USFS to determine if an update to the existing Special Use Permit is needed for the Project.

Table 1.7-1 State and Federal Permits and Approvals			
Agency	**Activity**	**Permit Type**	**Status**
STATE AGENCIES			
Department of Agriculture, Trade and Consumer Protection (DATCP)	Potential use of eminent domain on more than 5 acres of any farm operation	Agricultural Impact Statement (AIS)	Based on a response from DATCP on November 8, 2018, the agency confirmed an AIS will not be required for the Project because it is less than 100 kV
Wisconsin Department of Transportation (WisDOT)	Oversize Loads or Excessive Weights on Highways	Wis. Stat. ch. 348 Vehicles – Size, Weight and Load; Wis. Stat. §348.25 – Vehicle Weight and or Load Permit	Applicant has not determined if these permits will be needed. Applicant will work with the WisDOT to determine if any are necessary
Wisconsin Historical Society (WHS)	Site Preparation and Grading	Approval of Archaeological Surveys (Wis. Stat. § 44.40 and Section 106 of National Historic Preservation Act	A cultural resources assessment has been prepared for this Application.
Wisconsin Department of Natural Resources (WDNR)	See Section 8.0	See Section 8.0	See Section 8.0.

1.7.3 Local Permits

1.7.3.1 For CA applications, provide a list of all local permits and/or ordinances that apply to the proposed project and the status of those permits.

The Project will require a Conditional Use Permit and driveway permits from Bayfield County for the proposed substations. Portions of the West and East Routes which are located on Bayfield County Forest land may require an easement. The temporary bypass line may also require a permit from Bayfield County Forestry and Parks Department. Xcel Energy will continue to coordinate with Bayfield County and acquire local permits after the route and substations are ordered by the Commission.

Permits will be obtained to construct, operate and maintain the facilities along County or Township Roads as required by road authority. These permits will be used for permanent and temporary installations.

1.7.3.2 For CPCN applications and applications filed under the Wis. Stat. § 196.491(4)(c)1m exemption, provide a list of local permits and/or ordinances that would apply to the proposed construction activities, if the exemption did not apply.

This Project does not require a CPCN and as such does not qualify for any exemptions under Wis. Stat. §§ 196.491(4)(c)1m.

1.7.4 Railroad ROWs

Neither the West Route nor East Route cross or share railroad ROW.

1.7.5 Pipeline ROWs

There are no pipeline ROWs crossed by the West Route.

The East Route crosses an existing Northern Natural Gas transmission pipeline ROW north of the Washburn Switch. This pipeline also crosses beneath the existing tap line that runs from the Washburn Switch to the City of Washburn. These crossings are in locations where Xcel Energy has easements for the existing electric transmission lines. The bypass line associated with the East Route would also cross this pipeline in multiple locations around the Washburn Switch during construction. Xcel Energy has contacted Northern Natural Gas to notify them about the potential for a second line to cross the pipeline if the East Route is selected, and will continue to work with the company to determine any potential impacts to the pipeline or to existing easements.

1.7.6 Wisconsin Department of Transportation (WisDOT) ROWs:

Neither the West nor East Route cross or share a WisDOT ROW. The routes parallel several county highways and local roads.

1.8 Construction Schedule

1.8.1 Provide the anticipated general construction schedule, identifying any potential seasonal or regulatory construction constraints.

Project construction is expected to begin in the 2nd Quarter of 2020 and be in-service by the 4th Quarter of 2021, pending agency permits and authorizations. Xcel Energy expects construction of the new substations to last approximately 12 to 15 months. The estimated construction duration of the new transmission line is approximately 12 to 18 months. Due to the more complex nature of the East Route construction sequence, that alternative is expected to take approximately two months longer than construction of the West Route.

Xcel Energy has not identified any regulatory constraints to the construction schedule at this time other than road restrictions during spring break-up. Due to the hilly terrain in the project area, and the large amount of snowfall during typical winters, there may be times when conditions on

the ROW, particularly locations not adjacent to roads, are not accessible to construction equipment, and it may be necessary to adjust the schedule to accommodate these conditions.

Xcel Energy anticipates constructing the Project according to the following schedule:

Table 1.8-1 Construction Schedule

Project Activity	Preliminary Date
PSCW CA and WDNR Utility Permit Application Submittal	Q1 2019
PSCW CA Approval - Anticipated	Q4 2019
WDNR Utility Permit Issuance - Anticipated	Q1 2020
Start Transmission Line Construction	2020-2021
Project In-Service	2021

1.8.2 Generally discuss any generation or transmission outage constraints that may have to be accommodated.

Due to the radial nature of the existing lines no outages are available for construction of this Project. To accommodate construction of the Project, temporary bypass lines are included in both of the proposed options.

1.9 Project Maps

Consistent with the Application Filing Requirements and consultation with state agencies, a set of Project maps is provided in Appendix A, Figures 1 through 8.

Map figures included:

Figure 1 – Project Location

Figure 2 – Existing Transmission System

Figure 3 – Routes Considered

Figure 4 – Project Related Data

Figure 5 – Environmental Data

Figure 6 – Land Use

Figure 7 – Zoning

Figure 8 – Public Lands and Recreation Areas

The maps showing the proposed routes and other Project data are provided on aerial photographs and include Environmental, Parcel, Land Use and Existing Utility/Infrastructure data. The maps in Appendix A also contain environmental information required to support WDNR

permitting activities. Xcel Energy is providing separately to the Commission, in electronic format, Geographic Information System (GIS) data files supporting the mapping.

1.10 ESRI ArcGIS Data Files

All Project maps were created using ESRI ArcGIS 10.5. Xcel Energy will also provide the Commission a spreadsheet listing all GIS data sources, a description of the data, and the date the data was generated or collected.

1.11 Mailing Lists

Mailing lists of all affected private and public landowners located within 300 feet of the Project's proposed transmission centerline (both West and East Routes) and associated facilities, including properties on both sides of a roadway regardless of distance, are provided in electronic format as Microsoft Excel spreadsheets. The data includes all of the required information listed in AFR Sections 1.11.1 through 1.11.4

The landowner list provided in based on publicly available tax roll and spatial data recently acquired from Bayfield County's GIS data portal for the preparation of this Application (September 2018). Over the life of a project, owners may change. Xcel Energy has made its best efforts, however, to use the most accurate information available. This includes some updates to the list after receiving updated information from affected landowners (change of address, additional owner, etc.).

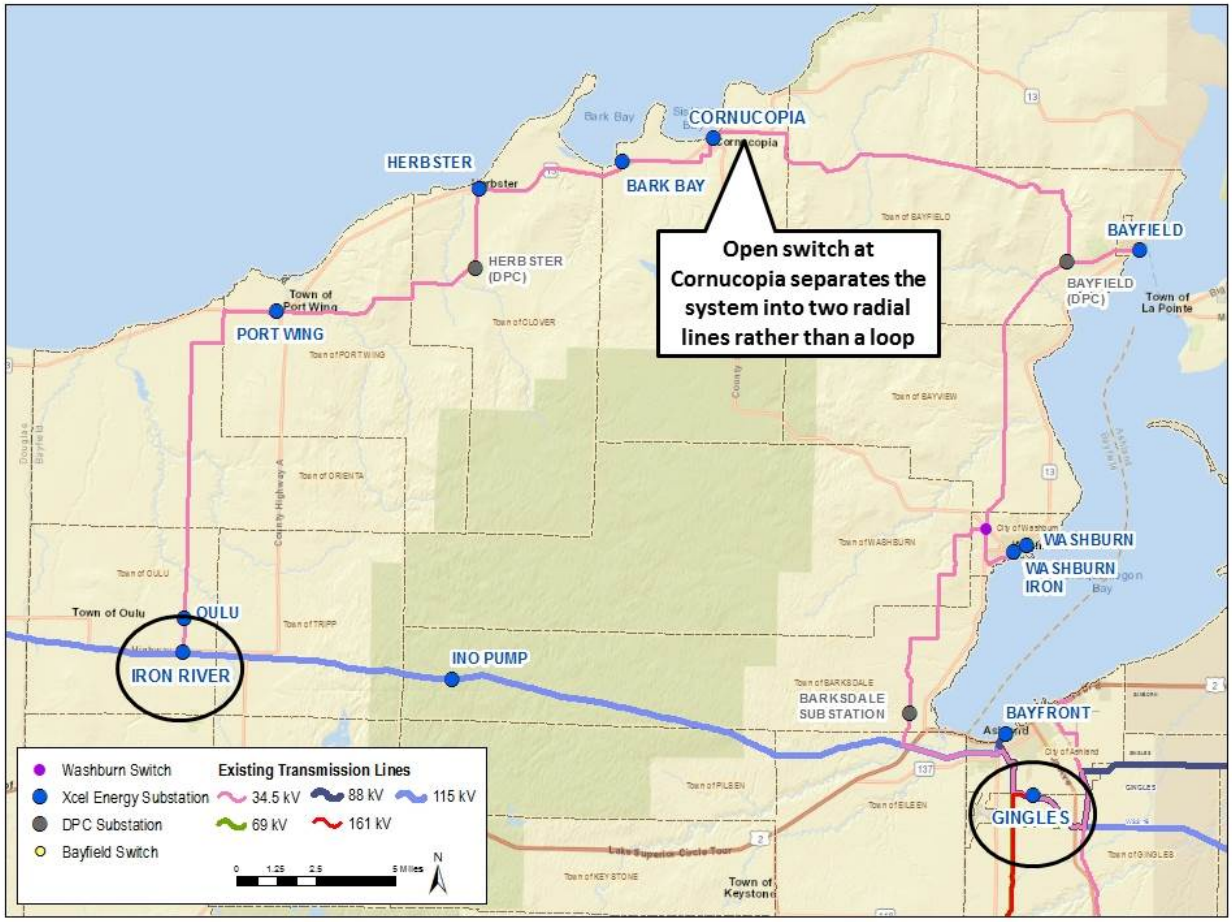
This application will be mailed to three libraries in the Project vicinity, including the Bayfield Carnegie Library in Bayfield, the Washburn Public Library, and the Vaughn Library in Ashland. The addresses for these libraries are included in Appendix G.

2.0 PROJECT NEED AND ENGINEERING

2.1 Project Need

Xcel Energy is the transmission provider to the entire Bayfield Peninsula and Xcel Energy is the distribution provider for 75% of customers on the peninsula, with the remaining customers served by Bayfield Electric Cooperative. The Project is needed to improve electric reliability and provide voltage support to communities on the Bayfield peninsula. Currently electricity is provided to communities on the east side of the Bayfield Peninsula via a single existing 34.5 kV transmission line that was built between 1957 and 1971. The existing 71-mile 34.5 kV line runs between the Gingles Substation south of Ashland and the Iron River Substation, north of Iron River, Wisconsin. In the approximately 50 years since the line was originally built, loads have increased on the peninsula, particularly at Bayfield and Washburn. The area is served by a single transmission line connecting two source substations, Gingles and Iron River. Due to the higher electric loads on the east side of the peninsula, at Washburn and Bayfield, Xcel Energy has operated this system with a switch at Cornucopia normally kept open. This essentially separates the loop into two separate radial lines, one from Iron River to Cornucopia, and one from Gingles to Bayfield (Figure 2.1). The east side of the peninsula is currently served only by this line from the Gingles Substation, and with no back up line, any failure on the line south of Bayfield or Washburn results in power outages to those communities. There are no transmission loads between Cornucopia and Bayfield. The load growth over time has also resulted in low voltages at Bayfield during peak load conditions. As voltage levels decrease, the risk of damaging electrical components rises and the flexibility of the grid to meet end user required voltage levels decreases.

Figure 2.1 Existing Transmission System



The proposed Project will increase reliability and add voltage support by providing an additional source of electricity to the largest peak load on the peninsula, in Bayfield. This second source of power to Bayfield helps ensure that power remains on should the existing line be damaged or require maintenance.

In addition, some parts of the line on the west side of the peninsula are in poor condition and in need of being rebuilt. This includes the line segments between Iron River and Herbster and between Cornucopia and a three-way switch structure near Bayfield (the Bayfield Switch). Xcel Energy is currently rebuilding the segment between Cornucopia and the Bayfield Switch, which is currently operated normally-open and therefore can be taken out of service during construction without impacting service to load. Until the Project is constructed, rebuilding the remaining segments of the 34.5 kV line presents significant difficulties because they actively serve load on the west side of the peninsula and there is no back up transmission line. Xcel Energy will rebuild the remaining west side segments of the transmission line once the Project is complete.

2.2 Transmission Network Alternatives

The alternatives analyzed as part of this project solve the identified problems in the Bayfield Peninsula for the planning horizon. The planning horizon in this case is 20 years or 25.5 megawatt (MW) total load on the Bayfield Peninsula 34.5 kV system; the load on the peninsula in 2018 was 19.3 MW. All alternatives focused on using 115 kV and 34.5 kV equipment because these are the two existing transmission voltages on the Bayfield Peninsula. Staying consistent with the existing voltages limits the number of necessary transformations. Similarly, all options were developed to limit the need for new or rebuilt substations. High level planning estimates for all alternatives, including the Project, were developed for comparison purposes, with the preferred project the most economic option.

2.2.1 Describe the preferred solution

New 34.5 kV Line to Bayfield

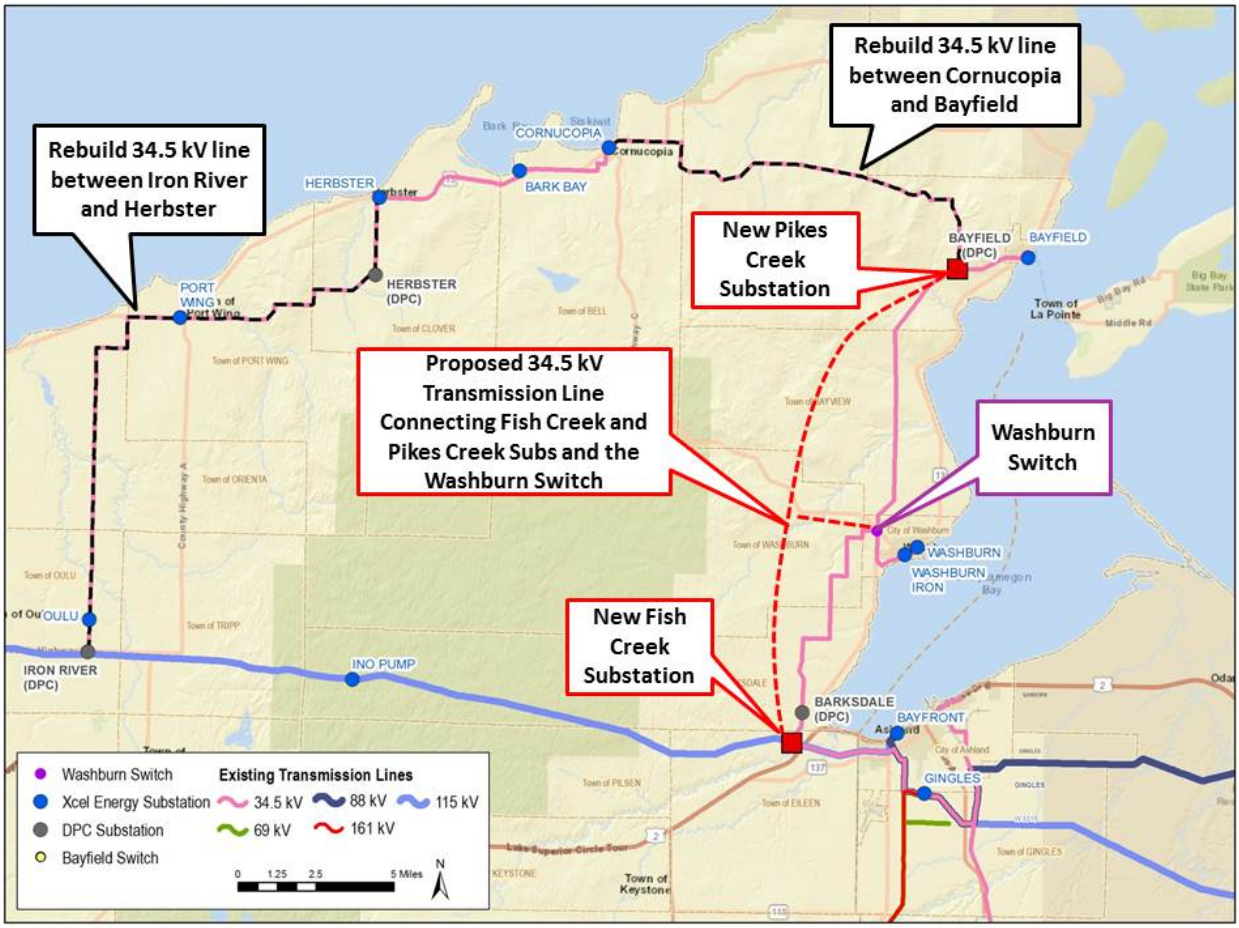
The preferred option requires construction of the following facilities:

- 115/34.5 kV substation on the Bay Front to Iron River 115 kV line ("Fish Creek Substation")
- 34.5 kV substation near the Bayfield Switch ("Pikes Creek Substation")
- 34.5 kV line from Fish Creek Substation to Pikes Creek Substation
- 34.5 kV tie line near Washburn Switch connecting the new and the existing 34.5 kV lines
- 3 MVAR capacitor bank at Pikes Creek substation
- Rebuild Iron River to Herbster 34.5 kV line
- Rebuild Cornucopia to Bayfield Tap 34.5 kV line

The planning level cost estimate for this option, used for comparison with the other alternatives analyzed, was $40 million. This estimate included the line rebuilds from Iron River to Herbster and Cornucopia to Bayfield which, taken together, comprise the preferred solution. This application for a CA includes the first five bulleted items above, but does not include the last two items, the line rebuilds. The rebuilds were separated from the proposed Project because they will be constructed within existing easements at different times than the Bayfield Second Circuit Project. Cost estimates for the items included in the proposed Project are included in Section 4.0.

The 34.5 kV line that connects the new and existing lines, described in this application as the tie line, is necessary to allow the system to be able to operate in the event of an outage on the existing line between Gingles and the Washburn Switch. The tie line would be operated normally-open and only be closed in the case of an outage on one of the lines. Figure 2.2 shows a conceptual map of the preferred solution.

Figure 2.2 Preferred Solution



2.2.1.1 Identify and describe any transmission line facilities that would be added or altered for this project. Include one-lines where appropriate

The proposed Project includes two new substations and a new 34.5 kV line between them. Additionally, lines around the new Fish Creek and Pikes Creek Substations would be altered and routed into each substation.

2.2.1.2 Identify and describe any substation facilities that would be added or altered for this project. Include electric schematics where appropriate. Substation Filing Requirements may also apply.

The proposed Project includes a new 115/34.5 kV substation with a single 28 MVA transformer and a breaker station near the existing Bayfield tap. The new breaker station includes a single 3 MVAR capacitor bank and breaker positions for all nearby transmission lines.

2.2.2 Discuss the viable Alternatives considered

Since the Bayfield Peninsula 34.5 kV system is currently operated as a radial system, the consideration of alternatives included an analysis of construction requirements to ensure minimal impacts to customers along the peninsula. Similar to the preferred option, all alternatives described below address the load serving needs of the Bayfield Peninsula beyond the 20-year planning horizon. While all options described below address the immediate and future load serving needs of the Bayfield Peninsula area, the preferred project was selected because the alternatives were more costly and Option 2 and Option 3 provided substantially more capacity than could reasonably be expected to be required in the area.

Option 1: New 115 kV Line to Bayfield

This option would require a new substation to be built on the Bay Front – Ino Pump 115 kV line (Fish Creek Substation) and on the Bayfield – Washburn 34.5 kV line (Pikes Creek Substation). To connect these two substations, a new 115 kV line from Fish Creek Substation to Pikes Creek Substation would be constructed. This 115 kV line would provide the Bayfield Peninsula with an additional strong power source and meet the load serving needs of the Bayfield Peninsula beyond the planning horizon. This option would split the current system with two radial lines into two 34.5kV load serving loops, greatly reducing the exposure of load to power outages. This option also includes the age and condition rebuild of the existing Iron River – Herbster and Cornucopia – Bayfield Tap 34.5 kV lines. The new Pikes Creek Substation would be designed to handle future 34.5 kV capacitor banks, providing future flexibility to the area. This option provides load serving capability comparable to the preferred option. The initial planning level cost estimate for this option, used for comparison with the other alternatives analyzed, was $60 million.

Option 2: Rebuild Entire 34.5 kV Loop to 115 kV

This option would rebuild the entire existing 34.5 kV line to a single circuit 115 kV line, including 19 miles of 12.5 kV distribution underbuild in the Herbster area. This option requires new 115 kV load serving substations at Iron River, Bayfield, Washburn, and Barksdale. The remaining existing substations along the Bayfield Peninsula would be served through the 12.5 kV distribution line built underneath the 115 kV line conductors. This option would create a 115 kV load serving loop with only a small portion of distribution remaining that serves the small substations from Port Wing to Cornucopia. This option provides load serving capability beyond the studied planning horizon, and substantially more than can be reasonably be expected to be required in this area. The initial planning level cost estimate for this option, used for comparison with other alternatives analyzed, was $90 million.

Option 3: Double Circuit 115/34.5 kV Entire Loop

This option would rebuild the entire existing 34.5 kV line to double circuit 115/34.5 kV, with new 115 kV substations near Herbster and Bayfield. With this option, the existing substations along the 34.5 kV loop will remain in their current state. This option would create a 115 kV looped

system feeding a parallel 34.5 kV load serving loop at multiple injection points. Similar to Option 2, this option provides load serving capability beyond the studied planning horizon, and substantially more than can be reasonably be expected to be required in this area. The initial planning level cost estimate for this option, used for comparison with other alternatives analyzed, was $90 million.

2.2.3 For the discussion of the Preferred Solution and viable Alternatives include the following, as appropriate:

2.2.3.1 Provide relevant regional studies of transmission networks solutions

There was no regional analysis completed as part of this project due to the lack of regional lines in the study area. Since the study area is a local load serving system, the impacts of all options on the regional transmission system are negligible, therefore a full regional analysis was not needed. However, the Bayfield Second Circuit Transmission Project, as described in the preferred project, has been included in the MISO (Midcontinent Independent System Operator, Inc.) Transmission Expansion Planning (MTEP) models since MTEP15.

2.2.3.2 Provide details of the reliability and performance benefits of each network solution studied, as available.

All options in the project area used 34.5 kV or 115 kV transmission lines. A 115 kV line is generally used for bulk power transfer or to serve larger loads than expected to develop on the Peninsula, and offers approximately 10 times the thermal capacity of a 34.5 kV line. A 34.5 kV transmission line is typically used for local load serving or low load, rural area load serving. All of the study options address the immediate and future load serving needs of the Bayfield Peninsula area, however the preferred option supports these needs using smaller infrastructure than the three 115 kV options and does so at a lower cost.

2.2.3.3 Supply the electrical losses for each alternative, peak MW and annual GWH estimates.

Table 2.2-1 shows the estimated net losses of each option compared to the base case. The net losses vary from -1.2 MW to -2.0 MW. Using the publicly available January 2019 NSP Companies MISO Attachment O Network Rate of $51,336.27/MW-YR equates to an annual savings of between $61,603.52 and $102,672.54. The models used for this analysis were based off of the MTEP18 2023 Summer Peak base model and modified for each option under a 2022 load level.

Table 2.2-1 Estimated Net Losses by Option

Option	2022 Net Losses (MW)	Annual Savings
Option 1: New 115 kV Line to Bayfield	-1.6	$82,138.03
Option 2: Rebuild Entire 34.5 kV Loop to 115 kV	-2.0	$102,672.54
Option 3: Double Circuit 115/34.5 kV Entire Loop	-1.8	$92,405.29
Proposed Project: Second 34.5 kV line to Bayfield	-1.2	$61,603.52

When comparing the annual loss savings from the proposed option to any of the other options, there is not enough savings to justify the increase in project cost of the other options.

2.2.3.4 For generator interconnections, supply the detailed short circuit, stability and thermal analysis studies that have been performed. There must be some initial studies performed in order for the application to be complete.

This Application does not include a generator interconnection. Therefore, these studies are not applicable.

2.2.3.5 For new distribution substations, supply the information from the Load Serving Entity on the need and alternatives considered. Those issues include existing conditions, voltage profiles, line capacities, outages, load growth, alternate substation feed pickup capability, etc.

This Application does not include a new distribution substation. Therefore, these studies are not applicable.

2.3 Local Transmission, Distribution and Distributed Resource Alternatives

2.3.1 Describe local transmission level alternatives that have been studied and rejected for the proposed project. Local transmission level alternatives can include but are not limited to:

- **An upgrade of existing transmission circuits with larger capacity conductors**
- **Installation of capacitor banks**
- **Installation of new substation equipment**
- **New operating guides**
- **Smaller and less expensive line/s in other locations.**
- **Distribution networking and upgrades**
- **Distributed resources, including solar and other distributed resources**

Since the primary drivers of this Project are increased electric reliability and voltage support to communities on the Bayfield peninsula, a capacitor bank was the only local transmission level alternatives (as described above) included in the analysis.

2.3.2 Explain why the alternatives were not selected.

A capacitor bank was included initially in the analysis but due to the overall length of the transmission system on the Bayfield Peninsula, the capacitor bank could not support the system during contingency conditions. Initial analysis showed that a capacitor bank would require a new small substation since the existing substations have no available room. The capacitor bank was

only capable of solving the voltage issue, and therefore some load serving capability increase, at Bayfield under system intact conditions. Since the capacitor bank did not solve the reliability issue and would not allow for line maintenance, it was not pursued as a standalone project. However, a capacitor bank was incorporated into the preferred project.

2.4 Non-Transmission Options: Discuss the potential for non-transmission solutions to the identified problem, as prioritized in Wis. Stat. §§ 1.12(4) and 196.025(1)(ar).

No non-transmission solutions would replace the need to build this project. Xcel Energy conducted a high level assessment of the potential of using generation and rejected it for the following reasons:

- The generation unit would need to provide 20 MW and be available 24/7, which limits the types of generation that would be considered.
- The Pike's Creek Substation would still need to be built.
- The generation would need to be near the Pike's Creek Substation and siting options are limited.
- The generation unit would need starting capability without connection to the transmission system (black start capable).
- To allow for maintenance of the unit, another 20M W similar unit would need to be located adjacent to the site.
- It is unclear what fuel source, if any, would be available and permittable in this area. We expect there would be air quality/water quality permit limitations. Xcel Energy would want to avoid any fuel that would emit carbon.
- There are no generation projects proposed in the MISO queue in the vicinity of Bayfield.

2.4.1 Noncombustible renewable energy resources

During the siting process for this project, we had many questions regarding the potential for solar, wind or batteries to solve the problem. Due to the inconsistent availability of renewable energy resources, these resources do not solve the identified problems. Noncombustible renewable energy resources could provide adequate energy capacity but are not a substitute for a transmission line due to their lack of dependability. A solar farm cannot be considered a reliable source of power when it comes to supporting the transmission system during outages. System outages can occur at any time of the day and in all types of weather (when a solar farm is not generating electricity). Wind turbines offer better output than solar because the wind blows throughout the day while the sun only shines for a limited amount of each day. However, wind turbines cannot be considered a reliable source of power because the wind does not always blow and an outage can occur at any moment. Battery installations provide a finite supply of power and then need to be recharged. Batteries can be effective for decreasing the peak load at a substation for short durations (i.e., peak shaving) but do not address long term electric transmission system reliability due to their finite size.

2.4.2 Combustible renewable energy resources

There is no existing or planned utility scale combustible renewable energy generation in the Bayfield Peninsula.

2.4.3 Nonrenewable combustible energy resources in the following order:

2.4.3.1 Natural gas

There are no planned utility scale natural gas generating stations in the Bayfield Peninsula.

2.4.3.2 Oil or coal with a sulphur content of less than 1%

There are no planned utility scale oil or coal generating stations in the Bayfield Peninsula.

2.4.3.3 All other carbon-based fuels

There are no planned utility scale generating stations in the Bayfield Peninsula.

2.5 No-Build Options

The no-build option is the base case in the Planning Analysis (Appendix D). In these evaluations, the transmission system was analyzed with and without the Project alternatives. The no-build option is not able to reliably supply electrical service to the loads in the Bayfield Peninsula. In a no-build situation, the low voltage conditions and outages on the Bayfield Peninsula will persist and likely get worse over time.

2.6 Provide an analysis of the ability of energy conservation and efficiency and load response to reduce, alter, or eliminate the need for this project. Analysis should include:

2.6.1 A description of the energy conservation and efficiency and load response programs and services available to customers in the project area

Focus on Energy is the statewide energy efficiency and renewable energy program in Wisconsin. Focus on Energy has residential and business programs that include providing incentives for customers to purchase energy efficient products or to use renewable resources. Customers can voluntarily choose to participate in these programs. Wisconsin's electric and gas utilities fund Focus on Energy through gas and electric rates.

2.6.2 An indication of the amount of additional energy efficiency and demand response, not already included in the forecast, needed to reduce, alter, or eliminate the need for this project.

Since the Project is driven by a need for increased reliability and voltage concerns, it is impossible to provide similar benefits as the Project using energy efficiency and load reduction. Reduction of load on the Bayfield Peninsula would improve the identified voltage issues but would not solve the reliability issues and does not accommodate any future load growth. The Project provides a redundant source to all loads on the peninsula and allows for additional load growth, both which cannot be provided by energy efficiency and demand response.

2.6.3 A discussion of the feasibility of achieving the level of energy efficiency and demand response identified in Section 2.6.2.

As noted in 2.6.2, no level of energy efficiency and demand response can meet the need for the Project.

2.7 For Market Efficiency Projects:

The proposed Project is not a Market Efficiency Project.

2.8 Modeling Information

2.8.1 For all projects submit network modeling information from PSSE or PowerWorld for steady-state power flow solutions. If submitting data from PSSE, submit the *.raw file. If submitting data from PowerWorld, submit the *.pwb file.

Power System Simulator for Engineering (PSS®E) models were used for reliability analysis in the Planning Analysis. Data files for PSS®E reliability analysis supporting the Planning Analysis contained in Appendix D were provided separately with a request for confidentiality.

In the Bayfield Peninsula System Assessment (Appendix D), the 2018 power flow model employed was developed by the Minnesota Transmission Assessment and Compliance Team (MNTACT). The base study model for this analysis was the 2018 summer peak model used in the 2017 MNTACT Annual Assessment. The base model was then modified to utilize the most recent distribution load forecasts for all NSPW and Dairyland Power Company (DPC) loads in the study area and provide a non-coincident peak for the study area. The program used for this powerflow analysis was PSS®E Version 33.

2.8.2 On an individual application basis, as requested by the assigned engineer, provide the computer network simulation(s) data input files, output files, and/or output summaries.

Xcel Energy will work with the Commission engineers to provide this information.

2.9 Area Load Information

Submit historical peak load by substation for the study area for at least the past ten years. Explain each component with quantitative detail of the estimated forecasted need. Any changes in the projected growth rates over the forecast period should be fully explained. Area load information requirements will be discussed at the pre-application consultations. Based on the need and scope of the proposed project, different historical data may be required.

Table 2.9-1 shows the actual peak loads in the Bayfield Peninsula from 2009-2018and the projected peak loads in the Bayfield Peninsula from 2020-2030 which are based on the actual peak loads. There is one load increase reflected between 2022 and 2025 at the combined Washburn load, which is driven by a large customer in Washburn, and the rest of the loads in the area assume a 0.5% load growth. The analysis indicates that projected peak loads are expected to grow over the next several years.

Table 2.9-1 Actual and Projected Peak Loads in the Bayfield Peninsula

Loads (MW)	Actual Peak Loads					Projected Peak Loads			
	2010	2012	2014	2016	2018	2020	2022	2025	2030
Barksdale (DPC)	1.09	1.01	1.23	1.25	1.35	1.35	1.36	1.37	1.38
Barksdale	1.07	0.49	0.49	0.50	0.50	0.51	0.51	0.52	0.53
Bayfield (DPC)	0.99	1.01	1.20	1.09	1.21	1.21	1.21	1.22	1.23
Bayfield	5.68	7.23	6.73	6.19	5.74	7.79	7.87	7.99	8.19
Cornucopia	0.56	0.42	0.41	0.42	0.37	0.44	0.45	0.45	0.47
Herbster (DPC)	0.60	0.63	0.73	0.74	0.78	0.78	0.78	0.78	0.79
Herbster	0.39	0.38	0.39	0.38	0.21	0.39	0.39	0.40	0.42
Iron River (DPC)	1.81	1.93	2.18	2.18	2.11	2.11	2.12	2.13	2.15
Oulu	0.40	0.45	0.45	0.62	0.52	0.53	0.53	0.54	0.56
Port Wing	0.69	0.73	0.70	0.56	0.69	0.69	0.70	0.71	0.71
Washburn	5.71	5.70	5.57	5.63	5.85	6.47	6.52	8.05	8.16
TOTALS	**18.99**	**19.99**	**20.07**	**19.56**	**19.34**	**22.27**	**22.45**	**24.16**	**24.58**

2.10 Regional Transmission Organization Information

2.10.1 For regional projects, supply the cost benefit analysis and the likely cost allocation per the Midwest ISO's filings.

The proposed Project is not a regional project, so cost allocation does not apply.

2.10.2 Description of applicable transmission tariffs

The proposed Project is not a regional project; there are no applicable regional tariffs.

2.10.3 Provide transmission service agreements, if applicable.

This provision is not applicable to this proceeding.

3.0 MAGNETIC FIELDS

3.1 Submit the estimate magnetic field data in PSC Table 6

Estimated magnetic field data including the information described in items 3.1.1 – 3.1.4 (predominant line configurations, unique structure types, existing lines affected, and each circuit configuration) is included in Appendix E and has been submitted to the PSC in an electronic spreadsheet.

3.2 PSC Table 6 includes the following information in for each estimated magnetic field scenario.

Estimated magnetic field scenarios include estimates at 80 and 100 percent of peak load at 1 year and 10 years post-construction and current levels for those scenarios as required in items 3.2.1 and 3.2.2.

3.3 Provide all assumptions used to model magnetic field levels including:

Assumptions used to model the magnetic field levels including those listed in items 3.3.1 – 3.3.4 (phase ID and angles, pole diagrams, height of lowest conductor at mid-span) are included in the data provided in Appendix E and the information provide in the electronic spreadsheet.

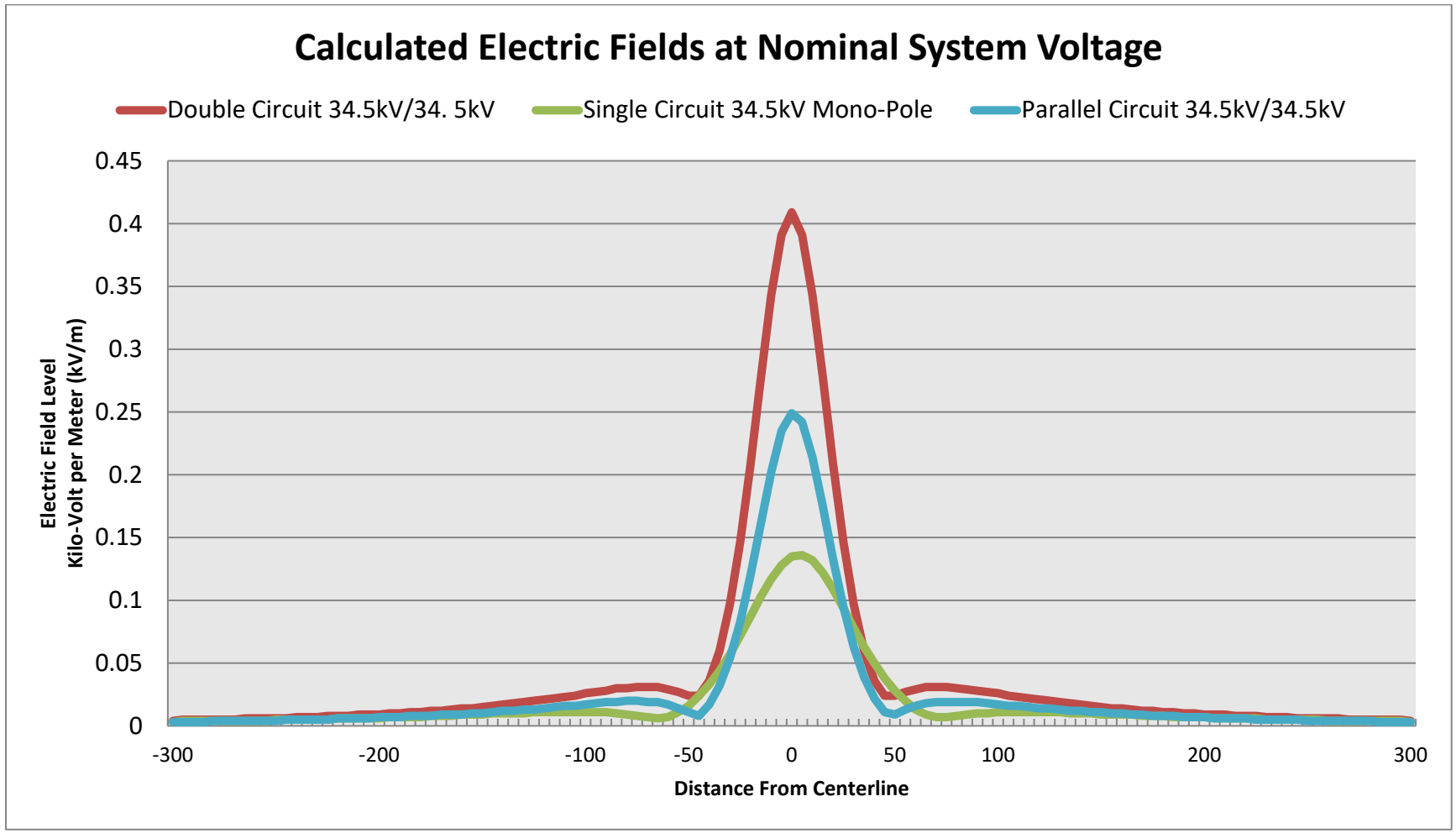
Electric and Magnetic Fields

EMF is an acronym for the terms electric and magnetic fields. For the lower frequencies associated with power lines (referred to as "extremely low frequencies"), EMF should be considered separately as electric fields (EFs) and magnetic fields (MFs), measured in kilovolts per meter (kV/m) and milliGauss (mG), respectively. EFs are dependent on the voltage of a transmission line and MFs are dependent on the current carried by a transmission line. The strength of the electric field is proportional to the voltage of the line, and the intensity of the magnetic field is proportional to the current flow through the conductors. Transmission lines operate at a power frequency of 60 Hertz (cycles per second).

Electric Fields

There is no federal standard for transmission line electric fields. Xcel Energy, however, has self-imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground. The standard was designed to prevent serious hazards from shocks when touching large objects parked under AC transmission lines of 500 kV or greater. Figure 3.3-1 provides the EFs at nominal conductor voltage for the proposed 34.5 kV transmission line. The maximum EF, measured at one meter (3.28 feet) above ground, associated with the Project is calculated to be 0.409 kV/m. As shown in Figure 3.3-1, the strength of EFs diminishes rapidly as the distance from the conductor increases.

Figure 3.3-1 Calculated Electric Fields (kV/m) for Proposed 34.5 Kilovolt Transmission Line Designs (3.28 feet above ground)



Magnetic Fields

There are presently no Wisconsin regulations pertaining to MF exposure. The Applicant provides information to the public, interested customers and employees so they can make informed decisions about MFs. Such information includes the availability for measurements to be conducted for customers and employees upon request.

The magnetic field profiles around the proposed transmission lines for each structure and conductor configuration proposed for the Project are shown in Figures 3.3-2 and 3.3-3. Magnetic fields were calculated for normal system conditions (systems intact with projected load flows) for the 1st year of service and the 10th year of service. As projected for the planned in-service year of the Project or 2021. The magnetic field values are calculated at a point where the conductor is closest to the ground. The magnetic field profile data shows that magnetic field levels decrease rapidly as the distance from the centerline increases (proportional to the inverse square of the distance from source). The maximum MF, calculated at one meter (3.28 feet) above ground, associated with the double-circuit segments is calculated to be 22 mG at year 1 and 23 mG at normal year 10, these values occur at points directly underneath the transmission lines. The maximum MF, calculated at one meter (3.28 feet) above ground, associated with the single-circuit segments is calculated to be 15 mG at year 1 and 16 mG at normal year 10, these values occur at points directly underneath the transmission lines. Maximum values at the edge of the transmission line ROW and sample points beyond are shown here in Table 3.3-1.

Table 3.3-1 Maximum milliGauss (mG) Values at Specified Distances from Proposed Transmission Lines

	Max. Level	25’ from center	150’ from lines	300’ from lines
Year 1				
Double Circuit	22	15	1.2	0.3
Single Circuit	15	10	0.7	0.2
Year 10				
Double Circuit	23	16	1.2	3
Single Circuit	16	10	0.7	0.2

The magnetic field produced by the transmission line is dependent on the current flowing on its conductors. Actual current flow on the line will vary throughout the day, so magnetic fields will be less than these projected upper levels during most hours of the year with short intermittent instances of levels reaching these calculated forecasts.

Figure 3.3-2 Calculated Magnetic Flux density (mG) for Proposed 34.5 Kilovolt Transmission Line Designs at Peak Operation (3.28 feet above ground)

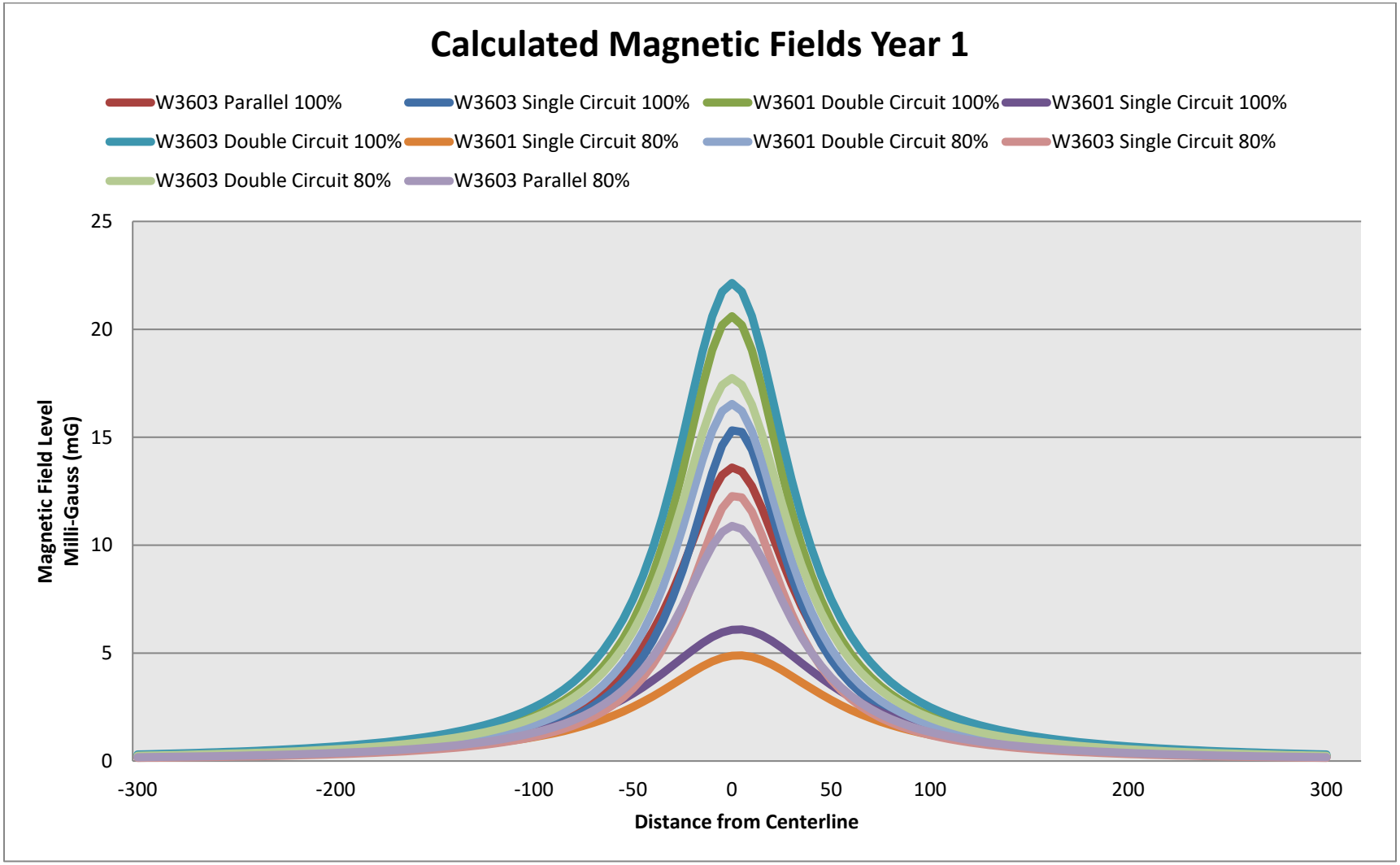
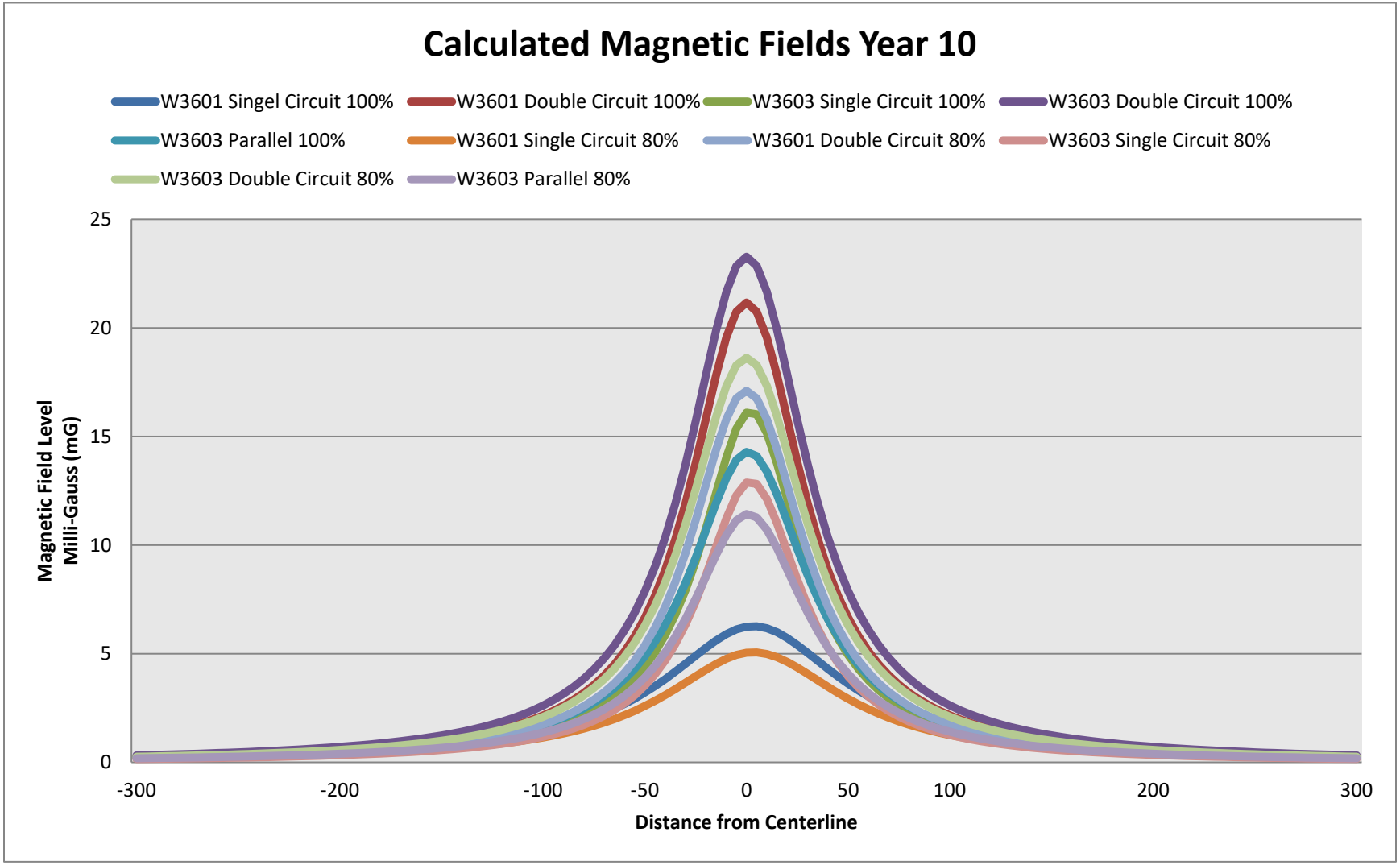


Figure 3.3-3 Calculated Magnetic Flux density (mG) for Proposed 34.5 Kilovolt Transmission Line Designs at Nominal Operation (3.28 feet above ground)



Appendix E contains data tables showing the specific EF and MF calculations shown in Figures 3.3-2 and 3.3-3.

Considerable research has been conducted since the 1970s to determine whether exposure to power-frequency (60 hertz) MFs causes biological responses and health effects. Public health professionals have also investigated the possible impact of exposure to EMF upon human health for the past several decades. While the general consensus is that EFs pose no risk to humans, the question of whether exposure to MFs can cause biological responses or health effects continues to be debated.

Since the 1970s, a large amount of scientific research has been conducted on EMF and health. This large body of research has been reviewed by many leading public health agencies such as the U.S. National Cancer Institute, the U.S. National Institute of Environmental Health Sciences, and the World Health Organization, among others. These reviews do not show that exposure to electric power EMF causes or contributes to adverse health effects.

For example, in 2016, the U.S. National Cancer Institute summarized the research as follows:

> *Numerous epidemiologic studies and comprehensive reviews of the scientific literature have evaluated possible associations between exposure to non-ionizing EMFs and risk of cancer in children (12–14). Magnetic fields are the component of non-ionizing EMFs that are usually studied in relation to their possible health effects. Most of the research has focused on leukemia and brain tumors, the two most common cancers in children. Studies have examined associations of these 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. No consistent evidence for an association between any source of non-ionizing EMF and cancer has been found.*[1]

Wisconsin, Minnesota, and California have all conducted literature reviews or research to examine this issue. The PSC actively monitors research on EMF and its potential for causing human health effects and provides information in the factsheet *EMF, Electric and Magnetic Fields* which can be found at https://psc.wi.gov/Pages/ForConsumers/EMF.aspx.

Detailed Magnetic Field Profiles

Detailed magnetic field profiles have been calculated for each line. This includes data for each unique structure type or configuration and each existing line that would be affected by the proposed transmission line. The tables include magnetic field scenarios and expected current levels for the proposed lines at 80% and 100% of peak load for 1 year post-construction and 10

[1] https://www.cancer.gov/about-cancer/causes-prevention/risk/radiation/electromagnetic-fields-fact-sheet (updated May 2016).

years post-construction. The data has been provided to the Commission in an electronic spreadsheet. Larger versions of the summary charts shown above are included in Appendix E.

4.0 PROJECT COSTS

Cost estimates are shown in Table 4.1-1 below for each of the alignment alternatives, associated bypass lines, and substations. Costs are based on the projected in-service year of 2021. Development of cost estimates included on-the-ground site visits of the route alternatives with representatives from civil and line construction, vegetation management, land rights, matting and project management.

4.1 Transmission Route and Substation Cost Estimate Tables

Table 4.1-1 Transmission Route and Substation Cost Estimates

TRANSMISSION LINES		**East Route**	**West Route**
Transmission Line - Permanent	Materials	$ 4,530,000	$2,960,000
	Labor	$3,600,000	$1,440,000
	Other	$11,310,000	$10,470,000
	Subtotal	$19,440,000	$14,870,000
Transmission – Temporary Bypass Line	Materials	$1,520,000	$280,000
	Labor	$530,000	$160,000
	Other	$2,350,000	$880,000
	Subtotal	$4,400,000	$1,320,000
Transmission Lines Total:		**$23,840,000**	**$16,190,000**
SUBSTATIONS			
Pikes Creek	Materials	$1,610,000	$1,630,000
	Labor	$1,280,000	$1,290,000
	Other	$360,000	$350,000
	Subtotal	$3,250,000	$3,270,000
Fish Creek	Materials	$3,440,000	$3,440,000
	Labor	$1,830,000	$1,830,000
	Other	$490,000	$490,000
	Subtotal	$5,760,000	$5,760,000
Substations Total:		**$9,010,000**	**$9,030,000**
OTHER PROJECT COSTS			
Pre-certification Costs		$1,650,000	$1,650,000
AFUDC		$900,000	$1,140,000$1,270,000
Other Costs Total:		**$2,550,000**	**$2,790,000**
TOTAL PROJECT COSTS		**$35,400,000**	**$28,010,000**

To assess project costs and constructability of both route options, the project team performed multiple field reviews of both route options. The costs provided in the table above reflect the best estimates that can be derived from the field reviews. Due to unique and challenging aspects of accessing off-road sections of the East Route, the East Route option's cost estimate contains an additional $1.2M in contingency to account for the risk of high access preparation and maintenance costs.

Additionally, the project team was not given permission to review all off-road sections of the West Route. Therefore, the West Route option's cost estimate contains an additional $600,000 in contingency to account for the risk of unknown challenging access conditions that could not be assessed during the field review process.

Because there are additional line rebuilds planned on the Bayfield Peninsula there may be benefits to planning for reuse of some of the materials that will be used for the temporary bypass line. The project team will evaluate permanent installation of some temporary bypass line materials on future line rebuild projects between the Cornucopia and Iron River Substations. Any impacts to project cost estimates will be reported to the Commission.

5.0 ROUTE INFORMATION

5.1 Factors considered in the applicant's evaluation of potential routes and locations for the transmission line and its associated facilities.

There are two characteristics, in particular, which make this Project unique as compared to a more typical transmission line project:

1. ***Radial line in remote terrain***: The existing transmission line cannot be taken out of service during construction of the Project, even for short periods of time, without taking residents out of power. Approximately 11.5 miles (nearly two thirds) of this line are not adjacent to roads, crossing multiple rivers and streams and steep terrain. This combination of remote line miles and the need to keep the line energized throughout construction makes the East Route more difficult to construct than would normally be the case. Typical construction methods would involve much greater safety and reliability risks. Because of this the Project team held multiple field reviews to evaluate construction options for the East Route. More detail about corridor evaluation is provided in Section 5.3 and in Appendix I.

2. ***Multiple miles of temporary bypass transmission line***: Both of the proposed routes include a temporary bypass line. For the East Route this temporary line is longer than the permanent line (26 miles vs. 19 miles). While temporary bypass lines have been used on other projects, these are typically only for short segments of the overall project. In this case, because of the concerns identified in #1 above, the temporary lines have been identified to be the most effective way to ensure safety for construction crews and the public and reliable power to the communities on the Bayfield Peninsula during construction of double-circuit portions of either route. The relatively long temporary bypass line for the East Route is unusual, but the Project team feels that this would ultimately be safer, more reliable, and more cost effective than attempting to construct the Project without it. More detail about development of the temporary bypass line is included in Section 5.1.1 below and in Appendix I.

5.1.1 Identify route(s) that were considered and explain why those corridors were or were not chosen.

During the route development process many different routes and route segments and substation sites were evaluated for the transmission line and the two new substations.

Substations

Multiple substation sites were evaluated for both the Fish Creek and Pikes Creek Substations. Based on engineering and constructability constraints and line routing considerations the sites were narrowed down. Potential locations for the new Fish Creek Substation were evaluated

based on their construction suitability and proximity to the existing 115 kV Stinson to Bay Front transmission line (the line which runs from Ashland to Iron River and on to the Bayfield County line). It was necessary for the Pikes Creek substation to be located relatively close to the three way switch which connects the existing transmission line from Gingles to the tap line that serves the City of Bayfield. This switch is located at the intersection of Star Route Road and Hatchery Road. Land agents then reached out to landowners of the most viable properties for each, and were able to identify willing sellers for properties that met the needs for both substations.

Transmission Line

During initial route development Xcel Energy looked at many route and route segment options for the new transmission line. Because of the hilly terrain and the number of streams and rivers throughout much of the Project area there are few existing linear corridors to follow between the Washburn Switch and the Pikes Creek Substation. Some routes were considered early in the process but were eliminated prior to conducting detailed analysis because there were less impacting route alternatives available. Xcel Energy used desktop mapping with available geographic data of environmental and infrastructure features as well as aerial photos to develop and evaluate initial routes. Field reviews were later held to better understand on the ground conditions for some of these routes. Xcel Energy also held a public routing workshop with residents from the area.

One option that was eliminated early in the process was a route through the USFS Chequamegon-Nicolet National Forest. Xcel Energy met with representatives from the USFS to discuss this option, but eliminated it from consideration because of the lack of existing linear features (roads, pipelines, power lines) to follow and share ROW with. Creating a new utility corridor would result in a much greater amount of forest clearing than would be necessary on other route alternatives. USFS staff also indicated that, because viable alternatives were available, the USFS was unlikely to grant a permit.

Another option considered, but eliminated, was a route that would follow State Highway 13 between Highway 2 and Hatchery Road on the west side of Bayfield. While this is an existing linear corridor, there were many constraints associated with this option. Some of the primary considerations were: the highway is a State-designated Scenic Byway, and a transmission line would affect the scenic character of the road; the setback distances required along highways are greater than for local or county roads; and the density of commercial and residential buildings and other existing infrastructure in the corridor. Higher traffic volumes on the highway, compared to local roads, would also require traffic controls, such as temporary barriers and lane shifts or lane closures, to ensure safety for construction crews and the driving public during construction of the line.

In August 2017, Xcel Energy held a public open house and presented one proposed alignment, which was substantially similar to the West Route. At that time the route was preferred by Xcel Energy because it was determined to be the most viable way to ensure the safety of crews during

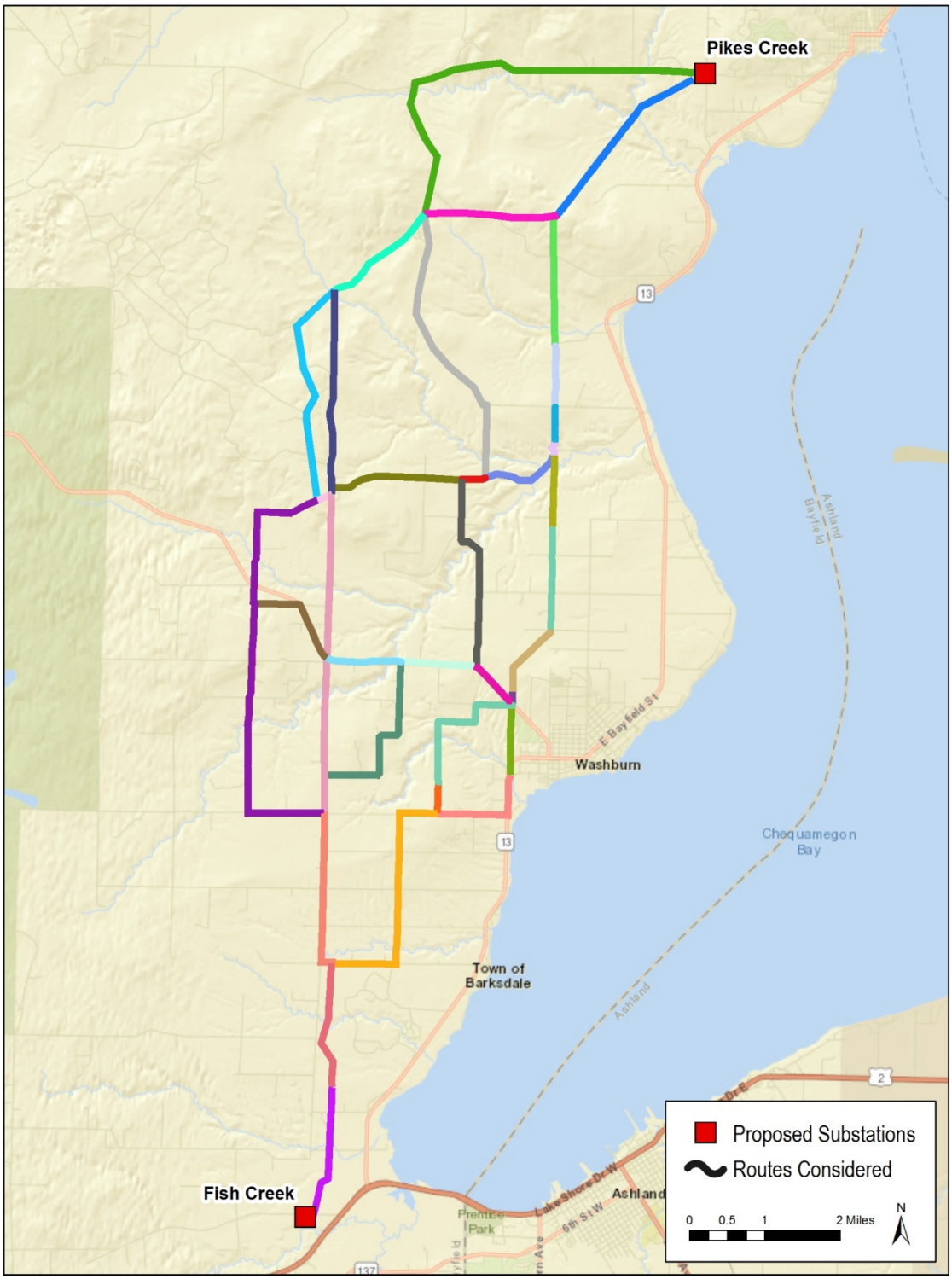
construction, and electric reliability, both during and following completion of Project construction. At the open house Xcel Energy heard from many residents who had concerns with the proposed route. More information on the open house is included in Sections 7.1 and 7.2. Based on public feedback regarding the proposed alignment, Xcel Energy reconsidered a number of other segments that had previously been reviewed internally, including the existing corridor. These route segments were refined to better reflect existing terrain and infrastructure features.

In September 2017, Xcel Energy received a proposal from a Bayfield County resident suggesting the use of a sub-marine (underwater) transmission line between Ashland and Washburn, in conjunction with some changes to the local distribution system and cutting service to some customers during peak use times, as an alternative to the proposed Second Circuit. The proposal also contemplated the development of a 5 MW solar generation facility with 10 MWh of battery storage somewhere near Bayfield. Xcel Energy Engineering, Project Management and Planning staff evaluated this proposed alternative but found that it did not adequately address the needs of the Project, in part because the line only reached Washburn, leaving Bayfield with the same reliability concerns. More information about renewable energy generation is provided in Section 2.4.1.

At the request of the community a public routing workshop was held in Washburn in April 2018 where participants were provided with information on 25 – 30 different segments that could be linked together to create complete routes connecting the Fish Creek and Pikes Creek substations. Details corresponding to those provided in PSC table 7- *Route Impact Summaries*, maps with community and environmental features, and information regarding opportunities and challenges associated with each segment were developed and were provided to participants. A map showing the route segments included in that evaluation is shown below in Figure 5.1-1 and in Appendix A, Figure 3. The different colors represent segments that can be constructed differently and/or linked together separately to create complete routes between Fish Creek and Pikes Creek substations. Feedback from participants at the routing workshop strongly favored looking more closely at the existing transmission corridor (the East Route).

After evaluation of all of the options described above and shown in Appendix A, Figure 3 Xcel Energy selected the West Route and the East Route as proposed route alternatives.

Figure 5.1-1 Evaluated Route Segments



Temporary Bypass Lines

The proposed temporary bypass line locations are based on the proximity of roads and the Project end points. To construct the temporary bypass line with a minimum of impacts and cost it needs to follow roads. This allows for relatively simple construction and removal, and limits, to the extent practicable, the amount of tree clearing that would be needed, because the line can share road ROW. Placing the bypass line in the proposed corridor, which is separate from the existing line, has the added benefit of providing flexibility as to which side of the road the line is placed on. This allows crews to cross the road with the line to avoid some trees, houses or other structures.

Highway 13 was not selected as the route for the bypass line because the amount of existing infrastructure along the road, adjacent houses and other buildings (including the City of Washburn) and the higher traffic volumes on the highway as compared to local roads would have made that alignment more time consuming and costly to construct than the proposed alignment. Because of the limited number of north/south roads in the Project area there were no other alternatives to consider.

5.1.2 Describe the use of any weighting criteria used to evaluate potential routes.

No quantitative weighting criteria were used to evaluate potential routes. The route selection process is a multi-step analysis that emphasizes identifying route alternatives with minimal impacts to the human and natural environment. Preliminary routes are initially developed in a GIS map where we begin to evaluate alternatives for potential impacts to human settlement and the environmental setting, including, but not limited to:

- Natural Resource/Environmental impacts (waterways, wetlands, forest clearing, soils and steep slopes, archaeological sites, protected species)
- Route corridor sharing opportunities (existing corridors, highways and roads, recreational trails, section lines or field lines)
- Affected landowners (proximity to residences, permanent and temporary easements needed, tree clearing near homes, impacts to agricultural lands)
- Aesthetics (type, height, number and size of poles, visual appearance, tree clearing)
- Public/Protected lands (type of ownership and protection, designated uses, ability to get approval to cross)
- Constructability issues (outage risk, worker safety, construction vehicle access routes, engineering constraints)
- Estimated cost

Route alternatives are typically eliminated from more detailed evaluation if the overall impacts clearly are substantially greater than other alternatives (see Section 5.1.1 above). Of those

remaining, each alternative route will typically have different types and quantities of expected impacts which can make direct comparisons difficult. For example, one route may require many acres of tree clearing while an alternative may have much less clearing, but be located near more homes. The Project team works together to identify potential routes based on which routes, on balance, solves the electrical need, are the least impactful, and most cost effective.

Field reviews of the Route alternative segments were conducted which included construction, engineering and routing staff, to better understand site conditions. These field reviews helped confirm natural resource and landowner impacts identified during GIS analysis phase. Field evaluation of the West Route segments identified opportunities to share corridor with existing roads and distribution lines, as well as how to best avoid impacts to homes and trees.

Field evaluation of the East Route identified constructability issues with remote access points, rugged terrain, and specific locations where construction near the existing energized line would be unsafe and very challenging. Because electric service to Washburn and Bayfield needs to be maintained throughout construction of the new line, the Project team determined that the most viable way to construct the East Route within the existing transmission line corridor would be to construct a temporary bypass line separated from the existing line. This would allow the existing line to be de-energized and removed from the corridor before constructing the new line, and alleviate safety and construction concerns noted above and described in detail in Appendix I.

5.1.3 Describe how the transmission line siting priorities in Wis. Stat. § 1.12(6) were considered.

The statutory siting priorities include, in order of priority:

1. Existing utility corridors;
2. Highway and railroad corridors;
3. Recreational trails to the extent the facilities may be constructed below ground and do not significantly impact environmentally sensitive areas; and
4. New corridors.

Xcel Energy considered these routing priorities in the development of this Project. The proposed West Route and East Route both substantially follow existing roads and utility corridors (distribution and transmission). For this Project there were characteristics of the existing transmission line corridor and the Highway 13 corridor which led Xcel Energy to eliminate Highway 13 from consideration. A discussion of the Highway 13 corridor is included above in Section 5.1.1.

The West Route follows existing roads and transmission or distribution lines for approximately 71% of its length. There is a portion between the north end of Church Corner Road and Friendly Valley Road approximately 1 mile long which would create a new corridor, because there are no existing roads through that area. North of Friendly Valley Road the West Route generally follows existing forest roads, but is straightened out in some cases to reduce sharp angles in the line

which would require more robust structures and foundations. Upon reaching Star Route Road the West Route then substantially follows an existing Bayfield Electric distribution line, with some slight diversions in order to limit more costly angle structures, which approximately parallels Star Route Road.

The East Route follows the existing 34.5 kV transmission corridor. Constructing the line on this route presents several challenges which are detailed in Section 5.3.7.2, and Appendix I. Xcel Energy evaluated construction of the second circuit parallel to the existing transmission line, constructing double circuited with the existing line, and a hybrid of both configurations, as well as an option that would involve constructing a new double-circuit line, offset from the existing line by 35 to 50 feet, while keeping the existing line in service until the new one is completed and energized.

5.2 Changes to Existing Easements

If the proposed project contains segments that share part or all of an existing transmission easement submit the following for each of those segment(s):

5.2.1 Describe changes to the location or width of existing electric easements.

The West Route does not include any ROW that would require a change to an existing transmission easement. Where appropriate new transmission easements will share ROW with existing Bayfield Electric distribution easements. If the East Route is selected the proposed ROW would require changes to the total width or location of maintained area in four locations. These include: widening of the ROW where the line crosses the Onion River and Pikes Creek, shifting the line to the opposite side of Bjork Road for three spans, and a change in the alignment angle north of Thompson Creek which shifts the ROW on the same parcel. The Bjork Road shift will require a new easement from the affected landowner. No other changes to existing easements are proposed at this time.

5.2.2 Provide the results of the analysis of existing transmission easements that would be shared by application routes and the potential problems that may be encountered.

The existing transmission easements, on the East Route, were obtained by Lake Superior District Power in the 1960's and provided the utility with the following conditions: the perpetual right and easement to construct, maintain, inspect, remove from, rebuild, replace, and operate across the premises hereinafter described, a line or lines of wires for transmission and/or distribution of electric energy and for the private telephone service of the grantee, including all supports, poles and/or structures, wires, guys, anchors, fixtures, appliances and other equipment which the grantee shall deem necessary, over, across, and upon said premises and to carry electric energy thereon.

Based on Xcel Energy's review of the existing easements, these easements can be used for the Project and no additional land rights are required for construction, operation and maintenance of the proposed Project with the exception of the four locations identified in Section 5.2.1.

The West Route utilizes existing easements only for Segment 1 (see 5.3.7.1) which is shared with the East Route. The remaining segments would require new transmission easements.

5.2.3 State if the existing easements are to be renegotiated and/or rewritten. If so, indicate the reason (for example language modernization, change in easement size, change in transmission, etc.).

No changes to existing easements, other than those described in Section 5.2.1 are proposed at this time. Xcel Energy does not plan to renegotiate and/or rewrite existing easements. Factors that may impact changes to existing easements include landowner requests to define easement/premises by exhibit and centerline description and/or topography requiring additional changes to existing ROW. In this scenario, Xcel Energy would obtain a new Low Voltage Easement parallel and adjacent to the existing, or provide a new easement to cover all and release the original Lake Superior District Power Easement. Xcel Energy would follow landowner's request.

5.3 Route Segments

Route segment descriptions for both routes and temporary bypass lines are included below. Information for Sections 5.3.1 to 5.3.6 are included within the descriptions.

5.3.1 Type and dimensions of structure and foundation (such as underground/overhead, single-pole/H-frame, direct embed/concrete caisson, type of material, average span length, etc.).
5.3.2 Transmission configuration (single-circuit, double-circuit, etc.).
5.3.3 Conductor information (for example size, voltage, etc.).
5.3.4 Existing transmission affected by proposed project.
5.3.5 Existing distribution affected by the proposed project.
5.3.6 Shared ROW configuration.

5.3.7 Details for both routes:

Structures will be wood or weathering steel single-pole structures with horizontal post insulators. The typical tangent structures will be directly embedded in the ground; most light angle structures will be installed within 48-inch culverts; dead-end structures or those with very hard angles will be installed on drilled pier foundations, estimated at 7 feet in diameter. The transmission line conductors will likely be 477 kcmil 26/7 ACSR "Hawk" conductor, or conductor of comparable capacity. The temporary bypass line is proposed to use a smaller conductor, 4/0 ACSR "Penguin" conductor, or comparable.

5.3.7.1 West Route

The West Route is proposed as a 26-mile 34.5 kV transmission line between the proposed Fish Creek Substation and proposed Pikes Creek Substation with a tie line from the West Route to the Washburn Switch. Approximately 39% of this route is co-located with roads (West Route Segments 2 and 3). West Route Segment 1 is exactly the same as East Route Segment 1; the first 3.5 miles of the West Route will be double-circuit with the existing 34.5 kV transmission line and require a temporary bypass (Temporary Bypass Line Segments 1 and 1W). Sequentially, the next 18.5 miles (West Route Segments 2, 3, and the first portion of 4) would be single circuit along a new utility ROW. The final 3.9 miles of West Route Segment 4 along Star Route Road would also be single circuit and mostly within a shared utility corridor with a Bayfield Electric distribution line.

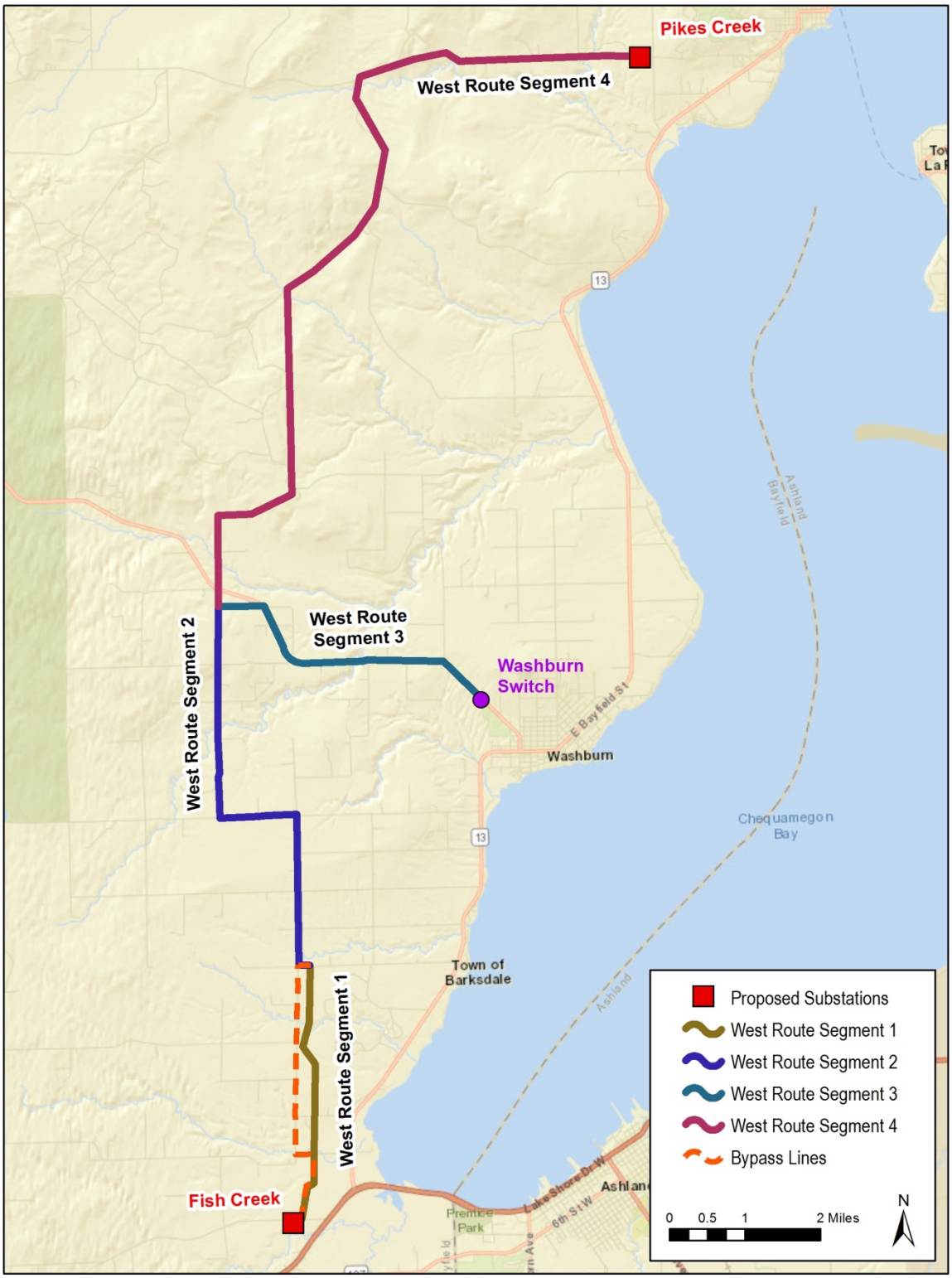
Span lengths for Segment 1 (the double-circuit segment) are typically 300-400 feet, which is similar to spans on the existing line; span lengths for single circuit Segments 2 -4 are typically about 500-600 feet. Typical structures on the West Route will be single-pole structures of wood or weathering steel with horizontal post insulators. Double-circuit poles will have three insulators on each side; single-circuit poles will have three total alternating post insulators. Single-circuit poles will average about 65 feet in height while double circuit poles will average about 60 feet. The taller single-circuit structures are due to the use of longer span lengths which allows for the use of fewer poles per mile. Typical photos of the single and double-circuit structure types proposed for the Project are shown below in Figure 5.3-1. Note that this shows examples of wood poles; as noted previously the proposed structures may be weathering steel or wood.

Figure 5.3-1 Typical Structure Types: Double-Circuit and Single-Circuit

Where the West Route is co-located with roads, 20 feet of the 50-foot-wide transmission ROW will be shared with the road ROW. That is, 30 feet of the ROW will be new and 20 feet will be shared with roads. Impacts for West Route Segments 2 and 3 incorporate this shared ROW configuration. While West Route Segment 4 generally follows roads in some locations, due to the terrain and curvilinear nature of the roads, Xcel Energy assumes the transmission ROW would be new because it does not completely follow the curvilinear roads.

The West Route is expected to impact some Bayfield Electric Distribution lines, particularly along roads. Xcel Energy is coordinating with this utility and anticipates burying distribution lines where they intersect the West Route. Some distribution lines may remain above-ground, if necessary, and be underbuilt on the new transmission line poles.

Figure 5.3-2 West Route Segments



West Route Segment 1

As noted above, West Route Segment 1 is exactly the same as East Route Segment 1. For this segment the new lie will be double-circuited with the existing 34.5 kV transmission line. This 3.5-mile segment generally extends from the proposed Fish Creek Substation north to Nolander Road within the existing 34.5 kV easement. Typical structures along Segment 1 of the West Route will be double-circuit, with horizontal post insulators, three on each side, and a shield wire on the top of the pole.

West Route Segment 2

West Route Segment 2 is a six-mile segment generally from the intersection of from Nolander and Ondossagon Roads north and west to the intersection of Church Corner Road and Old C Road. This segment parallels Nolander Road, Ondossagon Road, Wannebo Road, and Church Corner Road for its entire length.

West Route Segment 3

West Route Segment 3 is a 4.1-mile segment tie line that connects the West Route to the Washburn Switch. This segment runs from the corner of Church Corner Road and Old C east to the Washburn Switch along Old C Road and County Road C.

West Route Segment 4

West Route Segment 4 is a 12.4-mile segment from the intersection of Church Corner Road and Old C Road north and east to the proposed Pikes Creek Substation. This segment parallels portions of Church Corner Road, Van Stone Road, Little Sioux Road, Jammer Hill Road, and Star Route Road. Where this route does not parallel roads, it has been designed to traverse the terrain in this segment's vicinity most efficiently. The final 3.9 miles of this segment, along Star Route Road, would mostly share ROW with an existing distribution line.

Temporary Bypass Line Segment 1

Temporary Bypass Line Segment 1 is a 3.7-mile segment from the proposed Fish Creek Substation north to the intersection of Nolander and Ondossagon Roads. This segment parallels Terwilliger and Ondossagon Roads for the entire length. For a portion of this segment, the temporary bypass line will be on the opposite side of the road as the existing 34.5 kV transmission line.

Temporary Bypass Line Segment 1W

Temporary Bypass Line Segment 1W is a 0.25-mile segment connecting the northern terminus of Bypass Segment 1 to the existing 3601 34.5 kV transmission line. This short segment would complete the bypass to ensure power delivery when West Route Segment 1 is under construction. Temporary Bypass Line Segment 1W parallels Nolander Road.

5.3.7.2 East Route

The East Route is proposed as an 18.9-mile double circuit 34.5 kV transmission line within the existing corridor of Xcel Energy's 34.5 kV transmission line number 3601, between the proposed Fish Creek Substation and existing Washburn Switch, and Xcel Energy's 34.5 kV transmission line number 3603, between the Washburn Switch and the proposed Pikes Creek Substation. The average span length between tangent structures will be approximately 300 to 400 feet. Typical structures on the East Route will be double-circuit, with horizontal post insulators, three on each side, and a shield wire on the top of the pole. Structure heights are typically 57 to 61 feet tall, though heights vary based on the existing terrain and span lengths. A typical photo of the existing structures that would be replaced is shown in Figure 5.3-3. A typical photo of the primary new structure type proposed for the Project is shown below in Figure 5.3-4. Note that Figure 5.3-4 shows an example of a wood pole structure type; as noted previously; the proposed structures may be weathering steel or wood.

The East Route will be located almost entirely within the existing transmission corridor and is generally sited on opposite sides of roads from existing distribution.

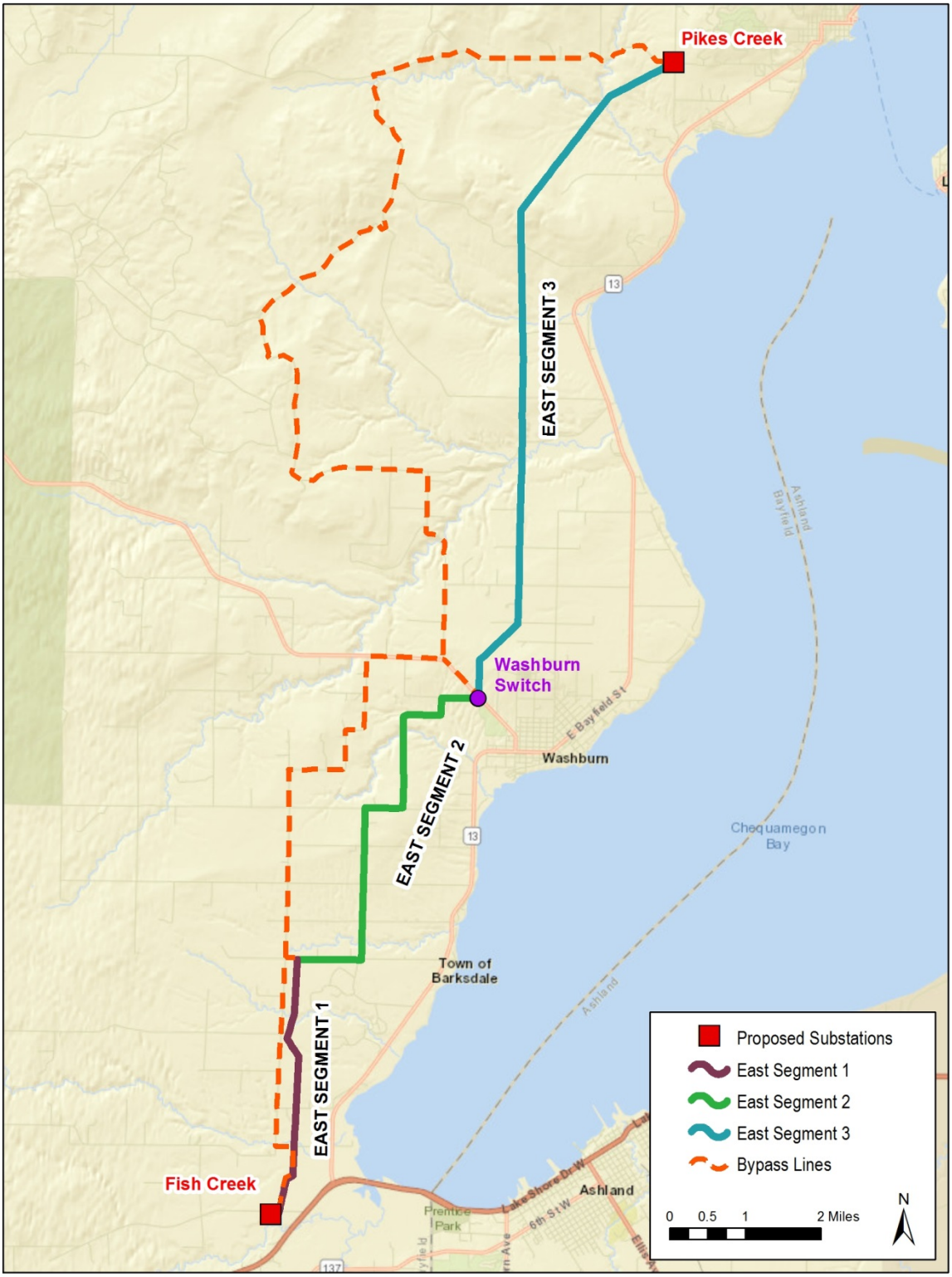
Figure 5.3-3 Typical Structures on Existing Line

Figure 5.3-4 Typical Double-Circuit 34.5 kV/34.5 kV Structure Type

To maintain electric service during construction, a 26.4-mile temporary bypass line would be needed for this route. Xcel Energy would install Temporary Bypass Line Segments 1, 2, and 3 prior to constructing the double circuit for East Route Segments 1 and 2 between the Fish Creek Substation and the Washburn Switch. Once that portion is completed, Xcel Energy would remove Temporary Bypass Line Segments 1 and 2 and install Temporary Bypass Line Segment 4, connecting it to Temporary Bypass Line Segment 3 and energizing that second temporary bypass phase prior to constructing the double circuit for East Route Segment 3 between the Washburn Switch and proposed Pikes Creek Substation.

As mentioned above, the East Route would be constructed within Xcel Energy's existing ROW with the adjustments described by segment below. A separate tie line segment is not necessary for the East Route because the new and existing lines share the same corridor and the tie between the two, located adjacent to the Washburn Switch, is only approximately 25 feet in length. The temporary bypass line will be co-located with road ROW for its entire length. For the purposes of this application and because the temporary bypass line is approximate and will be sited along the route based on ground conditions, we assume no ROW sharing between the temporary bypass line and road ROW.

Figure 5.3-5 East Route Segments



East Route Segment 1

East Route Segment 1 is 3.5 miles long and generally extends from the proposed Fish Creek Substation north to Nolander Road. This segment parallels Terwilliger and Wickstrom Roads for approximately 1.1 miles before the existing corridor follows field edges and travels through woodland.

East Route Segment 2

East Route Segment 2 is 5.8 miles long and generally travels from a point approximately 825 feet east of the intersection of Nolander and Ondossagon Roads north and east to the existing Washburn Switch along County Road C approximately 0.7 miles northwest of Washburn. This segment follows existing roads for 3.7 miles before the corridor travels through woodland to the Washburn Switch. There is a proposed change to the existing ROW for one span north of Thompson Creek to accommodate engineering and construction needs due to the challenging terrain in this location.

East Route Segment 3

East Route Segment 3 is 9.6 miles long and generally travels north from the existing Washburn Switch to the proposed Pikes Creek Substation at the intersection of Star Route Road (County Road J) and Hatchery Road. This segment follows roads and traverses woodland within the existing transmission corridor. There are two spans on this segment that will require wider ROW than the existing 100 feet: the 1,400-foot-long span where the line crosses the Onion River where the ROW will need to be widened to 150 feet, and the 1,300-foot span where the line crosses Pikes Creek where the ROW will need to be widened to 125 feet.

Temporary Bypass Line Segment 1

Temporary Bypass Line Segment 1 is a 3.7-mile segment from the proposed Fish Creek Substation north to the intersection of Nolander and Ondossagon Roads. This segment parallels Terwilliger and Ondossagon Roads for the entire length. For a portion of this segment, the temporary bypass line will be on the opposite side of the road as the existing 34.5 kV transmission line.

Temporary Bypass Line Segment 2

Temporary Bypass Line Segment 2 is a 6.0-mile segment from the intersection of Nolander and Ondossagan Roads north and east to the intersection of County Road C and Big Rock Road. This segment parallels Ondossagon Road, McKinley Road, and County Road C for its entire length.

Temporary Bypass Line Segment 3

Temporary Bypass Line Segment 3 is a 0.25-mile segment from the intersection of Big Rock Road to the existing Washburn Switch. This segment parallels County Road C for its entire length.

Temporary Bypass Line Segment 4

Temporary Bypass Line Segment 4 is a 15.7-mile segment from the intersection of Big Rock Road north and east to the proposed Pikes Creek Substation. This segment parallels Big Rock Road, Friendly Valley Road, Van Stone Road, Little Sioux Road, Jammer Hill Road, and Star Route Road for its entire length.

5.4 Impact Tables

Route impact tables, which quantify the general impacts of constructing the transmission line, have been prepared for each route segment. These tables are included in Appendix B and summarize impacts associated with the proposed transmission line corridor. Off-ROW access will be required in certain locations to construct the route. Land cover impacts associated with off-ROW access are provided in Section 5.7. Information regarding the type and date of source data is included with each table. Copies of each table have also been provided to Commission staff in Microsoft Excel spreadsheet format.

Below is a list of the impact tables included:

- Table 1 – General Route Impacts;
- Table 2 – Land Cover - Transmission Line / Off-ROW Access Roads;
- Table 3 – Federal, State, Local, and Tribal Lands excluding ROWs;
- Table 4 – Sensitive Receptors;
- Table 5 – Residential Buildings;
- Table 6 - Magnetic Field Data (included as Appendix E);
- Table 7 – Route Impact Summaries; and

An outline of the methods used to prepare the impact tables and a summary of the results for each route is presented below.

The information contained in these tables was developed using a combination of sources including available reference data, aerial photography, and field observations along accessible segments. These sources were utilized to measure and calculate impacts using GIS software.

The reference data utilized include county tax parcel data obtained in fall of 2018; databases from the State of Wisconsin regarding the locations of schools, daycares, and hospitals; state managed lands information from the WDNR; USFWS cadastral data; and U.S. Geological Survey (USGS) Gap Analysis Program (GAP) land cover data. Sources of aerial photography ranged from 2015-2017.

Field observation of the routes included both windshield surveys and off-road ROW surveys completed on multiple dates between August 2016 and September 2018.

5.4.1 General Route Impacts

More detailed line items for General route impacts are listed in Appendix B, Table 1.

5.4.1.1 Methods

The general ROW requirement and ROW sharing characteristics for each route are presented in Table 1 of Appendix B. For this table, East Route Segments 2 and 3 were broken into sub-segments to facilitate analysis and account for the additional ROW needed in three locations. GIS software was used to determine sub-segment and segment lengths, and the new and shared ROW widths.

The type and extent of existing ROW was determined from Xcel Energy's existing easements, aerial photography, and field observations. The following assumptions were made with respect to route impacts and ROW sharing:

- West Route: West Route Segment 1 would be constructed within Xcel Energy's existing 100-foot-wide ROW. West Route Segments 2 and 3 assume 20-foot ROW sharing with county and local roads. West Route Segment 4 is generally collocated with roads wherever practicable, but due to the curvilinear nature of many of the roads along portions of this segment, Xcel Energy assumes there is no ROW sharing. Similarly, Temporary Bypass Line Segments 1 and 1W are collocated with roads, but for the purposes of this analysis, Xcel Energy assumes there will be no ROW sharing. The portion of West Route Segment 4 along Star Route Road will share ROW with existing Bayfield Electric distribution lines for most of the length.
- East Route: this route would be constructed within Xcel Energy's existing 100-foot-wide ROW for the length of the route. Two locations require a wider ROW to facilitate a longer span over the Onion River (additional 50 feet; total ROW = 150 feet) and Pikes Creek (additional 25 feet; total ROW = 125 feet). Additionally, one location north of Thompson Creek will require an alignment change resulting in 0.4 acre of new ROW. Temporary Bypass Line Segments 1-4 are all collocated with roads, but for the purposes of this analysis, Xcel Energy assumes there will be no ROW sharing.

5.4.1.2 Summary of General Route Impacts

The West Route is 26 miles long. This Route would also require a 4-mile temporary bypass for Segment 1 to be built to double circuit. West Route Segment 1 would have a 100-foot ROW; West Route Segments 2-4 would have a 50-foot ROW. As indicated above in the methods, West Route Segments 2 and 3 assume 20 feet of ROW sharing with township and county roads. West Route Segment 4 generally follows roads, however due to the curvilinear nature of the roads in this area Xcel Energy assumes no ROW sharing. The final 3.9 miles of West Route Segment 4 along Star Route Road assumes 40 feet of ROW sharing with existing distribution lines and 10

feet of new ROW. The temporary bypass line for the West Route would require up to 20-foot-wide temporary ROW and assumes no ROW sharing even though it follows roads.

The East Route is 18.9 miles long with a 26.4-mile temporary bypass line. The East Route will be constructed within the existing 100-foot ROW with the exception of four locations. On East Route Segment 2, Xcel Energy plans to change a corner angle north of Thompson Creek. Rather than a right angle, due to topography constraints, Xcel Energy will remove the existing corner structure to create a softer angle. This shift will shorten the segment by approximately 120 feet. No new landowners are impacted by this shift. On East Route Segment 3, Xcel Energy will lengthen the spans of the Onion River and Pikes Creek, and therefore need wider ROW in those areas. The Onion River crossing would span 1,423 feet and require a 150-foot-wide ROW (additional 25 feet on either side of the transmission line). The Pikes Creek crossing would span 1,313 feet and require a 125-foot-wide ROW (additional 12.5 feet on either side of the transmission line). The temporary bypass line will require up to 20-foot-wide temporary ROW for its entire length. For the purposes of this application, and because the temporary bypass line is approximate and would be sited along the route based on ground conditions, we assume no ROW sharing between the temporary bypass line and road ROW.

Table 5.4-1 Summary of General Route Impacts by Route

Route	Total ROW (New + Shared)		Shared ROW				New ROW		Total % of Shared ROW
	Total Length (ft)	Total ROW Area (acres)	Shared ROW Length (ft)	Existing ROW Width (ft)	Shared ROW Width	Shared ROW Area (acres)	New ROW Width (ft)	New ROW Area (acre)	
West Route	137,195	178.7	84,193	40-100	20-100	78.3	30-50	100.4	42%
West Bypass	20,869	9.6	-	-	-	-	20	9.6	
West Total	**158,064**	**188.3**	**84,193**			**78.3**		**110.0**	
East Route	99,646	231.1	99,463	100	100	228.3	25-100	2.8	77%
East Bypass	139,447	64.0	-	-	-	-	20	64.0	
East Total	**239,093**	**295.1**	**99,463**			**228.3**			

5.4.2 Land Cover/Land Use

Land Cover generally refers to the current type of features, either natural or human-made, on the land. Land Use refers to how humans use the land. Land cover/use types by route segment are included in Appendix B, Table 2.

5.4.2.1 Methods

Land cover types were derived from the USGS GAP Land Cover database (USGS, 2014). The GAP Ecosystem Land Use attribute was reviewed and assigned to a category consistent with the PSCW

Table 2. Table 5.4-2 below displays the GAP Ecosystem Land Use categories and how they were translated to the PSCW categories. After the reclassification, the land cover data was spot checked for accuracy.

For each route, a corridor corresponding to the required ROW width was established along the route centerline. Existing ROW corridors were then overlaid on the route corridor to distinguish land cover in existing ROW versus new ROW. The polygons of each land cover type were then clipped with the route and existing ROW corridors. The acreages of each resulting polygon were quantified with GIS software. The resulting acreages were summed by land type within existing and new ROW for each segment.

Table 5.4-2 Land Cover/Land Use Classification

USGS GAP Ecosystem Land Use Type	PSCW Land Cover Type	PSCW Land Use Category
Cultivated Cropland	Crop Land	Agricultural
Pasture/Hay[1]	Grassland	Undeveloped Lands
Harvest Forest – Grass/Forb Regeneration		
Recently Burned Grassland		
Laurentian-Acadian Floodplain Systems	Non-Forested Wetland[2]	
Open Water (fresh)		
Great Lakes Coastal Marsh Systems		
Central Interior and Appalachian Shrub-Herbaceous Wetland Systems		
Great Plains Prairie Pothole		
Laurentian-Acadian Swamp Systems	Forested Wetland[2]	
Boreal-Laurentian Conifer Acidic Swamp and Treed Poor Fen		
Eastern Boreal Floodplain		
Boreal Aspen-Birch Forest	Upland Forest	
Laurentian-Acadian Northern Hardwoods Forest		
Laurentian-Acadian Northern Pine-(Oak) Forest		
Laurentian Pine-Oak Barrens		
Boreal White Spruce-Fir-Hardwood Forest		
Boreal Jack Pine-Black Spruce Forest		
Developed, Open Space	Developed	Developed/Urban
Developed, Low Intensity		
Developed, Medium Intensity		
Developed, High Intensity		
Disturbed, Non-specific		

[1] Pasture/hay lands have not been field-verified to assess previous disturbance. For the purposes of the analysis in this application, Xcel Energy is categorizing pasture/hay as grassland.

[2] Forested and non-forested wetlands described here are based on the GAP land use types. A more detailed discussion of wetlands based on Wisconsin Wetlands Inventory data is presented in Sections 6.3 and 8.0.

5.4.2.2 Summary of Land Cover

Appendix B, Table 2 provides an estimate of the land cover that will be impacted by each route option within the proposed ROW. A map of land cover in the Project area is also included in Appendix 1 Figure 6. The land cover present in the area includes agricultural lands, undeveloped

lands, and developed/urban lands as described in more detail below. A summary of Appendix B, Table 2 is presented below in Table 5.4-3.

Table 5.4-3 Summary of Land Cover Impacts by Route

Route	Agricultural[1]		Undeveloped Lands								Developed/ Urban	
	Crop Land		Grassland		Non-Forested Wetland		Forested Wetland		Upland Forest			
	ROW Area (acres)		ROW Area (acres)		ROW Area (acres)		ROW Area (acres)		ROW Area (acres)		ROW Area (acres)	
	Shared	New	Shared	New	Shared	New	Shared	New	Shared	New	Shared	New
West Route	0.1		6.4	2.5	1.1	0.3	4.2	0.5	40.9	68.3	25.8	28.4
West Bypass				1.8		0.4		0.3		2.0		3.9
East Route	0.2		16.5		3.8		6.2		152.5	2.7	48.8	
East Bypass		0.1		4.4		0.4		0.6		35.1		22.3

[1] This category also includes Specialty; however, since there are no specialty crops crossed by the Project, the category is not included in this summary.

Agricultural Land Use

Agricultural land cover includes active fields, pastures, recently fallow fields (old field) and specialty crops (i.e., tree farms). Fields or other areas with no evidence of recent tillage or agricultural production were not included as agricultural land. A detailed discussion of agricultural lands in included in Section 6.1.

Crop Land

The routes cross hay (non-alfalfa), corn, and alfalfa primarily in the southern portion of the Project. Based on a review of U.S. Department of Agriculture (USDA) Agriculture data, aerial photography, and field reviews, there are no specialty crops along either of the routes.

There is only 0.1 acre of cropland along the West Route. This occurs along West Route Segment 4 in shared ROW.

Approximately 0.3 acres of cropland are crossed by the East Route. The majority of the cropland (comparing total acreage) occurs along East Route Segment 2 (0.2 acre); Temporary Bypass Line Segment 2 also has 0.1 acre of cropland.

Undeveloped Lands

The types of undeveloped lands include grassland, non-forested wetland, forested wetland, and upland forest.

Grassland

Grasslands identified along both routes consist primarily of hay/pasture. As mentioned above, because areas identified as hay/pasture in the USGS GAP data were not field verified as previously disturbed, these lands are conservatively classified as grassland. To a lesser extent, grasslands are also characterized as harvest forest – grass/forb regeneration and recently burned grassland.

Approximately 6.4 acres of grassland are crossed by the West Route, almost all of which are in West Route Segment 1 (5.3 acres). Over half of the lands identified as grassland are in shared ROW of West Route Segments 1-2 compared to new ROW.

There are approximately 21 acres of grassland crossed by the East Route, most of which are in shared ROW. East Route Segment 2 crosses the most grassland (5.8 acres).

Non-Forested Wetland

This section refers to non-forested wetland types encountered along the routes (i.e., Laurentian-Acadian Floodplain Systems, open water (fresh), Great Lakes coastal marsh systems, central interior and Appalachian shrub-herbaceous wetland systems, and great plains prairie pothole; Table 5.4-1). Forested wetlands are discussed in the next section. As mentioned in Table 5.4-1, these wetland types are based on GAP land cover data; a detailed discussion of wetlands based on Wisconsin Wetland Inventory (WWI) along both routes is provided in Sections 6.2 and 8.0.

The West Route crosses approximately 1.8 acres of non-forested wetland. Over half of the non-forested wetland total crossed by the West Route is within the shared ROW of West Route Segment 1 (1.0 acre). West Route Segments 2 and 3 cross 0.1 acre and 0.2 acres of non-forested wetland in new ROW, respectively. Additionally, Temporary Bypass Line Segment 1 crosses 0.4 acre of non-forested wetland.

The East Route crosses approximately 4.2 acres of non-forested wetland. Most of the non-forested wetland total crossed by the East Route is within the shared ROW of East Route Segments 1-3 (3.8 acres). Temporary Bypass Line Segment 1 crosses 0.4 acre of non-forested wetland.

Forested Wetland

As previously discussed, a detailed discussion of wetland types along both routes, including forested wetlands and the criteria used to identify forested wetland areas, is included in Sections

6.2 and 8.0. The forested wetland category includes wetlands located in existing transmission line ROW which are no longer forested. Based on the GAP land cover classifications, forested wetlands include Laurentian-Acadian Swamp Systems, Boreal-Laurentian Conifer Acidic Swamp and Treed Poor Fen, and Eastern Boreal Floodplain.

The West Route crosses 5.0 acres of forested wetland, including 3.6 acres within the shared ROW of West Route Segment 1 and 0.3 acre in West Route Segments 2 and 4, which have already been cleared. Approximately 0.8 acres of forested wetlands will be crossed in new ROW along West Route Segments 2, 4, and Temporary Bypass Line Segment 1.

The East Route crosses 6.8 acres of forested wetland, most of which is within the shared ROW. East Route Segment 1 crosses 3.6 acres, East Route Segment 2 crosses 1.4 acres, and East Route Segment 3 crosses 1.2 acres of forested wetland. Temporary Bypass Line Segments 1, 2 and 4 cross 0.3, 0.2, and 0.1 acre of forested wetland in new ROW, respectively.

Upland Forest

A detailed discussion of forested lands along both routes, including the criteria to identify forested areas, is included in Section 6.1. The upland forest category includes cleared areas in existing transmission line ROW through previously wooded areas. Based on the GAP land cover data, the following ecosystem land use types comprise upland forest: boreal aspen-birch forest, Laurentian-Acadian northern hardwoods forest, Laurentian-Acadian northern pine-oak forest, Laurentian pine-oak barrens, boreal white spruce-fir hardwood forest, and boreal jack pine-black spruce forest (Table 5.4-1).

The quantity of upland forest presented in Appendix B, Table 2 for both routes assumes all woodland in the proposed ROW will be cleared. However, in areas with steep terrain and bluffs (i.e., portions of West Route Segment 4 and East Route Segment 3), some woodlands in valleys may not need to be cleared if there is sufficient distance between the height of the conductor and the top of the trees. These areas were not identified for purposes of preparing this Application, and thus, Appendix B, Table 2 may over estimate woodland impacts along segments with this terrain.

The West Route will cross approximately 111 acres of land categorized as upland forest. This total includes about 41 acres of previously cleared forest on existing utility ROW and 70 acres of new ROW that will require clearing. Most of the upland forest along this route occurs along West Route Segment 4 (63.6 acres).

The East Route will cross approximately 190 acres of land categorized as upland forest. These totals include nearly 153 acres of previously cleared forest within the existing utility ROW; only 2.7 acres of upland forest would need clearing along the East Route. The temporary bypass Line will cross nearly 35 acres of upland forest and require clearing.

Developed / Urban Land

Developed lands are based on the GAP land use developed types classifications (Table 5.4-1). These are primarily related to roads along the routes.

The West Route crosses 58.1 acres of developed/urban lands. Shared ROW accounts for 25.8 acres across West Route Segments 1-3. Most of the impacts for new ROW are associated with West Route Segment 2, which shares road ROW (13.0 acres).

The East Route crosses 71.1 acres of developed/urban lands. Shared ROW accounts for 48.8 acres across East Route Segments 1-3. Most of the impacts for the new ROW are associated with Temporary Bypass Line Segments 2 and 4, which shares road ROW.

5.4.3 Federal, State, Local, and Tribal Lands

Federal, state, local and tribal lands are listed in Appendix B, Table 3 and shown on Figure 8 in Appendix A.

5.4.3.1 Methods

Federal, state, local, and tribal lands were identified from a number of sources including parcel data and public lands (parcel) data from Bayfield County, WDNR managed areas, and USFWS cadastral data. As a starting point, Xcel Energy reviewed ownership in parcel data from Bayfield County (current as of September 2018). Xcel Energy then joined the public lands data to the parcel data based on the parcel identification field and assigned generic ownership and management fields to the database (i.e., federal, state, local, and tribal). Xcel Energy cross-referenced the ownership with WDNR and USFWS data. Data discrepancies were identified, reviewed, and corrected to reflect data that matched the appropriate jurisdiction. For example, neither the Bayfield parcel data or public lands data contained ownership information for the South Shore Lake Superior Fish and Wildlife Area that was displayed in the WDNR managed areas data. Therefore, these parcels were coded as state lands. While the lands in this example may be private lands managed by the WDNR, they are displayed as state lands and identified in Appendix B, Table 3.

The acreages of these managed lands intersecting the Project ROW was determined by intersecting the parcel data with the routes. However, as requested by the Commission, a representative length is also provided for each entry in Appendix B, Table 3. The length refers to the maximum length of a parcel within the proposed ROW. In some cases, the parcel data created instances where the route width included only a portion of a parcel. The route widths in Appendix B, Table 3 represent the entire route width needed for that segment. The ROW acreages are based on GIS calculations and account for these instances where the parcel edges do not align with the route width. Where the crossing length is zero, the public lands parcel is within the Project ROW, but not overlapping the proposed centerline.

Due to the number of public land parcels crossed by the routes, Xcel Energy has created a summary table of crossing lengths and acreages crossed by Segment and management type for each route. These are included as separate tabs within Appendix B, Table 3.

5.4.3.2 Summary of Federal, State, Local, and Tribal Lands

An estimate of the potential impacts to public lands is compiled for both routes and is included in Appendix B, Table 3 and summarized below in Table 5.4-4. Public lands will not be impacted by either the Fish Creek or Pike Creek substations.

Table 5.4-4 Summary of Government Lands Crossed by Route

Route	Federal			State			County			Local		
	ROW Length (mi)	ROW Area (acres)		ROW Length (mi)	ROW Area (acres)		ROW Length (mi)	ROW Area (acres)		ROW Length (mi)	ROW Area (acres)	
		Shared	New		Shared	New		Shared	New		Shared	New
West Route	1.3	11.7		1.2	2.0	5.2	7.7		46.2	0.6	1.8	2.0
West Bypass	0.3		0.7							0.1		0.2
East Route	1.3	11.7		1.6	19.3	0.7	2.3	26.2		0.5	4.9	
East Bypass	0.3		0.7	0.9		2.3	9.4		22.7	0.2		0.5

The West Route will cross federal, state, county, and local lands. The West Route will cross 11.2 miles of public land, 7.7 miles of which are on Bayfield County Forest land. Of the 69.8 acres of ROW that would be on public land, 54.3 acres of new ROW would be needed.

West Route Segment 1 and Temporary Bypass Line Segment 1 cross the Whittlesey Creek NWR, as described above for East Route Segment 1. The West Route will cross several WDNR owned and managed parcels of the South Shore Lake Superior Fish and Wildlife Area. West Route Segments 2, 3, and 4 cross these WDNR lands totaling approximately 6,300 feet. The crossings of these state lands by West Route Segments 2 and 3 are paralleling a road. The West Route Segment 4 crossing would not follow a road but cross the parcel in the shortest path along a distribution line.

West Route Segment 4 will cross nearly eight miles of Bayfield County Forest lands. To the extent practicable due to terrain and the curvilinear nature of the existing forest service roads, the route follows existing forest service roads as much as possible. The West Route also crosses several locally owned parcels, including the towns of Barksdale, Washburn, and Bayview. These parcels are locally owned and do not necessarily mean the route crosses through the municipal boundaries.

The East Route will cross federal, state, county, and local lands. The East Route will cross 16.4 miles of public lands, 11.5 miles of which are within the Bayfield County Forest. Of the 89 acres

of ROW needed for this route on public land, 62.1 are within the existing utility corridor. The majority of the 26.9 acres of new ROW are associated with the temporary bypass line.

East Route Segment 1 and Temporary Bypass Line Segment 1 cross the Whittlesey Creek NWR. The East Route Segment 1 would cross approximately one mile of the NWR within the existing easement and paralleling a road at the edge of the NWR boundary; the Temporary Bypass Line Segment 1 would also cross approximately one mile of the NWR and parallel to Terwillinger Road. The USFS owns several parcels adjacent and south of the NWR. Both East Route Segment 1 and the Temporary Bypass Line Segment 1 will cross approximately half mile of Chequamegon-Nicolet National Forest owned by the USFS.

The East Route will cross several WDNR owned and managed parcels of the South Shore Lake Superior Fish and Wildlife Area. These lands preserve a large, self-sustaining anadromous fishery with the goal to enhance the stream and coastal habitats to benefit flora and fauna. They are primarily associated with trout streams and other waterbodies than flow into Lake Superior. East Route Segment 3 and Temporary Bypass Line Segments 2 and 4 cross these state managed areas.

The East Route will also cross several locally owned parcels owned by the Towns of Barksdale, Washburn, and Bayview.

5.4.4 Schools, Hospitals and Daycare Centers

Distances to schools, daycare centers, and hospitals are addressed in Appendix B, Table 4. There are no schools, daycare centers or hospitals within 300 feet of either of the West or East routes.

5.4.4.1 Methods

The number of schools, daycare centers and hospitals and the distance of these buildings from the route centerlines were determined using GIS measurements to geocoded addresses provided by the following state agencies:

- Locations of licensed family and group child care centers were provided by the Wisconsin Department of Children and Families (Wisconsin Department of Children and Families, 2018);
- Public and private school locations were provided by the Wisconsin Department of Public Instruction (Wisconsin Department of Public Instruction, 2018); and
- Hospital locations were provided by the Wisconsin Department of Health Services (Wisconsin Department of Health Services, 2018).

5.4.4.2 Summary

There are no schools, daycare centers, or hospitals within 300 feet of either the West Route or East Route centerlines. The nearest school and daycare center are approximately half mile from East Route within the Town of Washburn. There are no hospitals in Bayfield County.

5.4.5 Residential Buildings

Residential buildings include homes and apartments. Residential buildings within 300 feet of either route are quantified in Appendix B, Table 5 and are shown in Appendix A, Figure 6.

5.4.5.1 Methods

The types of residential buildings (homes and apartments) and the distance of these buildings from the route centerlines were determined using GIS measurements on aerial photography. Residential buildings were tallied according to five distance categories from the route centerlines: 0–25 feet, 26–50 feet, 51–100 feet, 101–150 feet, and 151–300 feet. Where residences were within 300 feet of multiple route segments, the residence was classified with the closest segment.

5.4.5.2 Summary of Residential Buildings

Residential buildings within 300 feet of each route centerline are summarized below in Table 5.4-5.

Table 5.4-5 Summary of Distances of Residential Buildings from ROW Centerline by Route

Route	0-25 feet	26-50 feet	51-100 feet	101-150 feet	151-300 feet
West Route	1		6	12	46
West Bypass	1		4	4	1
East Route	1		1	6	26
East Bypass	1		10	8	27

[1] There are only residential homes in proximity to the Routes; there are no apartment buildings within 300 feet of either route centerline.

The West Route has a total of 75 residences within 300 feet of the centerline, all of which are homes. There are no apartment buildings within 300 feet of the centerline (Appendix B, Table 5). Two homes are within 0-25 feet of the centerline: one along West Route Segment 4 and one along Temporary Bypass Line Segment 1. The West Route has 47 homes within 151-300 feet of the centerline.

The East Route has a total of 80 residences within 300 feet of the centerline, all of which are homes. There are no apartment buildings within 300 feet of the centerline (Appendix B, Table 5). Two homes are within 0-25 feet of the centerline: one along East Route Segment 3 and one

along Temporary Bypass Line Segment 1. The East Route has 53 homes within 151-300 feet of the centerline.

5.4.6 Route Impact Summaries

A summary of the impacts associated with each route option is provided in Appendix B, Table 7. This includes key items that were included in the separate impact tables listed and described in sections 5.4.1 – 5.4.5 above.

5.5 Construction Impacts

The proposed transmission line will be designed to meet or surpass relevant local and state codes including the National Electric Safety Code, North American Electric Reliability Corporation, and Xcel Energy standards. Appropriate standards will be met for construction and installation, and applicable safety procedures will be followed during and after installation.

5.5.1 Proposed construction sequence

The Project does not involve construction of underground transmission lines. Therefore, construction activities are described only for overhead transmission line construction. An overhead transmission line requires several different activities at any given location. The following information generally describes the major construction activities, their approximate sequence, and the anticipated impacts associated with each activity.

Note, for construction either the West Route or the East Route some temporary bypass line construction will be necessary in order to make it possible to provide electricity to communities north of the construction area while the new line is being built. Additional detail about construction of temporary bypass lines is provided below in sections 5.5.1.1 and 5.5.1.2. Construction of the substations will take place concurrent with construction of the transmission lines. Lines and substation construction sequences are separated below.

Transmission Lines:

- Soil borings – Collection of geotechnical data will be necessary for final design of the transmission line. Soil borings are typically completed using rubber tired or tracked drill rigs, depending on site and access conditions. A pick-up truck or ATV is also typically used to transport the crew and drilling supplies to the work area.

- Surveying and staking of ROW – These activities are minimal impact, typically completed by a two-person crew travelling by foot, ATV, or pick-up truck.

- Tree Clearing– Vegetation crews will clear new or expanded ROW, and where necessary, access routes. Vegetation will be cut at or slightly above the ground surface using mechanized mowers, harvesters or by hand. Root stocks will

generally be left in place, except in areas where stump removal is necessary to facilitate the movement of construction vehicles, or as required by the landowner.

- Access Road Construction – In some locations such as areas of steep topography or where the ROW is remote, access roads will need to be constructed prior to line construction. This includes activities such as tree clearing, grading, and putting down gravel. This work is typically completed using equipment such as a bulldozer, track-hoe, skid-loader, and dump trucks.

- Install Construction Matting – Matting will be installed along access roads and the ROW to provide access through wetlands or other unstable soil areas prior to transmission line construction. Construction matting may consist of timber, composite, or hybrid timber mats and will be installed with rubber-tired mat trucks, forwarders, forklifts or skid loaders. Mat roads will generally be 16 to 20 feet wide with some larger matted work platforms, if needed, depending on the type of structure and location.

- Installation of erosion control Best Management Practices (BMPs) – BMPs will be location specific and installed prior to all anticipated ground disturbance. Where unexpected ground disturbance occurs, BMPs will be installed immediately after the disturbance occurs. Typical erosion control equipment includes ATVs and or trucks for crew transportation, skid loaders, tractors, backhoes, hydro-seeders and other light duty equipment. Temporary staging of poles and other materials along ROW – Trucks, loaders, and cranes will be needed to unload foundation materials, poles and other materials near each work location.

- Foundation installation and/or excavation for direct embedded structures – Both routes include a combination of direct-embedded poles without culverts, direct-embedded poles with culverts and rebar-reinforced drilled pier foundations. In general, the excavated holes range from 2 feet to 9 feet in diameter, depending on foundation type and soil conditions.

- If there are areas where groundwater seeps into the excavation, or where water is needed to hold the hole during drilling, it may be necessary to dewater the excavation. Depending on site conditions, the water may be de-silted and discharged to an upland area where it is allowed to re-infiltrate, or removed from site via a tank truck. Dewatering will proceed in accordance with applicable regulations and permit requirements.

- Structure setting for direct-embedded poles without culverts (no concrete foundation and no culvert), a hole is excavated to the appropriate depth. The base of the structure is placed into the excavated hole, and the area around the pole is backfilled with clean granular fill. For direct-embedded poles in culverts a hole is

excavated, a culvert is placed vertically into the hole (typically 48-inch diameter) and the pole is then inserted in the middle of the culvert to the appropriate depth, then backfilled.

For structures requiring a reinforced concrete foundation, the required hole is excavated and a rebar cage and anchor bolts are placed into the excavation. The excavation is then filled with concrete to a point where the rebar cage and anchor bolts are covered leaving a typical 1- to 2-foot reveal of the foundation above grade with exposed threaded anchor bolts. The complete caisson is allowed to cure. Drilled-pier foundations will typically be about 7 feet in diameter.

Typical equipment for this phase of construction includes: dump trucks, drill rigs, cranes, vacuum trucks, concrete trucks, concrete pump trucks and tanker trucks.

- Structure setting – (for drilled pier foundations) after the direct embed base is set or the caisson is cured, the steel pole structure is mounted to the base. Typical equipment for this phase of construction are cranes and bucket trucks.

- Wire stringing and clipping – once all the structures within a wire-pull segment are set, dollies are attached to the cross-arms and ropes are pulled through each of the dollies. Crews will need to access all the structures in that wire-pull segment to get the rope from structure to structure. These ropes are then used to pull the conductor wires in. Crews will access each of the structures, install the insulators and clip the conductor wire into each, and remove the dollies. This requires access to each structure with either a bucket truck or helicopter. Wire set up areas containing reel trailers, wire pullers, and related equipment are located at each end of the wire pull.

- Cleanup and Restoration of ROW – Upon completion of construction, cleanup and site restoration occurs. This includes removing construction mats, temporary clear span bridges (TCSBs), and other material or debris from the ROW, any necessary seedbed preparation, and seeding. Typical equipment for these activities includes mat trucks, bobcats, pickup trucks, and other light duty vehicles.

For Substations:

- Soil Borings – Collection of geotechnical data will be necessary for final design of substation foundations. Soil borings are typically completed using rubber tired or tracked drill rigs, depending on site and access conditions. A pick-up truck or ATV is also typically used to transport the crew and drilling supplies to the work area.

- Surveying and staking site - These activities are minimal impact, typically completed by a two-person crew travelling by foot, ATV, or pick-up truck

- Tree Clearing– Vegetation crews will clear the sites to provide adequate clearance for substation grading as well as transmission lines which will tie into the subs. In the substation area, the necessary trees will be cut and all stumps and roots will be removed during site grading.

- Installation of erosion control BMPs – BMPs will be installed prior to beginning grading, and will continue to be modified and repaired as needed throughout the construction process. Typical erosion control equipment includes ATVs and or trucks for crew transportation, skid loaders, tractors, backhoes, hydro-seeders and other light duty equipment.

- Grading of site to build the substation pad – Sites will be graded to create level areas and construct the substation pad (more detail about pad construction is included in Section 5.5.2.1. Typical equipment includes bulldozers, excavators, dump trucks, and bobcats.

- Installation of concrete footings – Once the gravel pad is complete concrete footings and pads are poured and assembled to support electrical equipment. Equipment includes concrete trucks and pump trucks.

- Installation of electrical equipment – Substation layout drawings are included in Appendix C, Figures 1 and 2, which show the proposed equipment and layout for each of the substations.

5.5.1.1 West Route Construction Sequence

In addition to the proposed construction sequence described above, construction of the West Route will also require construction of Temporary Bypass Line Segments 1 and 1W prior to beginning construction of Segment 1 of the West Route. Construction of the temporary bypass line would generally follow the same steps as described for the permanent transmission line. Once the temporary bypass line is completed it would be energized and the existing line in Segment 1 would be de-energized, after which crews will be able to remove the existing poles and conductor and begin construction of the new double-circuit segment.

- Construct Temporary Bypass Line Segments 1 and 1W
- Energize the Temporary Bypass Line and de-energize existing line corresponding to West Route Segment 1
- Wreck out existing transmission line in West Route Segment 1
- Construct new double-circuit West Route Segment 1
- Energize the existing transmission line on the new segment (only 1 of 2 circuits energized at this point), de-energize the temporary line
- Commence construction of West Route Segments 2-4

- Remove Temporary Bypass Line and restore disturbed areas as needed along bypass line Segments 1 and 1W
- Energize West Route Segments 2-4
- Restore disturbed areas as needed along West Route Segments 2-4

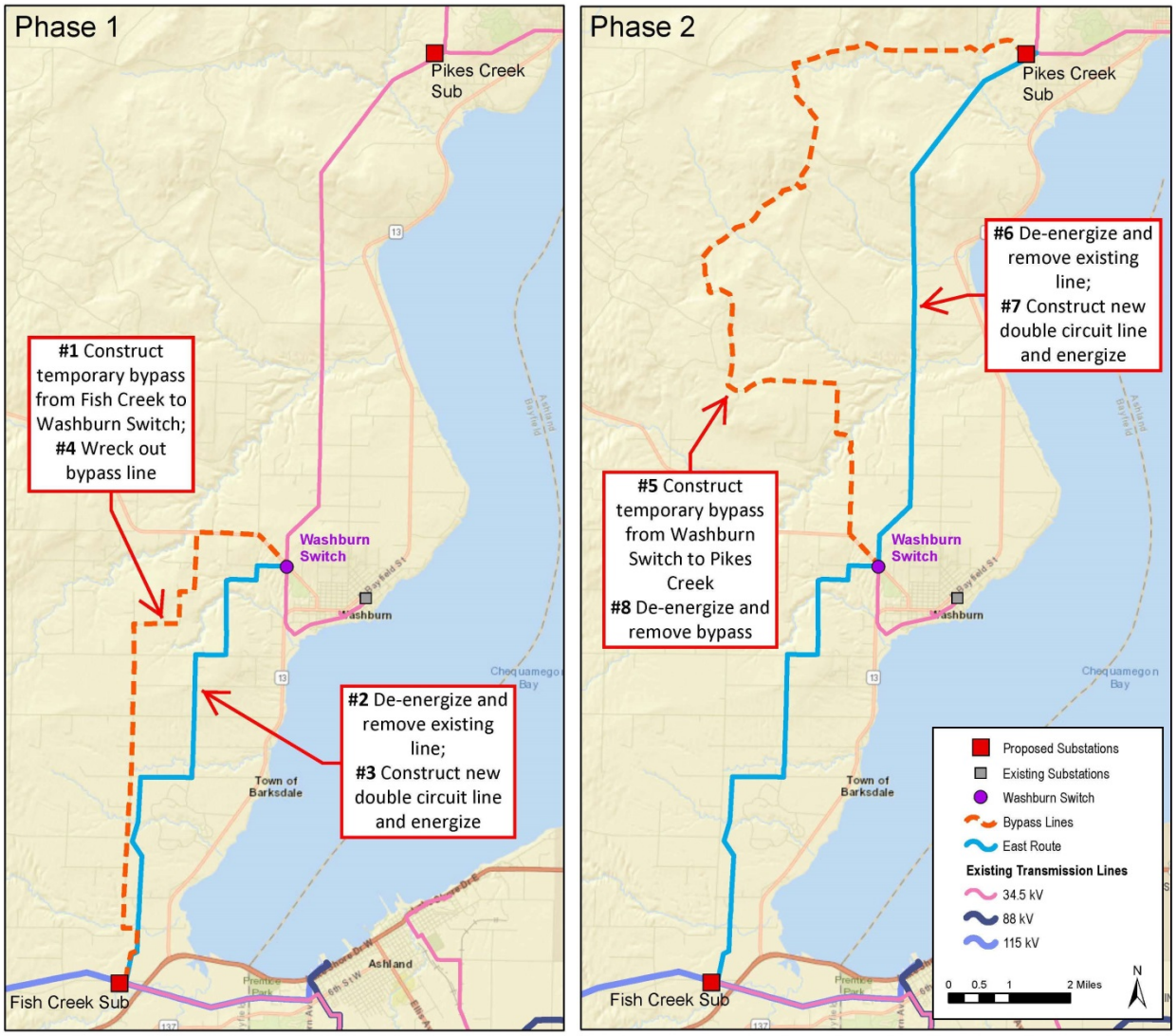
5.5.1.2 East Route Construction Sequence

In addition to the proposed construction sequence described above, construction of the East Route will also require construction of temporary bypass line to be done in two phases. Phase 1 would include construction of Temporary Bypass Line Segments 1, 2, and 3 prior to beginning construction of Segments 1 and 2 of the East Route. Construction of the temporary bypass line would generally follow the same steps as described for the permanent transmission line. Once the temporary bypass line is completed it would be energized and the existing line between County Road G and the Washburn Switch would be de-energized, after which crews will be able to begin the removal and construction process. When Phase 1 is completed the same general sequence would be followed for Phase 2.

- Phase 1:
    - Construct Temporary Bypass Line Segments 1, 2, and 3
    - Energize the Temporary Bypass Line and de-energize East Route Segments 1 and 2
    - **Wreck out existing line corresponding to East Route Segments 1 and 2 and construct new double-circuit line in the existing corridor for East Route Segments 1 and 2, OR;**
      Construct new double-circuit line in the existing corridor for East Route Segments 1 and 2 and wreck out existing line corresponding to East Route Segments 1 and 2, then:
    - Energize both circuits of East Route Segments 1 and 2 de-energize the Temporary Bypass Line Segments 1 and 2
    - Remove Temporary Bypass Line Segments 1 and 2, and restore disturbed areas as needed
    - Restore disturbed areas as needed along East Route Segments 1 and 2
- Phase 2
    - Construct Temporary Bypass Line Segment 4 (re-use Segment 3)
    - Energize Temporary Bypass Line and de-energize existing line
    - **Wreck out exiting line corresponding to East Route Segment 3 and construct new double-circuit line in the existing corridor for East Route Segment 3, OR; Construct new double-circuit line in the existing corridor for East Route Segment 3 and wreck out exiting line corresponding to East Route Segment 3, then:**
    - Energize both circuits of East Route Segment 3, de-energize the Temporary Bypass Line Segments 3 and 4

- Remove Temporary Bypass Line Segments 3 and 4 and restore disturbed areas as needed
- Restore disturbed areas as needed along East Route Segment 3

Figure 5.5-1 East Route Bypass Construction Sequence



5.5.2 Construction Impacts

5.5.2.1 Size of Excavations

Substations

Substation sites include the substation pads as well as stormwater ponding areas and transmission poles outside the substation fence. Detailed grading plans will be developed for

each substation site prior to construction. Grading requirements will vary based on topography of each site and the types of soils present. In general construction of the substation starts with grading the site to create a level footprint. Construction of the pad involves installing 3 feet of sand with one foot of gravel on top. Grading and shaping of the stormwater pond is typically done using soils from on-site. If necessary any unsuitable or excess spoils will be removed from the site and disposed of according to stormwater plan requirements.

The proposed Fish Creek Substation pad area is approximately 1.6 acres (70,500 sq. ft.) and preliminary design includes an approximately 0.5 acre stormwater pond. The total area expected to be impacted temporarily during grading and construction is approximately 5 acres. The site for the Fish Creek Substation is an existing hayfield which is relatively flat; therefore, the site will not require a significant amount of initial grading prior to construction of the pad and pond areas.

The proposed Pikes Creek Substation pad is approximately 1 acre (38,100 sq ft.) in size with a preliminary stormwater pond design of about 0.25 acres. The total area of temporary impact during grading and construction is expected to be approximately 3.25 acres. This includes areas where transmission lines will connect to the substation. The Pikes Creek location is currently wooded and initial tree and stump clearing will be necessary prior to beginning site grading. The existing site is not as level as the Fish Creek site and generally slopes away from the northeast corner of the property. Site grading will include moving soils in order to create a level area for the substation pad and for creation of a stormwater pond.

Transmission Lines

Transmission poles will be installed within one of three foundation types: drilled concrete pier, direct-embedded within culverts and direct-embedded without culverts. A majority of the tangent structures for both the West and East Routes are expected to use the direct-embed type installation, either with or without culverts. Some structures with heavier loading such as at sharp corners or long spans will be installed with drilled pier/poured concrete foundations.

Volumes of excavations for the different installation/foundation type are approximately as follows:

Table 5.5-1 Volume of Excavation by Installation or Foundation Type

Foundation/ Installation Type	Approx. Diameter (ft)	Approx. Depth (ft)	Approx. Volume of excavation (yd^3)
Concrete Pier	7	36	51.3
Direct-embed - Culverts	4	12	5.6
Direct-embed – no Culvert	2	12	1.4

Table 5.5-2 Number of Each Installation/Foundation type by Route		
Foundation/ Installation Type	**West Route**	**East Route**
Concrete Pier	12	34
Direct-embed: Culverts	90	125
Direct-embed: no culvert	177	116
Total	**279**	**275**

5.5.2.2 Type of Construction Machinery Used

Section 5.5.1 describes the typical construction equipment anticipated to be used on the Project.

5.5.2.3 Construction Disturbance Zone

Transmission line construction will be confined to the ROW, identified off ROW access routes, substation sites, and the laydown and staging areas. Most disturbances will occur in the area immediately surrounding transmission line structures. In areas where access cannot be gained from existing roads, some disturbance from vehicular traffic is expected occur. Disturbance at these areas may include clearing of vegetative cover, soil compaction, vehicular tracking, and some topsoil disturbance.

5.5.2.4 Spoil Management

Excavated soil may be thinly spread on surrounding upland areas and stabilized depending on site conditions, landowner preferences, and environmental requirements. Soil may also be hauled to an approved disposal site. Temporary stockpiles of excavated soils and woody debris resulting from ROW clearing and construction will be required throughout the course of construction. While specific locations have not been determined, it is anticipated that minor soil piles may be required adjacent to excavations for the new transmission line structures and within the laydown yards. Stockpiles will be placed in upland locations. Stockpiled materials will be prevented from entering any wetlands or waterways by the use of proper erosion control methods such as silt fence, silt socks, or wattles.

If contaminated materials are encountered during construction, spoils will be isolated and steps will be taken to determine disposal requirements in accordance with applicable regulations.

5.5.3 Unique construction methods

No unique construction methods are proposed at this time. Should any areas be identified that would require such methods Xcel Energy will notify appropriate agencies and acquire the necessary approvals.

5.6 Staging Areas

Temporary staging areas (laydown yards / laydown areas) outside of the Project ROW will be utilized to store job trailers, construction vehicles and equipment, transmission line structures, conductor, cables and equipment, and other related material/equipment.

Potential laydown yards have been identified based on the construction requirements of the Project, proximity to work areas, and environmental and landowner impacts. Laydown yards are selected based on the ability to minimize the amount of disturbance and preparation required to provide suitable surfaces for temporary storage and staging of construction equipment and material. For example, sites that are paved and/or have been previously graded and cleared of vegetation, such as parking lots, old gravel pits, and fields are ideal locations for laydown yards.

Xcel Energy has identified two potential laydown yards near the south end of the Project. These sites are preliminary and the Applicant has not yet negotiated use of these areas with the landowners as of the filing of this Application. The laydown yard identified for the north end of the Project is at the Pikes Creek Substation Parcel. This was identified as a potential staging area if another site cannot be identified; however, its use as a laydown/staging site is expected to conflict with substation and line construction and the Project team will continue to look for an alternative site.

An environmental review of the potential laydown yards was conducted using existing GIS data and aerial photography. The following resources were utilized in the evaluation: WDNR Natural Heritage Inventory (NHI), WDNR Hydro Layer, WDNR WWI, Wisconsin Historical Society (WHS) database, and county soil maps. The potential laydown yards are listed in Table 5.6-1 below, and are shown on site maps included in Appendix A, Figure 7.

Table 5.6-1 Potential Laydown Yards

Site #	Parcel Owner	Township, Range, Section	County	Size of Parcel (Acres)
1	Town of Barksdale	48N 5W Sec. 35	Bayfield	4.4
2	Todd's Redimix Concrete, LLC	48N 5W Sec. 26	Bayfield	38.5
3	Northern States Power Company	50N 4W Sec. 21	Bayfield	9.8

If any additional laydown yards or other staging areas are identified they will be reviewed and evaluated for potential impacts or concerns with respect to wetlands, waterways, natural features, grading and clearing requirements, threatened and endangered resources, and cultural or archaeological concerns. Xcel Energy will also notify the Commission of these new locations and will submit the necessary information to the Commission prior to establishing any such areas in accordance with Wis. Admin. Code § PSC 111.71.

5.7 Off-ROW Access Roads

Wherever possible, Xcel Energy intends to access the Project by traveling down the Project ROW or directly from public roads that intersect the Project ROW. Access from outside the Project ROW will be required in some cases where physical limitations exist within the Project ROW or where other constraints prevent direct access from public roads. Off-ROW access roads are primarily associated with construction of the East Route due to amount of ROW that is located away from roads in challenging terrain.

The need for potential off-ROW access paths has been identified based on a field review the routes. Upon approval of a route, the preliminary access plan may be amended based on additional field review, negotiations with local landowners and/or contractor requirements.

The typical travel surface of the access road is approximately 14 to 20 feet wide. The total amount of disturbance of the road (cut slope to base of the spoils slope) is dependent on soil type and topography. Following construction, the access roads may be left in place or returned to prior conditions, depending on landowner preference.

5.7.1 Identify those areas along the proposed routes where off-ROW access roads may be required.

The off-ROW access paths are shown on Figures 5A and 5B in Appendix A. Whenever possible these off-ROW access paths follow existing access routes, forest roads or trails.

5.7.2 For each route, provide the total length of off-ROW access roads.

The West Route would utilize approximately 1.5 miles of off-ROW access roads while the East Route would utilize approximately 7.2 miles of off-ROW access roads (Appendix B, Table 2). As noted previously the total length of off-ROW access roads is greater for the East Route because of the amount of that route which does not follow existing roads.

5.7.3 Discuss the reasons for the necessity for off-ROW access roads such as topography, rivers/wetlands, etc. If protection of a natural resource is a reason, discuss how the resource would be protected during construction and operation of the proposed project.

The need for potential off-ROW access paths has been identified based on field reviews of the routes as well as aerial photography and topography data. Off-ROW access roads are necessary in location where the Routes do not parallel existing roads, and where the terrain prevents travel along the ROW. The purpose of developing these off-ROW access paths is to allow for safe material and equipment movement to and from the Project ROW.

The primary constraints necessitating off-ROW access roads are steep terrain (such as in the area north of Thompson Creek on East Route) and/or waterway crossings (Thompson Creek, Onion

River, Pikes Creek). Access from outside the ROW in these areas is required due to the impracticable amount of grading and road building and bridge construction that would be necessary within the ROW.

Upon approval of a route, the access paths may be amended based on additional field review and negotiations with local landowners.

5.7.4 Provide quantitative land cover information for off-ROW access roads similar to the information provided in PSCW Impact Tables.

A list of preliminary off-ROW access paths is provided in Appendix B, Table 2. This table provides quantitative land cover information for areas such as agriculture, grassland, forested areas, and forested and non-forested wetlands. The land cover information was quantified using GIS, as described in Section 5.4.

The impacts included in this table were calculated utilizing an access path with an approximate width of 15 feet, based on typical construction practices. In forested lands, existing cleared roads or trails were utilized where possible, however, in most cases these areas were relatively narrow, and the entire width was identified as forested land cover within the GIS data. As such, the forested land impacts, as outlined in Appendix B, Table 2, may overstate the actual tree clearing necessary for utilizing these paths. As discussed, these paths may be amended once a route is ordered and further analysis is conducted.

5.7.5 If the off-ROW access roads would be modified post-construction, provide details.

Prior to construction, many of the off-ROW access paths will need modifications and improvements to allow for safe equipment movement to and from the Project ROW. These modifications may include vegetation removal, grading, and/or gravel placement; however, permanent wetland fill associated with off-ROW access paths is not proposed. Access within wetlands may include the use of ice roads, conducting work during dry or frozen conditions, low ground pressure equipment or construction mats. These methods are further described in Section 6.4.

Once construction has been completed, off-ROW access paths created or modified for the Project would typically be restored to pre-construction conditions. Appropriate restoration materials and methods would be employed, as described in Section 6.9. Depending on landowner negotiations and requirements, the improved access paths may be left in place. Some of the off-ROW access paths may be required for long-term maintenance and safe operation of the transmission line. Once a route has been ordered, the need for permanent access routes will be evaluated.

6.0 NATURAL RESOURCE IMPACTS

6.1 Forested Lands

6.1.1 Upland Woodlands Description

Xcel Energy reviewed the USGS GAP national land cover data to identify forested lands along each proposed route segment (USGS, 2014). PSCW Table 2, provided in Appendix B, presents the total acres of forested lands along each of the proposed route segments. The GAP national land cover data does not provide specific details about tree species, size, or use of forested areas; therefore, this information is not available for all forested areas crossed by the proposed routes. Based on the GAP data, the West Route would cross 111.2 acres of upland forest, 40.9 acres in shared ROW and 70.3 acres of new ROW that would require tree clearing, most of which are along West Route Segment 4. The East Route would cross approximately 190 acres of upland forest: 152.5 acres of upland forest within the existing ROW, 2.7 acres for the new ROW in three areas that will require tree clearing, and 35.1 acres of new ROW along the temporary bypass line, which will also require tree clearing.

Xcel Energy also reviewed GIS data provided by the Bayfield County Forestry and Parks Department (BCFPD) to identify woodlands owned and managed by the county forestry department that would be within each proposed route segment. The BCFPD manages county forest lands in accordance with Wisconsin's County Forest Law as stated in s. 28.11, Wis. Stats. The County Forest Law encourages, "…planned development and management of the County Forests for optimum production of forest products together with recreational opportunities, wildlife, watershed protection and stabilization of stream flow, giving full recognition to the concept of multiple use to assure maximum public benefits…" (BCFPD, 2006-2020). The West Route crossed 7.7 miles of Bayfield County Forest land while the East Route crosses 11.6 miles. These managed forests are representative of upland forest crossed by both routes. Based on data from BCFPD, many of the dominant tree species in this area are a mix of hardwoods, aspen, oak, red pine, white pine, and jack pine in upland areas and fir-spruce, lowland hardwoods, tamarack, and cedar in lowland areas (BCFPD, 2006-2020).

6.1.2 Managed Forest Law (MFL) and Forest Crop Law (FCL)

6.1.2.1 Identify properties within proposed ROWs that are enrolled in the MFL or FCL programs

Table 6.1-1 lists the properties identified along the West and East Routes that are enrolled in the Managed Forest Law (MFL) program. In some cases, only a portion of a parcel may be enrolled in the MFL program. Table 6.1-1 identifies parcels enrolled in the MFL program and whether the routes cross the portion enrolled in the MFL program, if applicable. No properties enrolled in the Forest Crop Law (FCL) program are crossed by the proposed route segments.

Table 6.1-1 MFL Properties Crossed by the Bayfield Second Circuit Project						
Segment ID	**Parcel ID**	**Twp.**	**Range**	**Sec.**	**Qtr./Qtr. Section**	**Crossed (Yes/No)**
West Route						
West Route Segment 1 and Bypass Line Segment 1	04-002-2-48-05-35-3, 02-000-20000	48N	5W	35	Part of the NW of the SW	Yes
West Route Segment 2	04-050-2-48-05-10-2, 01-000-10000	48N	5W	10	NE of NW	Yes
West Route Segment 2	04-050-2-48-05-10-2, 02-000-10000	48N	5W	10	NW of NW	Yes
West Route Segment 2	04-050-2-48-05-10-1, 02-000-10000	48N	5W	10	NW of NE	Yes
West Route Segment 2	04-050-2-48-05-09-1, 01-000-10000	48N	5W	9	NE of the NE	Yes
West Route Segment 4	04-050-2-49-05-22-2, 02-000-10000	49N	5W	22	NW of NW	Yes
West Route Segment 4	04-008-2-49-05-15-3, 04-000-10000	49N	5W	15	SE of SW	Yes
West Route Segment 4 and Bypass Segment 2	04-006-2-50-04-17-4, 04-000-10000	50N	4W	17	Part of the SE of SE	No
East Route						
East Route Segment 1 and Bypass Line Segment 1	04-002-2-48-05-35-3, 02-000-20000	48N	5W	35	Part of the NW of the SW	Yes
East Route Segment 2	04-050-2-48-05-01-4, 02-000-10000	48N	5W	1	Part of the NW of SE	No
East Route Segment 2	04-050-2-48-05-01-3, 04-000-10000	48N	5W	1	SE of SW	Yes
East Route Segment 2	04-050-2-48-05-01-1, 03-000-10000	48N	5W	1	SW of NE	Yes
East Route Segment 2	04-050-2-48-05-01-1, 02-000-10000	48N	5W	1	NW of NE	Yes
East Route Segment 3	04-006-2-50-04-29-3, 03-000-10000	50N	4W	29	SW of SW	Yes
East Route Segment 3	04-008-2-49-04-05-2, 02-000-20000	49N	4W	5	NW of NW	No
East Route Segment 3	04-008-2-49-04-08-3, 03-000-30000	49N	4W	8	SW of SW	No
East Route Segment 3	04-008-2-49-04-17-3, 02-000-10000	49N	4W	17	NW of SW	No
East Route Segment 3	04-008-2-49-04-17-3, 03-000-10000	49N	4W	17	SW of SW	No

Table 6.1-1 MFL Properties Crossed by the Bayfield Second Circuit Project						
Segment ID	**Parcel ID**	**Twp.**	**Range**	**Sec.**	**Qtr./Qtr. Section**	**Crossed (Yes/No)**
East Route Segment 3	04-008-2-49-04-30-4, 03-000-10000	49N	4W	30	SW of SE	Yes
East Route Segment 3	04-291-2-49-04-31-1, 02-000-13000	49N	4W	31	Part of NW of NE	Yes
Bypass Line Segment 4	04-008-2-49-05-24-1, 03-000-10000	49N	5W	24	SW of NE	Yes
Bypass Line Segment 4	04-008-2-49-05-24-1, 02-000-10000	49N	5W	24	NW of NE	Yes

6.1.2.2 Discuss how the proposed project would affect the properties enrolled in the MFL or FCL programs.

The extent to which program participation may be affected cannot be determined based on the information available to Xcel Energy. The extent to which a property is enrolled in the MFL program will be identified during the easement negotiation process. If any landowner would be unable to continue participation, Xcel Energy will compensate the landowner for the costs of withdrawal and any adverse tax consequences.

6.1.3 Provide specific details for mitigating or minimizing construction impacts in and around woodlands.

This Project will require the clearing of tall vegetation within the ROW and clearing of brush and trees along temporary construction access. Tall-growing vegetation that may interfere with safe construction and safe and reliable operation of the transmission line will be removed and controlled. Specifically, woody vegetation will be removed as needed within the ROW for construction of the Project and managed through the operational life of the facility. Clearing of vegetation within the ROW will occur prior to construction activities as allowed by landowner agreements and permit conditions.

The cut and scatter method may be used during construction in areas where limited clearing will occur. The purpose of this method is to limit the need for unnecessarily hauling and potentially disturbing the existing ground or vegetation. Likely situations where this method will be used are in shrub and brush areas with a limited number of trees. Limited numbers of trees in shrub wetlands may be disposed of in this manner as long as trees that are cut and scattered originate within the wetland.

Woody vegetation may be chipped and scattered over the ROW in non-agricultural upland areas. Invasive shrubs such as common and glossy buckthorn with berries will not be chipped and scattered to minimize the spread of these species. Chipping will not occur in wetlands or floodplains, with the exception of chipped material that is evenly scattered through the use of

rubber-tracked blade mowers or ASV Posi-Track mower type equipment used to clear small diameter trees and shrubs. Chipped material derived from onsite locations may be spread as mulch up to six inches deep in upland areas to provide ground protection along access paths. Upon abandonment of access routes, mulch will be spread evenly to a depth no greater than two inches.

As discussed in Section 6.6 (Invasive Species) tree clearing timing restrictions and slash management procedures can be implemented to prevent the spread of oak wilt, emerald ash borer and gypsy moth in forested areas. All vegetation clearing will be completed in accordance with the Commission restrictions on oak tree cutting and pruning as specified in Wis. Admin. Code § PSC 113.0511.

6.2 Grasslands

6.2.1 For each route segment describe the grasslands that would be impacted by the proposed project. Include the following information in the description.

Grasslands were classified based on USGS GAP ecosystem land use types pasture/hay and harvest forest – grass/forb regeneration. As previously mentioned in Section 5.4.2, because areas identified as pasture/hay were not field verified as previously disturbed, these lands are conservatively classified as grassland.

The West Route crosses 10.7 acres of grassland, nearly half of which are associated with West Route Segment 1. Of that 10.7 acres, 9.3 acres are pasture/hay and the remaining 1.4 acres are harvested forest – grass/forb regeneration. Most of the grassland is on private land (9.5 acres). There is mapped grassland on the Whittlesey Creek NWR, Chequamegon-Nicolet National Forest parcels, Wisconsin WDNR parcels, Bayfield County Forest parcels, and land owned by local towns.

The East Route crosses 20.9 acres of grassland, the majority of which are along East Route Segments 1 and 2. Of that 20.9 acres, 14.2 acres are pasture/hay and the remaining 6.8 acres are harvested forest – grass/forb regeneration. Most of the grassland is on private land (18.2 acres). There is mapped grassland on the Whittlesey Creek NWR, Chequamegon-Nicolet National Forest parcels, Bayfield County Forest parcels, and land owned by local towns.

6.2.2 Provide specific details for mitigating or minimizing construction impacts in and around grasslands.

Grasslands crossed by the Routes are predominantly within existing or shared ROW. Additionally, because most grassland is made of up pasture/hay land there is inherently some level of disturbance from either livestock or machinery. Regardless, Xcel Energy will limit construction impacts to the off-ROW access roads and the transmission line ROW.

6.3 Wetlands (see Section 8.0)

Xcel Energy evaluated the presence of wetlands along the routes using WWI data and desktop review of aerial photography for the purpose of quantifying impacts in this Application. After the PSCW issues an Order for the Project, Xcel Energy will conduct field surveys to provide more detailed information. A summary of all wetlands which may be impacted by each route segment is presented in Appendix B, Table 8 and shown in Appendix A, Figure 5. In addition, access through several wetlands will be required for off-ROW access. These wetlands are identified in Section 5.7; however, they are also briefly addressed in this section.

6.3.1 Wetland Crossings

The total number of wetlands that intersect the proposed route including the bypass segments are summarized in Table 6.3-1. These numbers are derived from the detailed inventory of wetlands presented in Appendix B, Table 8. Although each separate crossing was counted, any given wetland unit may be crossed more than once, depending on its shape.

The West Route and its bypass segments will have a total of 17 wetland crossings. The East Route, inclusive of its bypass segments, will have 30 wetland crossings. Substation construction will not impact wetlands.

Table 6.3-1 Number of Wetland Crossings by Route Segments [a]

Route / Segment ID	Palustrine Emergent	Palustrine Scrub-Shrub	Palustrine Forested
WEST ROUTE			
1	3	1	7
2	-	-	-
3	-	-	-
4	-	1	3
Bypass 1	1	1	-
Bypass 1W	-	-	-
TOTAL	**4**	**3**	**10**
EAST ROUTE			
1	3	1	7
2	-	-	5
3	1	1	7
Bypass 1	1	1	-
Bypass 2	1	-	-
Bypass 3	-	-	-
Bypass 4	-	2	-
TOTAL	**6**	**5**	**19**

[a] Wisconsin Department of Natural Resources, Wisconsin Wetland Inventory, 2018.

6.3.2 For each route segment provide the number of structures that would be constructed within wetlands/identify the structure or facility that would be constructed within wetlands.

Appendix B, Table 8 depicts conceptual pole locations which have been developed to evaluate the potential impacts on wetlands. These pole locations are approximated based on the proposed design spans for the structures that will be used and have been spotted along the alignment to conservatively estimate transmission line impacts. The wetland impacts will be closely reviewed during detailed Project design to help minimize impacts without adding undue costs or physical impacts to the integrity and reliability. The wetland impact estimates associated with pole locations may require adjustment during detailed design to accommodate landowner concerns, or if previously unknown or unanticipated conditions are encountered. Examples of these conditions include physical terrain details that may affect span lengths or refinement of wetland boundaries once easements are obtained and field delineations are completed.

Based on preliminary engineering, the West Route will have seven structures installed within a wetland and the East Route will have 11. There will be no permanent impact associated with structures in wetlands along the bypass lines since they are temporary facilities. The permanent wetland impact at each pole location will be less than 0.001-acre, based on a typical 4-foot-diameter area of impact associated with each culvert installation (see Section 5.5.1). Further detail on each wetland, including the area of wetland impact and wetland type, is provided in Appendix B, Table 8.

6.3.3 Provide the methods to be used for avoiding, minimizing or, if necessary, mitigating construction impacts in and near wetlands.

Xcel Energy will avoid or minimize wetland impacts during its routing and siting process and with the use of certain construction techniques (refer to Section 8.2). However, there are some areas where impacts on wetlands cannot be avoided along the route segments. Equipment access and pole installation within wetlands will be required during transmission line construction. The use of heavy equipment in some wetlands or portions of wetlands may be avoided if unstable soil conditions exist and alternate access is practical. If a wetland has drier, more stable and cohesive soils, or is frozen and rutting will not occur, construction will likely proceed in a manner similar to upland construction.

If saturated or unstable soil conditions exist, several construction techniques may be implemented to reduce the effects on wetland soil structure and dependent functions, including hydrology and the wetland's capacity for re-vegetation of native species. Disturbance to wetlands will be minimized using one or more of the following standard construction techniques depending on soil conditions:

- completing wetland construction during dry or frozen conditions;
- the use of equipment with low ground pressure tires or tracks;

- placement of construction matting to help minimize soil and vegetation disturbances and distribute axle loads over a larger surface area, thereby reducing the bearing pressure on wetland soils; and/or
- the use of ice roads.

Site conditions at the time of construction will dictate the type of construction access technique. Wetland access routes will not require permanent fill.

A general discussion of vegetation typically found in wetlands in the Project area is provided in Section 8. Xcel Energy will conduct field surveys to determine wetland boundaries and collect information on dominant species within each feature after PSCW Order issuance. If it is evident that transmission line construction activities could spread invasive plant species to new areas, appropriate protection measures will be implemented. These measures, detailed in Section 6.6, may include: avoiding known infested areas, removal, or control of small populations of plants, scheduling construction activities during the plant's dormant period, or cleaning of equipment prior to accessing uninfested areas.

Upon completion of construction of the Project, Xcel Energy will conduct site restoration and revegetation consistent with the activities described in Section 6.9. Xcel Energy will work with the appropriate agencies to determine compensatory mitigation requirements.

6.3.4 For "Significant" or "High Quality" Wetlands in the project area identify:

6.3.4.1 The Location where the proposed Project would cross or potentially Impact

Wetlands along both routes were evaluated for Areas of Special Natural Resource Interest (ASNRI), in accordance with Wis. Admin. Code. § NR 1.05. Wetlands are considered ASNRI when they fall within (entirely or in part), or are contiguous with, one or more of the designated special features listed in NR 1.05 (e.g., trout streams, state wildlife areas or parks, etc.). However, despite their association with these special features, not all ASNRI-designated wetlands are significant or of high quality; many are affected by historical and/or ongoing land use practices (e.g., development) that have caused degraded conditions such as altered hydrology or infestation with invasive plant species.

Xcel Energy evaluated the presence of ASNRI-designated wetlands along the routes using the WDNR Surface Water Data Viewer. No ASNRI-designated wetlands are crossed by either the West Route or the East Route.

Xcel Energy will conduct field surveys to provide a more detailed site-specific resource review of wetlands prior to construction.

6.3.4.2 The Wetland Type

The majority of wetlands along both routes are wet meadows and forested wetlands, most of which are characterized by low plant diversity due to domination by invasive species due the adjacency of road rights-of-way; however, higher-quality wetlands may exist along each route. Other significant wetlands may also be present that present uncommon characteristics such as relatively intact native plant communities, structural diversity (e.g., mix of cover types), and/or hydrological attributes/functions (e.g., riparian, open water).

6.3.4.3 The specific mitigation methods that would be used to mitigate potential impacts

The process that was conducted in which to avoid and minimize impacts on wetlands is discussed in Section 8.2, which included minimizing the number of wetland crossings to the extent practicable and the number of structures spotted within wetlands. Since both routes are mainly collocated with either Xcel Energy's existing easement or road rights-of-way, fragmentation of greenfield wetland areas is minimized. Refer to Sections 6.3.3 and 8.2 for additional information on mitigation methods for minimizing impacts on wetlands.

6.4 Waterbodies/Waterways (see Section 8.0)

The WDNR maintains the 24K Hydro layer, which was reviewed to assess the presence of waterbodies and waterways along the routes (hereafter collectively referred to as waterways). A summary of all waterways which may be crossed by each route segment is presented in Appendix B, Table 8 and shown in Appendix A, Figure 5.

Substation construction will not impact waterbodies.

6.4.1 Waterway Crossings

The total number of waterways which will be crossed by the proposed routes including their bypass segments are summarized in Table 6.4-1. As previously noted, Xcel Energy will conduct field surveys after PSCW of Order issuance; therefore, these numbers are derived from the WDNR's 24K Hydro layer. All waterways intersecting the proposed route corridors are included in this table. These waterways will either require a bridge crossing (either a TCSB or a bridge requiring support below the ordinary high water mark [OHWM]).

The West Route and its bypass segments will have a total of 50 waterway crossings. The East Route inclusive of its bypass segments will have 70 waterway crossings including three waterway crossings which will be required for off-ROW access for Route construction. There are no waterway crossings associated with off-ROW access for West Route construction.

Table 6.4-1 Number of Waterway Crossings by Route Segments [a]		
Route / Segment ID	**Perennial**	**Intermittent**
WEST ROUTE		
1	4	4
2	1	9
3	1	4
4	5	14
Bypass 1	5	3
Bypass 1W	-	-
TOTAL	16	34
EAST ROUTE		
1	4	4
2	4	7
3	9	8
Bypass 1	4	4
Bypass 2	-	9
Bypass 3	-	3
Bypass 4	5	9
TOTAL	26	44
[a] Wisconsin Department of Natural Resources, 24K Hydro Layer, 2018.		

6.4.2 Structures Constructed Below the OHWM

Xcel Energy is not proposing to place transmission line structures below the OHWM of waterways along the West or East Route options.

6.4.3 Need and Method of Constructing Waterway Crossings

A summary of the waterways proposed to be crossed along the West and East Routes, and their proposed methods for access across, are presented in Appendix B, Table 8. All proposed crossings are necessary to allow for safe and efficient construction access along both routes. In addition, several waterways are proposed to be crossed as part of both on and off-ROW access requirements (refer to Section 5.7), which may also require a TCSB.

Where necessary and authorized by the WDNR, TCSBs will be placed to avoid in-stream disturbance. Each TCSB will consist of construction mats or other similar material, placed above the OHWM on either side to span the stream bank. Preparation for setting the bridge may include minor blading and excavation confined to the minimum area necessary for safe bridge installation. Removal of low-growing trees, shrubs, and other shoreline vegetation will be

minimized to the extent practicable. Proper erosion control measures will be installed and maintained during and after the utilization of the temporary crossing. For those streams or rivers where stream crossing permits have not been requested and acquired, rope will typically be thrown across to the opposite bank then picked up and threaded into dollies. More detail on rope pulling and wire stringing is provided in Section 5.5. Additional details regarding waterway crossings are provided in Section 8.0.

6.4.4 Avoiding / Minimizing Construction Impacts In or Near Waterways

The number of potential temporary stream crossings has been minimized by proposing to access from the ROW on either side of the stream or by using existing public crossings to the extent practicable. Xcel Energy will work with private landowners to identify alternate access routes to further reduce the use of stream crossings, if possible. Some of these crossings may not be required if Xcel Energy is able to secure alternate access via privately-owned land. However, Xcel Energy will apply for WDNR permits for all potential crossings that are reasonably anticipated in the event that avoidance is not possible.

As discussed in Section 6.4.3, the amount of disturbance associated with installation of the TCSBs will be minimized to reduce potential impact on the waterways. Refer to Section 6.6 for a description of mitigation methods that will be employed to avoid the spread of invasive plants and Section 6.9 for a discussion of re-vegetation and restoration plans for disturbed areas, including those near waterways. In addition, an erosion control and storm water management plan will be prepared once the PSCW issues an Order.

6.4.5 Special Waterways

Waterways along both routes that are designated as ASNRI are identified in Appendix B, Table 8. The WDNR's Surface Water Data Viewer[2] was used to identify these special waterways in the Project area. Refer to Section 6.4.4 for Xcel Energy's proposed measures to avoid, reduce, and mitigate impacts associated with all waterway crossings. Additionally, the following methods will be based on site-specific information once a route is ordered and field surveys are conducted, to mitigate potential impacts to ASNRI waterways in the Project area.

Potential direct and indirect impacts on these special waterways have been minimized during preliminary pole spotting as structures are not immediately adjacent to the majority of these designated waterways. During final design of an ordered route and to the extent feasible, Xcel Energy will attempt to maintain a suitable distance from the structure to the waterway. In addition, at this point, it is anticipated that numerous ASNRI-designated waters will require a TCSB crossing; however, as discussed above, attempts will be made to find alternate access that does not require a bridge crossing once a route is ordered.

[2] https://dnr.wi.gov/topic/surfacewater/swdv/

A Construction Sediment and Erosion Control Plan will be prepared once a route is ordered and additional site-specific information is available. BMPs will be implemented near waterways during construction to minimize the potential for erosion.

6.4.5.1 Outstanding or Exceptional Resource Waters

Table 6.4-2 includes the ORW that are intersected by each route option, there are no Exceptional Resource Waters crossed by the Project.

Table 6.4-2 Outstanding Resource Waters by Route Segment [a]

Route / Segment ID	Outstanding Resource Water
WEST ROUTE	
Segment 1	Whittlesey Creek
Segment 2	Thompson Creek Sioux River
Segment 3	Sioux River
Segment 4	Fourmile Creek Little Sioux River Pikes Creek Birch Run
Bypass Segment 1	Whittlesey Creek
Bypass Segment 1W	-
EAST ROUTE	
Segment 1	Whittlesey Creek
Segment 2	Thompson Creek
Segment 3	Onion River Pikes Creek Birch Run Sioux River Unnamed North Pikes Creek
Bypass Segment 1	Whittlesey Creek
Bypass Segment 2	Thompson Creek
Bypass Segment 3	-
Bypass Segment 4	Pikes Creek Sioux River Little Sioux River North Pikes Creek

[a] Wisconsin Department of Natural Resources, Surface Water Data Viewer, 2017.

6.4.5.2 Trout Streams

Table 6.4-3 includes the designated trout streams and its designated Class at the crossing location that are intersected by each route option.

Table 6.4-3 Trout Streams Crossed by Route Segment [a]

Route / Segment ID	Waterbody Name	Trout Class
WEST ROUTE		
Segment 1	Whittlesey Creek	Class I
	Unnamed Tributary to Whittlesey Creek	Class I
Segment 2	Bono Creek	Class I
	Thompson Creek	Class I
	Sioux River	Class I
Segment 3	Sioux River	Class I
Segment 4	Fourmile Creek	Class I
	Little Sioux River	Class I
	Pikes Creek	Class I
	Birch Run	Class I
Bypass Segment 1	Whittlesey Creek	Class I
	Unnamed Tributary to Whittlesey Creek	Class I
Bypass Segment 1W	-	-
EAST ROUTE		
Segment 1	Whittlesey Creek	Class I
	Unnamed Tributary to Whittlesey Creek	Class I
Segment 2	Bono Creek	Class II
	Thompson Creek	Class I
Segment 3	Onion River	Class I
	Pikes Creek	Class I
	Unnamed Tributary to Whittlesey Creek	Class I
	Birch Run	Class I
	Sioux River	Class II
	Unnamed	Class I
	North Pikes Creek	Class I
Bypass Segment 1	Whittlesey Creek	Class I
	Unnamed Tributary to Whittlesey Creek	Class I
Bypass Segment 2	Bono Creek	Class I
	Thompson Creek	Class I
Bypass Segment 3	-	-
Bypass Segment 4	North Pikes Creek	Class I
	Little Sioux River	Class I
	Sioux River	Class II
	Pikes Creek	Class I

[a] Wisconsin Department of Natural Resources, Surface Water Data Viewer, 2017.

6.4.5.3 Wild and Scenic Rivers

There are no Wild and Scenic Rivers crossed by either the West or East Route.

6.5 Rare Species and Natural Communities (see Section 9.0)

6.5.1 Communication with WDNR and USFWS

A proposed Endangered Resources (ER) Certified review has been completed and was submitted to the WDNR Bureau of Natural Heritage Conservation on January 22, 2019. The WDNR responded with the final ER Review (ER Log #19-059) on January 30, 2019 (East Route) and February 1, 2019 (West Route). The ER Review summarizes all state-listed rare species, natural communities, and other natural features with element occurrence records within one mile of the Project routes for terrestrial and wetland occurrences and within 2 miles for aquatic occurrences.

Rare species and natural communities that are not legally protected or are exempt from protection by the Project include special concern animal species; threatened and endangered, and special concern plant species; and natural communities.

A review of federally listed species with potential to occur in the Project area was conducted using the USFWS Information for Planning and Consultation (IPaC) online review tool. The results of the review identified the following federally listed species as known or expected to occur in the Project area: Canada lynx (*Lynx canadensis*), gray wolf (*Canis lupis*), northern long-eared bat (*Myotis septentrionalis*), red knot (*Calidris canutus rufa*), and Fassett's locoweed (*Oxytropis campestris* var. *chartacea*). A request for informal Section 7 consultation was submitted to the FWS on January 15, 2019 (see Appendix F). In addition, Xcel Energy will adhere to the National Bald Eagle Management Guidelines to avoid disturbance to breeding eagles in the Project area.

6.5.2 Compliance with WDNR and USFWS Direction

As stated above, a final ER Review has been received from the WDNR. Due to confidentiality requirements for Wisconsin NHI data, a redacted copy of the final ER Review is included in Appendix H. Appropriate follow-up actions will be coordinated with WDNR and USFWS. Xcel Energy will continue regular communication with the agencies throughout the application process to follow state and federal endangered resources laws during Project evaluation, planning, and implementation.

6.5.3 Concerns and Potential Impacts to Rare Species

The ER Review summarizes all state-listed rare species, natural communities and other natural features with element occurrence records within one mile of the Project segments for terrestrial and wetland occurrences, and within two miles for aquatic occurrences. Several of the rare species and natural communities have multiple element occurrence records along the route segments. In addition to providing an inventory of rare species and communities, the ER Review

also outlines the required follow-up actions necessary to protect threatened and endangered animal species, as well as the recommended follow-up actions to help conserve rare species, communities, or other natural features that are not legally protected or are exempt from protection by the Project (i.e., special concern animal species; threatened, endangered, and special concern plant species and; natural communities).

Avoidance measures are required for one state-listed bird and a reptile in areas of suitable habitat along both route options. In addition, the WDNR recommended a tree clearing timing windows to avoid impacts to a state-listed mammal potentially present along the East Route.

Several rare plants have been recorded in the Project vicinity and may be impacted by the both route options. Although not required because utility projects are exempt from take of rare plants, the WDNR recommends avoidance or minimization of take of rare plants.

In addition, various special concern species and natural communities have also been recorded in the vicinity of both routes. As noted above in Section 6.5.1, special concern species and natural communities are not legally protected; however, the WDNR recommends avoidance or minimization measures for these species and communities.

6.5.3.1 Endangered Species Law Impacts on Project

The ER Review (Appendix H) summarizes the specific segments along which element occurrence records exist for animal species requiring follow up actions. The required actions will be implemented (by species) where threatened and endangered animals are verified to occur based on species surveys or where species are assumed to occur based on the presence of suitable habitat along the identified segments. The required follow-up actions, as well as the effects these actions have on the proposed Project, vary by animal group and are summarized in the ER Review (Appendix H). In general, the actions include completing species surveys in areas of suitable habitat; implementing time-of-year avoidance periods; implementing erosion / runoff prevention measures; consulting with the WDNR's Bureau of Natural Heritage Conservation (BNHC) if a protected species is verified or assumed to be present; and, if necessary, altering the Project where a protected species is verified to be present.

If during the course of the Project there is uncertainty regarding actions to avoid impacts or take for some species or in some situations, Xcel Energy will coordinate with the WDNR's BNHC on appropriate conservation measures. If the Project cannot completely avoid all areas of suitable habitat or take, Xcel Energy will work with the WDNR's BNHC Incidental Take Coordinator to apply for an Incidental Take Permit for the affected species.

6.5.3.2 Voluntary Conservation Actions

Rare species and natural communities that are not legally protected or are exempt from protection by the Project include special concern animal species; threatened and endangered, and special concern plant species; and natural communities. The ER Review (Appendix H)

summarizes the specific segments along which element occurrence records exist for each species, community, or feature. In consultation with the WDNR BNHC, Xcel Energy may implement recommended avoidance and impact minimization measures by species, community, or feature where they are verified to occur.

Avoidance and minimization measures recommended as follow-up actions to help conserve rare species and natural communities are similar to those outlined in Section 6.5.3.1. Recommended measures to protect special concern animal species when and where practicable include: voluntary species surveys, adherence to avoidance periods, use of exclusion fencing, and use of erosion / runoff prevention practices. Similarly, measures recommended for conserving rare plants include voluntary species surveys, and use of exclusion fencing in occupied areas. Recommendations that may be implemented for natural communities include avoiding direct impacts and/or minimizing impacts, where possible; and incorporating buffers along community edges where practicable.

6.6 Invasive Species (Uplands and Wetlands)

6.6.1 Location of Invasive Species/Disease-Causing Organisms

The Project survey corridor will be evaluated for invasive plant species during field investigations, to be completed after a final route is identified.

Bayfield County is listed by Wisconsin Department of Agriculture, Trade and Consumer Protection (DATCP) as a quarantine county to help prevent the spread of emerald ash borer and gypsy moths. Practices that minimize the spread include avoiding movement of wood products (logs, posts, pulpwood, bark and bark products, slash and chipped wood from tree clearing) and hardwood firewood from quarantine areas to non-quarantine areas, as per Wis. Admin. Code § ATCP 21.17. Where wood products cannot be left on-site, alternative plans will be developed to meet the requirements.

6.6.2 Mitigation Methods

Xcel Energy will comply with Wis. Admin. Code ch. NR 40 by implementing BMPs when encountering species listed as “Restricted” or “Prohibited”. Standard BMPs have been developed to avoid and minimize the spread of NR 40 listed species. These BMPs will vary throughout the ROW based on the degree of invasiveness, severity of the current infestation, and susceptibility of non-infested areas to invasion.

Typical BMPs include:

- Avoidance through construction timing and alternate access;
- Proper management of construction vehicles and materials (i.e., storage, cleaning);
- Minimizing ground disturbance;
- Placing a barrier between construction vehicles and plants (i.e., construction matting);

- Proper storage and disposal of plant materials;
- Promoting native regeneration; and
- Leaving cut vegetation on site where it is cut (i.e., mowing shrubs).

Additional evaluation will be conducted on the ordered route to further identify invasive species, their locations, and locations where site specific BMPs are appropriate. Appropriate BMPs will be incorporated into compliance plans and implemented during construction.

6.7 Archeological and Historic Resources

Cultural resources were identified within a one-mile buffer around the proposed corridors referred to as the study area. GIS data was obtained from the WHS and additional information pertaining to cultural resources was accessed online through the Wisconsin Historical Preservation Database. Historical documents and aerials were reviewed to evaluate the potential for previously unidentified archeological resources within the proposed corridors.

6.7.1 Wisconsin Historical Society Sites

Merjent, Inc. (Merjent) on behalf of Xcel Energy, completed a Phase Ia Literature review of cultural resources within the areas of the proposed routes. The objective of this review was to identify historic properties that may be potentially affected by the proposed Project and to provide recommendations for mitigation or avoidance of these resources. A summary of historic properties by route is described below and a full account provided in the Phase Ia report.

There are seven previously reported archaeological and cemetery/burial sites and 33 architectural/historic resources within one mile of the West Route; none have been determined eligible for listing on the NRHP. The archaeological sites include three cemetery/burial sites protected under Wisconsin Statute §157.70(4). One archaeological site and three historic structures are within the West Route corridor.

There are 13 previously reported archaeological and cemetery/burial sites and 39 architectural/historic resources within one mile of the East Route; three eligible or contributing for the National Register of Historic Properties (NRHP). The archaeological sites include seven cemetery/burial sites protected under Wisconsin Statute §157.70(4). Two archaeological sites and three historic structures are within the East Route corridor.

Further archaeological and historic resource review and investigation will be undertaken prior to construction to ensure that all identified sites affected are properly protected.

6.7.2 Archaeologist Reports and Official Correspondence

Nicole Wittig of Merjent completed a Phase Ia Literature Review in accordance with WHS standards (Dudzik, et. al. 2012). This report contains confidential information and is provided to the PSC Historic Preservation Officer under separate cover.

6.8 Conservation Easements

Geographic information regarding properties with conservation easements or encumbrances was acquired from the sources listed in Table 6.8-1.

Table 6.8-1 Sources Used to Identify Conservation Easements Along Each Route Segment

Property Type	Database Source
Publicly available information for federal, state, and local conservation easements	National Conservation Easement Database
Wetland Reserve Program and Grassland Reserve Program Easements	Natural Resources Conservation Service (NRCS)
Emergency Watershed Protection Program - Floodplain Easement	NRCS
Riparian Easements	USFWS
State Fishery Areas, State Parks, Forests and Trails	WDNR - Managed Lands
Land & Water Conservation Fund Properties	WDNR, Bureau of Community Financial Assistance
The Nature Conservancy Easements	U.S. Geological Survey Gap Analysis Program - Stewardship

Conservation land interests, among many other factors, were utilized in the routing and siting process to inform the selection of proposed route segments while avoiding, to the extent practicable, properties with recorded conservation land interests. There are many types of conservation easements and encumbrances that exist today. Some of the conservation easements are placed upon properties by state and federal agencies (i.e., scenic easements or MFLs), while other conservation land interests are initiated by the landowner (i.e., Conservation Reserve Program or Farmland Preservation Plan [FPP]). These land rights are generally not known until we initiate the Project's easement acquisition process with the landowner of record. Once Xcel Energy is made aware of the existence of other land rights on the property, they will work with the landowner to accommodate the existing agreement or make them whole if there are additional monetary burdens they have to incur. The following is a discussion, for each route and by route segment, identifying unavoidable properties that have conservation easements or other types of agreements that restrict land use.

Based on publicly available information and preliminary communications with landowners Xcel Energy is aware one conservation easement along Star Route Road which would impact both the West Route and East Route. MFL is discussed in Section 2.1.2; FPP is discussed in Section 7.4.

6.9 Restoration of Disturbed Areas

The need for and approach to site restoration and re-vegetation will be based on the degree of disturbance caused by construction activities and the ecological setting of each site, and will need to reflect and satisfy the requirements of the property owner. If construction can be accomplished without creating appreciable soil disturbance, restoration may not require active

re-vegetation efforts. Restoration activities will be implemented following the completion of construction activities. These activities will begin as soon as practical and as allowed by seasonal conditions.

6.9.1 Proposed Revegetation

Xcel Energy will develop a restoration plan for disturbed sites based on the level of ground disturbance and the site setting. In some cases, re-growth of vegetation in disturbed areas may be allowed to occur without supplemental seeding. In cases where there is no sign of re growth of pre-existing vegetation species in the first month of the subsequent growing season, an assessment will be made and if necessary, an appropriate seed mix will be brought in and properly applied. Xcel Energy will monitor the sites that are seeded to ensure adequate growth occurs. The restoration and re-vegetation methods for wetland areas are described in Section 6.2.3.

6.9.2 Vegetative Monitoring Criteria and Methods

During active construction and ROW restoration, Xcel Energy or its representatives will inspect re-vegetation and restoration activities in accordance with Wis. Admin. Code ch. NR 216 and the Wisconsin Pollution Discharge Elimination System (WPDES) general permit conditions.

Written documentation of the inspection will be maintained by Xcel Energy describing the re-vegetation progress and corrective measures taken, if applicable. Areas where ground disturbance occurs will be monitored until 70% re-vegetation has occurred.

6.9.3 Invasive Species Monitoring and Management

The invasive species located along the Project corridor and the BMPs to avoid the spread of invasive species are discussed in Section 6.6. A post-construction assessment of these areas will be conducted in the growing season following construction. If this monitoring shows that the species composition within the ROW varies from surrounding conditions, Xcel Energy will discuss the need for additional monitoring with WDNR.

7.0 COMMUNITY IMPACTS

7.1 Communication with Potentially Affected Public

As detailed below, communication efforts regarding the Project began in August of 2017. Prior to 2017 Xcel Energy had done public outreach for a similar, but higher voltage, project, which was referred to as the Bayfield Loop Project. Those details are not included here because they do not reflect the Project being proposed.

Xcel Energy's representatives have actively sought input on the Project route and related issues from state, county, and local governments, elected officials, landowners, and business leaders. Copies of letters, emails, and comments forms that are referenced below are included in Appendix J. Following is a timeline and list of communication and outreach efforts beginning in August of 2017:

- August 3, 2017 Xcel Energy sent a letter to agencies and municipalities in the Project area (approximately 70 recipients) identifying the proposed Project and requesting input. At this time Xcel Energy was proposing one alignment, which was substantially similar to the current West Route.
- August 14, 2017 Xcel Energy presented the proposed Project to the Bayfield County Forestry and Parks Committee because a portion of the proposed alignment would be located on County Forest land. Committee granted provisional approval for location of the transmission line on County Forest land pending approval by the Bayfield County Board of Supervisors.
- August 17, 2017 notice is run in the Ashland Daily Press providing information about an upcoming open house scheduled for August 30th.
- August 20, 2017 (approximate date) Xcel Energy sent mailers out to approximately 500 landowners regarding an upcoming public open house for the Project which was scheduled for August 30th (see August 30, 2017 bullet for more detail). Project web site went live which provided details about the proposed Project and includes an interactive map.
- August 29, 2017 Xcel Energy presented the proposed Project to the Bayfield County Board of Supervisors and requested preliminary County approval for location of the transmission line on county forest land which would require an easement, permit, lease, or other similar form of land rights from the County. Several members of the public attended this meeting to voice concern about the proposed Project (open house was scheduled for the following day). County chose to postpone any action until the following month.
- August 30, 2017 Xcel Energy held a public open house at the Bayfield County Annex in Washburn. Mailings were sent to approximately 540 landowners in the area and included all properties along the proposed route and the existing transmission line and all

properties between the two. Approximately 60 people attended the open house; many had concerns about the proposed route location. Comment forms were provided to attendees to submit at the meeting or mail in.

- September 18, 2017 Project team members Chris Buboltz, Project Manager and Ellen Heine, Sr. Land Agent, attended the Town of Bayfield meeting to answer questions and provide more information about the proposed Project.
- September 19, 2017 Project team members attended Bayfield County Board of Supervisors meeting where several landowners and Supervisors again spoke about their concerns about the Project. Project team noted that Xcel Energy would be open to considering additional alignment alternatives; Board of Supervisors postponed any action regarding placement of the line on County land.
- November 7, 2017 Xcel Energy sent outreach letters and maps describing additional alignment alternatives being considered to over 300 landowners who had property near any of these alternatives (including the previously proposed alignment). This included an alternative following the existing transmission line. Comment forms were included with the letter to be mailed or emailed back to Xcel Energy.
- November 9, 2017 Xcel Energy mailed a letter to agencies and municipalities which included copies of the November 7 landowner letter, and the comment form. That same day an email was sent to those contacts with the same because agency letters were two days after the landowner letter, and Xcel Energy wanted to make sure staff and elected officials were aware of the details of the mailing.
- November 16, 2017 notice published in the Ashland Daily Press and Bayfield County Journal noting the recent mailing to landowners regarding new alternative segments and request for comments.
- December 14, 2017 Xcel Energy presented to the Bayfield County Forestry and Parks Committee an alignment alternative following the existing transmission line, which would also require an easement for County land, and received provisional approval.
- January 16, 2018 Xcel Energy Project team members attended an informational Q&A session at the Washburn Library hosted by the Bayfield Peninsula Energy Alternatives (BPEA), a landowner group that formed following the August public open house. Chris Buboltz, Ellen Heine and Jason Espeseth, Sr. Engineer – Transmission Planning, attended the session and answered questions from the group. At the end of the meeting Xcel Energy agreed to develop more detailed materials about the alternative route segments and schedule a routing workshop for the public to participate in sometime in the future.
- January 22, 2018 Xcel Energy submitted a letter to Mark Ables-Allison, Bayfield County Administrator, to be forwarded to the Bayfield County Board of Supervisors, requesting that they take no action regarding the Project at the January 30, 2018 board meeting and allow Xcel Energy to continue evaluating alignment alternatives and working with the public.

- March 15, 2018 Letter sent to about 100 landowners located along some additional potential route segments that hadn't been included in previous outreach.
- March 21, 2018 Public Routing Workshop invite sent to landowners adjacent to any of the potential route segments as well as agency contacts.
- April 4, 2018 Xcel Energy held a Routing Workshop at the Harborview Event Center in Washburn. The workshop was attended by approximately 75 landowners and included a presentation about the Project and current potential route options and attendees were notified that Xcel Energy plans to submit an application with two different route alternatives to the PSC. The presentation was followed by an interactive working session where people broke into smaller discussion groups facilitated by Xcel Energy Siting and Land Rights staff, and reviewed maps and tables containing information about each segment. The request was for each group to select two route alternatives based on the detailed information provided. Feedback from attendees largely favored construction of the Second Circuit in the same corridor as the existing transmission line. There was little support for any of the recently added route segments.
- September 10, 2018 mailer is sent to over 900 landowners and agency contacts notifying them about the upcoming public open house. Two route alternatives are identified: the West Route and the East Route (existing corridor), which are both to be included in the application to the PSC. It is also noted that construction of the East Route will require construction of a temporary bypass line in a separate corridor, which is included on the map.
- September 17, 2018 letters with property-specific maps showing the location of any of the potential lines in relation to affected or adjacent properties are sent to all landowners located along either of the potential routes or the temporary bypass line, inviting them to attend the public open house.
- September 24, 2018 Held public open house at the Harborview Event Center in Washburn, WI. Approximately 70-80 people attended the event. Staff from Siting and Land Rights, Project Management, Vegetation Management, Construction (line and civil), Media Relations and Community Relations were all present to talk with attendees, answer questions and receive comments. Comment forms were available at the open house requesting feedback on the two proposed route alternatives.
- October 29, 2018 sent letter to agencies notifying them about the upcoming Application filing and requesting comments on the Project.
- January 14 and January 29, 2019 Brendan Cohen, who took over as Project Manager, attended Bayfield County Forestry and Parks Committee and County Board of Supervisors meetings to provide an update on the proposed project and a preview of the upcoming PSC review process.

Throughout this entire process Xcel Energy has also had many phone conversations and email exchanges with landowners and agency representatives about the Project. Many people have had questions about the location/s of the proposed line, the Project timeline, and details about upcoming meetings. People have been encouraged to submit comments via email or in a letter or comment form in order to ensure that each person's specific concerns are documented. The Project web site has also been updated a number of times and a Frequently Asked Questions document, available through the web site, has been updated as the Project has evolved. An interactive web map has been included on the Project web site as well, which was updated as route segments were added, changed or removed in order to reflect the most current state of proposed route alternatives.

7.2 Community Issues

Following the August 30, 2017 public open house, a group of several landowners who lived along the then proposed alignment (which was substantially similar to the West Route) organized to form a group called BPEA. Much of the early emphasis from BPEA was on encouraging Xcel Energy to evaluate the possibility developing solar energy generation on the Bayfield Peninsula instead of building the Second Circuit. This effort was largely driven by a proposal written by Robert Owen, dated September 6, 2017, which supported solar as a Project alternative, in conjunction with a number of additional changes to the transmission and distribution systems in the area, the primary of which was the installation of a submarine transmission cable that would run from Ashland to Washburn within Lake Superior. This proposal was also referred to as the CheqBay Renewables proposal, because Mr. Owen was part of a non-profit by that name. Over the next several months many community members expressed a desire to see the Bayfield Second Circuit Project replaced by a solar farm. Xcel Energy evaluated the proposal by Mr. Owen and found that it was focused on bringing solar energy to the area but did not address the electric reliability issues that exist on the Bayfield Peninsula. More detail regarding Xcel Energy's analysis of, and concerns with, the CheqBay proposal were provided in the FAQ document on the web site and communicated to landowners and County staff and Board members via the communication methods described above in Section 7.1.

Placement of the new Second Circuit within the Existing Transmission Line Corridor

Xcel Energy's initial proposal included a single route, which was substantially similar to the West Route. The option of co-location with the existing 34.5 kV line was not initially advanced due to a number of challenges/concerns related to constructability, safety, reliability and redundancy (described in more detail in Section 5.1.3). However, after Xcel Energy had completed analysis of the solar proposal and indicated to the public that that option was not being considered further, many of the landowners in the area expressed a strong preference for construction of the new second circuit within the existing corridor, rather than the initially proposed one, and began to advocate for use of the existing transmission line corridor. In response, Xcel Energy Project team members began to further evaluate a co-location option. A key concern was that electric service to Washburn and Bayfield needs to be maintained throughout construction of the

new line, and those communities are served by the existing line. Earlier iterations included constructing the Second Circuit parallel to the existing line on new poles or constructing it as a new double-circuit line that would be offset from the existing line. Eventually the Project team determined that the most viable way to construct within the existing transmission line corridor would be to construct a temporary bypass line separated from the existing line. This would allow the existing line to be de-energized and removed before constructing the new line, and would alleviate a number of safety concerns and more challenging construction requirements. This existing corridor alternative is the East Route in this application. More detail on this issue is included in Section 5.3 and Appendix I.

7.3 Land Use Plans

The Bayfield County Land Use Plan (2003) and the Bayfield County Comprehensive Plan (2010), outline the existing land use and future development plans for Bayfield County. As noted in the plans, approximately 82 percent of land in Bayfield County is forested and approximately 48 percent of the land in the county is public land (i.e., under federal, state, or county ownership). Based on review of the current and future land use maps in the Bayfield County Comprehensive Plan, Both the East and West Routes would predominantly cross county-owned land, private forest, residential, and agricultural land (Bayfield County, 2010).

In addition to the Bayfield County plans, each of the five towns along the routes have their own land use plans (Eileen, Barksdale, Washburn, Bayview, and Bayfield). Similar to the overall county plans, these local land use plans focus on stewardship of the forest resources and maintaining the scenic quality of the County (Town of Barksdale, 2010; Town of Bayfield, 2005; Town of Bayview, 2008; Town of Eileen, 2009; and Town of Washburn, 2007).

Forest management directives from federal, state, or county agencies play a large role in land use planning in Bayfield County. The Bayfield County Forest Comprehensive Land Use Plan (2006-2020) provides guidance on information to be included in requests for public utility ROWs on county forest land. Section 515.6 of the plan lists the information that should be included with easement requests submitted to the Forestry and Parks Committee of the County Board (Committee) for consideration. The plan further advises that public utilities are encouraged to use existing corridors to minimize disturbance of county forests and native plants and animals (BCFPD, 2006-2020). Prior to construction, Xcel Energy will coordinate with the Committee to request an easement or license for location of the line across county forest land and to ensure that the proposed transmission line is in compliance with applicable provisions of the plan.

The Bayfield County Land Use Plan and the Bayfield County Comprehensive Plan include information on existing and future land use for municipalities within the county. The East Route would cross one city, the City of Washburn; the West Route would not cross any cities. Both routes also cross the Towns of Eileen, Barksdale, Washburn, Bayview, and Bayfield. According to existing and proposed future land use maps of the town of Washburn provided in the Bayfield County Land Use Plan, the East Route would cross county-owned land and private forested land

(Bayfield County, 2003). Beyond recommendations that future development be clustered to limit negative impacts on natural resources in Bayfield County, no specific restrictions to utility corridor development are noted in the County or Town land use plans. Xcel Energy has sited the proposed routes to follow existing roadways and cleared utility corridors, which would limit impacts to natural resources and would therefore be in agreement with the county plans.

7.4 Agriculture

7.4.1 Type of Farming

Xcel Energy reviewed USGS GAP National Land Cover Data to identify agricultural lands along each proposed route segment (USGS, 2014). PSCW Table 2, provided in Appendix B, presents the total acres of agricultural lands along each of the proposed route segments. In addition to the USGS GAP data, cropland data layers from the USDA, National Agricultural Statistics Service were reviewed to provide additional details about the types of farms crossed by the proposed route segments, including specialty farms such as orchards, tree plantations, and cranberry bogs (USDA, 2017).

According to the USDA 2012 Census of Agriculture, approximately 71,000 acres (7.5 percent) of the approximately 944,861 acres of land in Bayfield County is used for farming operations. Corn, wheat, and soybeans are the main crops grown in Bayfield County (USDA, 2012).

The West Route and the bypass line segments associated with the West Route would cross approximately 8.9 acres of agricultural land. Agricultural lands along the West Route predominantly produce hay (non-alfalfa), corn, and alfalfa. Collectively, the East Route and associated bypass line segments would cross approximately 8.8 acres of agricultural land. Agricultural lands crossed by the East Route predominantly produce hay (non-alfalfa), corn, alfalfa, and soybeans. No orchards, tree plantations, or cranberry bogs were identified along the proposed route segments.

7.4.2 Agricultural Practices Affected by Project

Specific agricultural practices such as irrigation systems or drainage tiles are generally not identified until we initiate the easement acquisition process with the landowner of record. Xcel Energy has not been made aware of organic farms, irrigation systems, or other specific agricultural practices that could be affected by the Project through public outreach and meetings. Once Xcel Energy is made aware of the existence of specific agricultural practices, they will work with the landowner to avoid or minimize impacts to these practices or make them whole if there are additional monetary burdens they might incur as a result of the Project.

7.4.3 Farmland Preservation Program

The number and size of parcels enrolled in the FPP along each route were identified from a database obtained from DATCP. The database lists landowners who have voluntarily filed a FPP

agreement with DATCP; therefore, it is not necessarily comprehensive, but it is the only database that could be obtained. The existing transmission line, which is the alignment for the East Route, crosses one property that is currently enrolled in the Farmland Protection Program. If the East Route is selected impacts to this property are expected to be similar to current conditions.

7.4.4 Mitigating Project Impacts In/Near Agricultural Lands

Potential construction-related impacts on agriculture will generally be short term in nature, and would primarily consist of crop losses, soil mixing, and/or soil compaction along equipment access routes and around structure installation sites. Xcel Energy would mitigate these short-term impacts by providing compensation to producers, and by restoring agricultural lands to the extent practicable. Where appropriate, mitigation techniques such as topsoil replacement and deep tilling will be utilized.

Xcel Energy has attempted to minimize long-term impacts associated with constructing the Project across agricultural lands through careful consideration of alignment routing and individual structure siting. Much of the route in agricultural areas is sited along fence lines or between fields; others would run along public road ROW, where practicable, so the proposed structures are located along the edge of the land area used for agricultural purposes. These routing and siting practices minimize the loss of tillable land and associated interference with agricultural equipment operation. If conflicts occur, Xcel Energy will work with property owners during the real estate acquisition process to accommodate property owner needs to the extent practicable.

Prior to construction Xcel Energy will coordinate with each agricultural landowner regarding farm operation (e.g., irrigation systems, drainage tiles), locations of farm animals and crops, current farm biological security practices, landowner concerns, and use of access routes. Potential impacts to each farm property along the ordered route will be identified and where practicable, construction impact minimization measures may be implemented. Site-specific practices would vary according to the activities of the landowner/farm operator, the type of agricultural operation, the susceptibility of site-specific soils to compaction, the degree of construction occurring on the parcel, and the ability to avoid areas of potential concern.

If there are any organic farms located on the ordered route, Xcel Energy will work with the landowners to minimize potential impacts to their organic farming status due to the transmission line routing or construction. Methods to minimize impacts could include offsetting the transmission line structures from the property line so tree lines or other buffers are maintained. Additionally, construction vehicles may be cleaned prior to entering the organic farm parcels, based on input from the landowner. Further, to protect organic farms during vegetation management activities once the line is in operation, Xcel Energy does not apply herbicide within portions of an easement on which the landowner wishes not to introduce it.

7.4.5 Agricultural Impact Statement

An Agricultural Impact Statement (AIS) is generally required when a project involves the actual or potential exercise of the powers of eminent domain and if any interest in more than five acres of any farm operation may be taken (Wis. Stat. § 32.035(4)(a)). However, electric transmission projects less than 100 kV are exempt from the Agricultural Impact Statement Program. On November 7, 2018, Ms. Alice Halpin of DATCP confirmed that because the Project is less than 100 kV, it is exempt from the AIS Program (see Appendix F).

7.4.6 Neutral to Earth Voltage (NEV) and Induced Voltage

7.4.6.1 The number of confined animal dairy operations located within one half mile of the proposed centerline.

Table 7.4-1 below shows the number of confined animal dairy operations within one half mile of the for each route segment.

7.4.6.2 The number of agricultural buildings located within 300 feet of the proposed centerline.

Table 7.4-1 below shows the number of agricultural buildings within 300 feet of the centerline for each route segment

There are 52 and 40 agricultural buildings within 300 feet of the West Route and East Route, respectively. There are 2 confined dairy operations within 300 feet of the West Route and 4 within 300 feet of the East Route (Table 7.4-1). Most agricultural buildings and confined dairy operations are in the southern portion of the Project (West Route Segments 1 and 2; East Route Segments 1 and 2; and temporary bypass line Segment 1).

Table 7.4-1 Agricultural Buildings and Dairy Operations

Route / Segment ID	Confined Dairy Operations within half mile	Agricultural Buildings within 300 feet
WEST ROUTE		
1	-	8
2	1	21
3	-	5
4	-	7
Bypass 1	1	11
Bypass 1W	-	-
West TOTAL	**2**	**52**
EAST ROUTE		
1	-	8
2	1	3

Table 7.4-1 Agricultural Buildings and Dairy Operations		
Route / Segment ID	**Confined Dairy Operations within half mile**	**Agricultural Buildings within 300 feet**
3	-	-
Bypass 1	1	11
Bypass 2	1	14
Bypass 3	-	-
Bypass 4	4	4
East TOTAL	**4**	**40**

7.4.6.3 Discuss induced voltage issues as they relate to the project and routes.

Induced voltage or "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 - not transmission lines as proposed here. The term generally describes a voltage between two objects where no voltage difference should exist. More precisely, stray voltage is a voltage that exists between the neutral wire of either the service entrance or of premise wiring and grounded objects in buildings such as barns and milking parlors. 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.

Transmission lines do not, by themselves, create stray voltage because they do not connect directly to businesses or residences. Transmission lines, however, can induce voltage on a distribution circuit that is parallel and immediately under the transmission line. If the proposed transmission lines parallel or cross distribution lines, appropriate mitigation measures can be taken to address any induced voltages. For additional information regarding stray voltage, please see the PSCW page on Stray Voltage Guide that is available online at https://psc.wi.gov/Pages/Programs/StrayVoltageHomePage.aspx, or contact your electrical utility provider.

Farming Operations, Vehicle Use, and Metal Buildings near Power Lines

The power lines will be designed to meet or exceed minimum clearance requirements with respect to electric fencing as specified by the National Electric Safety Code (NESC). Nonetheless, insulated electric fences used in livestock operations can be instantly charged with an induced voltage from transmission lines. The induced charge may continuously drain to ground when the charger unit is connected to the fence. When the charger is disconnected either for maintenance or when the fence is being built, shocks may result. The local electrical utility can provide site specific information about how to prevent possible shocks when the charger is disconnected.

Farm equipment, passenger vehicles, and trucks may be safely used under and near power lines. The power lines will be designed to meet or exceed minimum clearance requirements with respect to roads, driveways, cultivated fields and grazing lands as specified by the NESC. Recommended clearances within the NESC are designed to accommodate a relative vehicle height of 14 feet.

Vehicles, or any conductive body, under high voltage transmission lines will be immediately charged with an electric charge. Without a continuous grounding path, this charge can provide a nuisance shock. Such nuisance shocks are a rare event because generally vehicles are effectively grounded through tires. Modern tires provide an electrical path to ground because carbon black, a good conductor of electricity, is added when they are produced. Metal parts of farming equipment are frequently in contact with the ground when plowing or engaging in various other activities. Therefore, the induced charge on vehicles will normally be continually flowing to ground unless they have unusually old tires or are parked on dry rock, plastic, or other surfaces that insulate them from the ground.

Buildings are permitted near transmission lines but are generally discouraged within the ROW itself because a structure under a line may interfere with safe operation of the transmission facilities. For example, a fire in a building on the right- of-way could damage a transmission line. As a result, NESC guidelines establish clear zones for transmission facilities. Metal buildings may have unique issues. 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 Xcel Energy for further information about proper grounding requirements.

Xcel Energy will design and construct the proposed facilities to minimize the potential for induction issues. See Section 5.3 of this Application for locations where electric distribution lines will be relocated to eliminate physical conflicts with the Project or to increase separation with the proposed transmission line. Additionally, Xcel Energy will work with the owners of the potentially impacted facilities to address their concerns. This includes coordinating with the local distribution companies to perform pre and post-construction testing of potentially impacted facilities, if necessary, to ensure that no adverse impacts result.

7.5 Residential and Urban Areas:

7.5.1 Discuss anticipated impacts to residential/urban neighborhoods and communities such as ROW clearance and temporary construction impacts, including noise, dust, duration of construction, time-of-day of construction, road congestion, impacts to driveways, etc. how they will be mitigated.

The routes and substation sites are primarily located in rural areas. However, there are many rural residences along both of the route alternatives. Construction of the transmission line, substations, and access roads will generate temporary impacts to rural residences and communities. The Project will be built using conventional construction equipment (e.g., bulldozers, heavy trucks, drill rigs, cranes and hydraulic and pneumatic tools). During construction, ambient noise levels

would increase; dust may be generated by ground disturbing activities and the use of access roads; and, mud may be tracked onto public roadways at construction vehicle access points. Work will generally be completed during daylight hours under a typical 8 to 12-hour work day, unless night work is specifically required. In areas of active construction along roadways or at road crossings, lane closures may be necessary during active construction to ensure public safety.

7.5.2 Discuss how anticipated impacts would be mitigated.

Xcel Energy will mitigate construction impacts to residential areas, where possible. Noise generated during construction will be temporary and sporadic throughout a typical work day including night work if specifically required. Dust will be controlled by periodic wetting of access roads and work areas or by application of polymer to exposed soil. Tracking pads will be constructed at frequently used access points to minimize mud being tracked onto public roads. Road sweepers may also be used to remove mud tracked onto the road. Traffic control plans will be developed if needed and implemented during construction to minimize impacts to traffic and to comply with permit requirements.

Use of residential concrete or blacktop driveways will be avoided whenever possible. If access is unavoidable, the driveways may be protected using composite mats or other low-profile protection systems. Commercial or industrial driveways may be used without surface protection, but will be evaluated prior to their use. Any damage caused by construction access will be repaired as needed.

7.6 Aesthetic Impacts

7.6.1 Photo Simulations

Concerns were raised about the visual aesthetics of the proposed transmission line during Xcel Energy's public outreach activities; however, no significant concerns were raised warranting a photo simulation of the proposed transmission line in a particular area of the landscape. Photo simulations were also not identified as needed during any pre-application meetings.

7.6.2 Scenic Roads

Neither the West nor East Routes cross scenic byways or rustic roads. Wisconsin State Highway 13 is designated as a scenic byway along the coast of the Bayfield peninsula (State of Wisconsin Department of Transportation [WisDOT], 2018a). At its closest, this highway is approximately half mile east of proposed Fish Creek Substation. West and East Route Segment 1 are also about half mile west of this scenic highway. This segment is proposed to be double-circuited with existing transmission lines and within an existing corridor.

No Wisconsin Rustic Roads are present in the Project area (WisDOT, 2018b).

7.7 Parks and Recreation Areas

7.7.1 Parks and Recreation along the Routes

Table 7.7-1 below lists parks and recreation areas that are located along the proposed routes. The West Route crosses or is near 4 parks and recreation areas and the East Route crosses or is near 7 parks and recreation areas. Both the West and East Route cross ATV/UTV, snowmobile, and silent sport trails.

Table 7.7-1 Parks and Recreation Areas

Name	Owner/Manager	West Route	East Route
Whittlesey Creek National Wildlife Refuge	U.S. Fish and Wildlife Service	X	X
Northern Great Lakes Visitor Center	U.S. Forest Service	X	X
South Shore Lake Superior Fish and Wildlife Area	Wisconsin Department of Natural Resources (WDNR)	X	X
Nourse Sugarbush State Natural Area	WDNR		X
ATV/UTV Trails	Bayfield County	X	X
Snowmobile Trails	WDNR	X	X
Silent Sport Trails	Varies	X	X
Big Rock Park Campground	Bayfield County		X
Lake Superior View Golf and Driving Range	Lake Superior View Golf	X	X
Mount Ashwabay Recreation Area	Mount Ashwabay Ski Resort		X

Whittlesey Creek National Wildlife Refuge – The Whittlesey Creek NWR is an approximately 560-acre area on the shore of Lake Superior approximately 2 miles west of Ashland, Wisconsin that is owned and managed by the USFWS (USFWS, 2018). The primary management goal of the NWR is to preserve and restore coastal wetland and spring-fed stream habitat along the shore of Lake Superior (Northern Great Lakes Visitor Center, undated). In particular, the USFWS seeks to protect and restore habitat and increase population numbers of coaster brook trout, a native Wisconsin trout species that lives in Lake Superior and spawns in Whittlesey Creek. The NWR is also managed for and used by the public as a resource for environmental education through partnerships with local agencies such as the Northern Great Lakes Visitor Center. West and East Route Segments 1 cross the NWR within the existing transmission easement and will be built to double circuit. Temporary Bypass Line Segment 1 also crosses the western edge of the NWR.

Xcel Energy has met with USFWS representatives to discuss the proposed Project and necessary approvals, and will continue to coordinate with them as the PSC review process moves forward.

Northern Great Lakes Visitor Center - The Northern Great Lakes Visitor Center is part of the NWR complex. The Forest Service holds title to the facility and 180-acre grounds immediately adjacent to the south of the NWR. West and East Route Segments 1 cross the Forest Service parcels within the existing transmission corridor and will be built to double circuit. Temporary Bypass Line Segment 1 also crosses the western edge of this recreation area.

Xcel Energy has a Special Use Permit with the USFS which includes the location of proposed West and East Route Segments 1. We will work with USFS on any modifications to the SUP that are needed.

South Shore Lake Superior Fish and Wildlife Area – The South Shore Lake Superior Fish and Wildlife Area was created in 1992 to preserve a large, self-sustaining anadromous fishery with the goal to enhance the stream and coastal habitats to benefit flora and fauna. They are primarily associated with trout streams and other waterbodies than flow into Lake Superior. Both the West and East Routes cross several parcels of South Shore Lake Superior Fish and Wildlife Area.

Nourse Sugarbush State Natural Area - The Nourse Sugarbush SNA is managed as an old-growth northern mesic forest reserve and ecological reference area on the northwest flank of Mount Ashwabay (WDNR, undated-a). The East Route would be within Xcel Energy's existing 3601 34.5 kV transmission line corridor where it crosses the SNA and no additional clearing would be necessary for construction or operation of the East Route. For this reason, no impacts to the management goals of the SNA are anticipated.

Xcel Energy reached out to representatives from the WDNR who manage the fish and wildlife area and the SNA as well as real estate staff early in the routing process. Based on the number of locations where the potential segments crossed parts of DNR property staff requested that we renew discussions with them once the number of potential impact areas is narrowed down. We will continue to work with WDNR staff during the PSC review process.

ATV/UTV trails – There are numerous ATV/UTV trails in Bayfield County, most of which are on local roads. Both the West and East Routes have several crossings of ATV/UTV trails and, in some cases, the routes are parallel to the roads that make up the trails.

Snowmobile trails – snowmobiles trails traverse much of Bayfield County and connect cities. In the Project vicinity, there is a snowmobile trail through/around Whittlesey Creek NWR connecting to Washburn along the Lake Superior Shore. A second snowmobile trail, the Joe Scholl Trail, travels north and west out of Washburn and runs into the National Forest. Both the West and East Routes would cross portions of each of these snowmobile trails.

Silent Sport Trails – silent sport trails are designated for hiking, mountain biking, cross country skiing and other activities that do not require mechanized equipment. These trails are generally associated with other recreation areas. In the Project vicinity, there are silent sport trails at the Northern Great Lakes Visitor Center and associated property, Lake Superior View golf course, Mount Ashwabay recreation area, and Big Rock Park campground.

Big Rock Park Campground – This campground is owned by Bayfield County Forestry & Parks Department (Bayfield County, 2018). It hosts 13 camp sites, a pit toilet, and a hand pump along the Sioux River. Temporary Bypass Line Segment 4 is collocated with Big Rock Road at this recreation area.

Xcel Energy has informed Bayfield County that some tree clearing may be required for placement of the temporary bypass line along Big Rock Road.

Mount Ashwabay – Mount Ashwabay is a ski and snowboard facility that has 12 runs spanning over 65 acres of skiable alpine area, and over 25 miles of skate and classic cross-country trails (Mount Ashwabay, 2018). In the summer this facility is open to bike trails with over eight bike trails throughout the park. The East Route crosses the back side of this recreation area within the existing easement. Additionally, off-ROW access roads will cross the ski area.

Lake Superior View Golf Course – This 18-hole golf course converts to a cross country ski and snow shoe recreation in the winter months. The Washburn Switch is adjacent to this golf course, to which both routes will connect.

7.7.2 Parks and Recreation Mitigation

Potential long-term impacts on the affected properties have been minimized primarily by utilizing Xcel Energy's existing transmission line corridor to the extent practicable and/or routing the transmission line with existing linear facilities such as roads and distribution lines.

Construction of the temporary bypass line could result in some medium-term impacts, particularly in locations where trees need to be trimmed or removed. However once the temporary line is removed vegetation will allowed to grow back over time.

Short-term impacts would include an increase in ambient noise. Short-term construction impacts for affected areas on the selected route would be mitigated, in coordination with the corresponding land managers, through strategic scheduling and the application of construction BMPs.

7.8 Airports

7.8.1 Location of Airports and Airstrips

There are two public airports within five miles of the Project. The John F Kennedy Memorial Airport is located approximately 2.9 miles southeast of the proposed Fish Creek Substation and south of the town of Ashland. The airport is owned by the City and County of Ashland. The Major Gilbert Field Airport is located approximately 5 miles east of the Pikes Creek Substation on Madeline Island. The airport is owned by the town of La Pointe.

7.8.2 Airport/Airstrip Descriptions

The John F Kennedy Memorial Airport has two runways with dimensions of 5,197 by 100 feet oriented north/south and 3,498 by 75 feet, oriented northwest/southeast (Airnav.com, 2018a). Both runways are covered with asphalt. The John F Kennedy Memorial Airport averages 29 aircraft operations per day and is predominantly used for single engine and multi engine airplanes and has fewer jet planes and ultralight aircraft.

The Major Gilbert Field Airport has one runway that is oriented from southwest to northeast and has dimensions of 3,000 by 75 feet (Airnav.com, 2018b). The runway is covered in asphalt. The Major Gilbert Field Airport averages 116 aircraft operations per week and is used for transient and local general aviation.

7.8.3 Potential Construction Concerns and FAA Consultation

An evaluation of the structures and substations will be conducted once the designs are final. Xcel Energy submitted approximate structure locations and heights to the Federal Aviation Administration (FAA) Notice Criteria Tool for those points nearest each airport as a preliminary screening. Both the southern- and eastern-most points of the Project are proposed substations. The Notice Criteria Tool indicated structure heights in each of these locations do not exceed Notice Criteria for the FAA. Neither the FAA nor WisDOT Bureau of Aeronautics have provided comments on the Project.

7.9 Communication Towers

Xcel Energy reviewed the Federal Communications Commission (FCC) databases for registered communication towers in the Project vicinity. There is one FM tower approximately 550 feet west of West Route Segment 2 along Church Corner Road. There are no other FCC towers within one mile of the West or East Routes.

7.9.1 Discuss any potential interference to the function of communication towers within the project area by the proposed project.

No impacts on radio, television, cellular phones, or Global Positioning System (GPS) units are expected from construction or operation of either of the route options. Depending on signal strength and direction, minor interference with AM radio may occur within the 50- to 100-foot-wide ROW along each route. We believe we have maintained an adequate distance from any of these towers or facilities during the initial routing process to avoid potential safety or quality issues.

7.10 Community Income from High-Voltage Transmission Impact Fees

High-Voltage Transmission Impact Fees do not apply to this Project because the voltage of the proposed line is 34.5 kV. Wisconsin Statute 16.969(1)(b) defines a high-voltage transmission line as one designed for operation at a nominal voltage of 345 kV or greater.

8.0 WDNR PERMITS AND APPROVALS FOR IMPACTS TO WATERWAYS AND WETLANDS

It is anticipated that a WDNR Utility Permit will be required for this Project. The WDNR permits required for construction of the facilities proposed in this Application include:

- Chapter 30 permit to place temporary bridges in or adjacent to navigable waters, pursuant to Wis. Stat. § 30.123 and Wis. Admin. Code ch. 320;
- Wetland Individual permit, pursuant to Wis. Stat. § 281.36 and Wis. Admin. Code chs. NR 103 and 299;
- WPDES Storm Water Discharge permit pursuant to Wis. Stat. ch. 283 and Wis. Admin. Code ch. NR 216; and
- Any other applicable permit which is required, if the need for that permit is identified by WDNR.

The documentation required by WDNR to review the Project in consideration of the above-referenced permits is provided in the following section of the Application. A Notice of Intent under NR 216 would be filed after a route is ordered and prior to construction of the Project. If an Incidental Take permit is required, additional information will be submitted to WDNR Bureau of Natural Heritage Conservation. Also included in Appendix B are Table 8 – WDNR Waterway/Wetland Impact Location Table and Table 9 – WDNR Waterway/Wetland Environmental Inventory Table.

Temporary Bridges

Temporary bridges will be required at navigable waterways for each route as described in Section 6.4 and listed in Table 8 of Appendix B. These crossings require approval by the WDNR under Wis. Stat. § 30.123. It is anticipated, based on desktop review, that all of the waterways proposed for TCSB installation are less than 35 feet wide and will be designed to meet the standards and conditions for TCSB crossings in Wis. Admin. Code § NR 320.06. A clearance waiver, as authorized by Wis. Admin. Code § NR 320.04(3), will be requested once a route is ordered for those crossings that do not meet the 5 feet of navigation clearance standard in Wis. Admin. Code § NR 320.04.

Xcel Energy will provide additional data regarding site-specific conditions at each waterway for each proposed bridge crossing location, as well as photographs when field surveys occur after a route is ordered.

Discharges to Wetlands

Transmission structures to be placed in wetlands are summarized in Section 6.3.2. The proposed locations are specified in Appendix B, Table 8 for each route, and the wetlands are depicted in Appendix A, Figure 5. Placement of fill in wetlands, including the temporary fill resulting from the placement of protective construction matting, will require approval under Section 404 of the

Clean Water Act (CWA) from the U.S. Army Corps of Engineers, Water Quality Certification from the WDNR under Section 401 of the CWA, Wis. Stat. §§ 281.15, 281.31 and 281.36, and Wis. Admin. Code ch. NR 299.

8.1 WDNR Tables for Wetland and Waterways

As described in Section 8.0, a WDNR Waterway / Wetland Impact Location Table (Table 8) and a Waterway/Wetland Environmental Inventory Table (Table 9) are provided for each route in Appendix B. In addition to wetlands and waterways encountered along both routes, Table 2 also includes upland natural communities which are referenced in other sections of the Application (i.e., Section 6.1 – Forested Lands, and Sections 6.5 and 9.0 which are related to Endangered Resources and Natural Communities).

8.2 Wetland Practicable Alternatives Analysis (Wis. Admin. Code Ch. NR 103)

During route selection, environmental and other factors were evaluated along all potential routes as described in Section 5.1. Through this evaluation, the proposed routes were identified for further evaluation and refinement. Proposed alignments along these routes were also determined through the consideration of these factors.

The number of structures preliminarily determined to be placed in wetlands represents a conservative estimate based on the conceptual pole locations and is detailed by wetland location in Appendix B, Table 8 – WDNR Waterway/Wetland Impact Location Table. Prior to construction, Xcel Energy will attempt to further minimize wetland impacts in the final design.

Access through wetlands will be minimized to the extent practicable, and the use of heavy equipment in wetlands will also be minimized to the extent practicable. When wetland access is required, as described in Section 6.3, disturbance to wetlands will be reduced by one or more of the following: completing wetland construction during dry or frozen conditions; the use of equipment with low ground pressure tires or tracks; placement of construction matting to help minimize soil and vegetation disturbances; distributing axle loads over a larger surface area thereby reducing the bearing pressure on wetland soils; or the use of ice roads.

Upon completion of the transmission line, Xcel Energy will complete site restoration and revegetation consistent with the activities described in Section 6.9.

8.2.1 Describe how wetlands were factored into the corridor and route/site selection process.

Xcel Energy factored wetland avoidance into the Project corridor and route selection process to the extent practicable in the early planning stages. Using WWI data, the location of wetlands within the Project area were identified and frequently referenced as the potential route options were narrowed down and segments were defined by the Project team. During the planning phase, potential wetland impacts were taken into consideration along with other environmental

and social impacts, input from the preceding open houses, engineering feasibility, and cost as described in Section 5.

8.2.2 Describe how the location of proposed routes/sites and design of the line/project avoids and minimizes wetland impacts including consideration for placing structures outside wetlands. Explain how proposed access routes will avoid or minimize wetland impacts.

The proposed route segments have been selected to avoid and minimize wetland impacts to the extent practicable. However, given the structure spanning requirements, wetland impacts cannot be completely avoided by either route. Based on standard design elements, transmission structures will typically span about 200 to 300 feet. This distance is dependent upon several factors, including topography and ROW constraints which can restrict Xcel Energy's flexibility to completely avoid structure placement in wetlands. Many of the route segments are collocated with existing linear corridors, which can reduce wetland conversion impacts associated with the Project. However, those areas that are collocated are also limited in avoiding wetlands in some cases, in that shifting the route to avoid a wetland could potentially cause other impacts such as additional forest fragmentation or landowner encroachment.

The number of structures preliminarily determined to be placed in wetlands represents a conservative estimate based on the conceptual pole locations, as discussed in Section 6.3, and is further detailed by wetland in Table 8 of Appendix B.

Upon route approval, Xcel Energy will attempt to further minimize wetland impacts in the final design. For example, where possible, efforts will be made to move structures near a wetland edge to outside of the wetland. However, based on the number and extent of wetlands along each route, complete avoidance of wetlands may not be practicable.

Access through wetlands will also be minimized to the extent practicable. For example, if construction occurs during periods when the ground is not frozen or dry, wetlands occurring along most roads will be accessed from the adjacent roads near the structure location. If practicable, this will eliminate the need for heavy equipment to access through the entire length of the wetland. As discussed in Sections 5.7 and 6.3, there are no wetland impacts proposed for off-ROW access roads currently identified for the Project.

8.2.3 For proposed construction that will impact wetlands, detail why project alternatives are not practicable after taking into consideration cost, available technology, and logistics in light of overall project purpose.

The purpose of the Project is to improve electric reliability and to provide voltage support to communities on the Bayfield peninsula. A number of factors were considered during the routing process including, but not limited to the following:

- cost - relative to wetland avoidance;

- available technology - materials and construction methods that can be employed to minimize impacts on wetlands for example; and
- logistics - weighing wetland avoidance with factors such as proximity to homes and other buildings, regulation-based design, and benefits of collocation.

However, complete avoidance of wetlands is not feasible due to the frequency of occurrence, and other design-related and logistics issues to consider in addition to wetland and other natural resource impact minimization. Therefore, in light of the Project purpose and in consideration of practical limitations including but not limited to cost, available technology, and logistics, Xcel Energy was unable to identify a practicable alternative that would entirely avoid wetland impacts.

8.2.4 If wetland impacts cannot be avoided, describe all temporary and permanent impacts, as well as the construction and restoration methods that would be used to minimize wetland impacts.

During construction, the implementation of BMPs and Xcel Energy's standard environmental protection practices will provide for further avoidance and minimization of wetland impacts. Through careful attention to access routing, consideration of off-ROW access, types of equipment used, construction time of year, sedimentation control, and the implementation of other relevant site-specific measures, Xcel Energy will mitigate impacts to important wetlands, to the extent practicable in each case. Where minor impacts such as rutting and vegetation disturbance due to equipment operation and mat placement in wetlands, site restoration activities will be implemented, monitored, and remedial measures applied (as necessary) until established restoration goals are achieved.

The construction of either route will result in the loss of a nominal amount of wetlands along the length of the Project (total area of foundations or structures, and backfill). There will also be a small amount of forested wetland conversion; however, as previously mentioned fragmentation of undisturbed wetlands will be minimized due to the collocation of the routes with existing linear features. In areas where additional ROW is needed, the adjacent lands will be cleared of trees and other woody vegetation, resulting in a conversion to emergent or scrub-shrub wetland types. Compensatory mitigation options that meet regulatory requirements will be developed in coordination with the appropriate agencies.

8.3 Wetland Delineations

This Application is presented using remote sensing tools (e.g., aerial photography, WWI data). However, Xcel Energy will conduct wetland field surveys after the PSCW issues an Order. These wetland boundary determinations will be conducted taking into account topography, vegetation and hydrology indicators per WDNR guidelines. Wetland boundaries will be mapped using a GPS unit with sub-meter accuracy.

8.4 Mapping Wetland and Waterway Crossings

The maps included in Appendix A, Figure 5 include the required information for mapping wetland and waterway crossings as listed below.

8.4.1 Recent aerial photo

8.4.2 Transmission line

8.4.3 ROW

8.4.4 Pole locations - Label each pole by number if appropriate.

8.4.5 Waterways

8.4.6 Wisconsin Wetland Inventory

8.4.7 Delineated wetlands

8.4.8 Hydric soils

8.4.9 Proposed temporary bridge locations (labeled to correlate with WDNR Table 1 (referred to in this Application as Table 8))

8.4.10 Locations for other Chapter 30 activities such as grading or riprap (labeled to correlate with WDNR Table 1(referred to in this Application as Table 8))

9.0 ENDANGERED, THREATENED, SPECIAL CONCERN SPECIES AND NATURAL COMMUNITIES

As noted in Section 6.4, a proposed ER Review has been submitted to the WDNR, and a public version is provided in Appendix H.

9.1 WDNR-Endangered Resource Review

As noted in Section 6.4, a final ER Review was issued by the WDNR with required and recommended actions for various species. Due to confidentiality requirements of NHI data, Xcel Energy has provided the proposed ER Review to the PSCW under separate and confidential filing.

9.2 Maps and Data Files Showing NHI Occurrences

The tables included in the ER Review show the NHI element occurrence records. These records are based on a query of the NHI database completed in November 2018.

9.3 Assessment and Biological Surveys for Proposed Routes

At this time, Xcel Energy does not propose to conduct biological surveys.

10.0 REFERENCES

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