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September 19, 2011

--Via Electronic Filing--

Burl W. Haar
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East
Suite 350
St. Paul, MN 55101

RE: Application to the Minnesota Public Utilities Commission for a Route Permit for the North Rochester to Chester 161 kV Transmission Line Project
Alternative Permitting Process
Docket No. E002/TL-11-800

Dear Dr. Haar:

Northern States Power Company, a Minnesota corporation ("Xcel Energy") is electronically filing an application for a route permit for the North Rochester to Chester 161 kV Transmission Line Project ("Project") pursuant to the alternative permitting procedures in Minnesota Rules 7850.2800 to 7850.3900.

The proposed Project consists of 29-30 miles, depending upon the route selected, of new 161 kilovolt ("kV") transmission line between the proposed North Rochester Substation located between Zumbrota and Pine Island, Minnesota and the existing Chester Substation located west of Rochester, Minnesota.

This filing consists of the body of the Application and associated appendices, 8 files in total, as follows:

Filing Order	File Name	File Content	Size
1	Cover_Letter_North_Rochester_Chester_161_kV_Transmission_Project.pdf	Cover Letter Route Permit Application Text and Figures	1.4 MB
2	Appendix_A.pdf	Commission Proceedings, Findings of Fact and Order Granting the Certificate of Need	4.5 MB
3	Appendix_B.pdf	Public Utility Commission and Local Governmental Unit Notification Letters	422 KB
4	Appendix_C.pdf	North Rochester-Chester 161 kV Route Sheet Maps	10.7 MB
5	Appendix_D.pdf	Agency Correspondence	239 KB
6	Appendix_E.pdf	North-South Segment Proposed Chester Route Land Cover Maps	1.5 MB
7	Appendix_F.pdf	North-South Segment Proposed Chester Route Natural Heritage Inventory Maps	2.2 MB
8	Appendix_G.pdf	Property Owner List	145 KB

The initial application fee payment and additional copies of the application are being sent to the Department of Commerce under separate cover.

Please call me at (612) 330-6538 if you have any questions.

Sincerely,

Tom Hillstrom
Supervisor, Siting and Permitting

cc: Matt Langan, Department of Commerce

Enclosure

NORTHERN STATES POWER COMPANY APPLICATION TO THE MINNESOTA PUBLIC UTILITIES COMMISSION FOR A ROUTE PERMIT

NORTH ROCHESTER TO CHESTER 161 KV TRANSMISSION PROJECT

Alternative Permitting Process
PUC Docket No. E002/TL-11-800

September 19, 2011

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1.0 Executive Summary

1.1 Proposal Summary

Northern States Power Company, a Minnesota Corporation ("Xcel Energy" or "the Applicant" or "Company") submits this application ("Application") for a Route Permit to the Minnesota Public Utilities Commission ("MPUC" or "Commission") pursuant to Minnesota Statutes Chapter 216E and Minnesota Rules Chapter 7850. The Applicant is making this Application on behalf of itself and other anticipated co-owners of the Project, including Dairyland Power Cooperative ("Dairyland"), Rochester Public Utilities ("RPU"), Southern Minnesota Municipal Power Agency ("SMMPA"), and WPPI Energy. These co-owners are referred to as "the Utilities".

A Route Permit is requested to construct approximately 29-30 miles, depending upon the route selected, of new 161 kilovolt ("kV") transmission line between the proposed North Rochester Substation located between Zumbrota and Pine Island, Minnesota and the existing Chester Substation located west of Rochester, Minnesota ("North Rochester – Chester 161 kV Line" or "Chester Line" or "Project"). Modifications to the Chester substation are included as associated facilities in this Application. **Figure 1** shows the Project location.

1.2 Project Need

The Project is part of the Hampton – Rochester – La Crosse 345 kV Transmission Project. The Commission granted a Certificate of Need ("CON") in May 2009 approving construction of the Hampton – Rochester – La Crosse 345 kV Transmission Project. The Minnesota portion of the project includes a 345 kV transmission line from a new Hampton Substation near Hampton, Minnesota to a new North Rochester Substation and from the North Rochester Substation to the Minnesota border near Kellogg, Minnesota, a 161 kV line between the North Rochester Substation and the existing Northern Hills Substation, located in northwest Rochester, Minnesota ("North Rochester – Northern Hills 161 kV Line"), the North Rochester – Chester 161 kV Line proposed in this Application and associated facilities. The Hampton – Rochester – La Crosse 345 kV Transmission Project would terminate in the La Crosse, Wisconsin area. As part of the CON order, the Commission directed that the 345 kV structures in Minnesota be constructed as "double-circuit capable" to accommodate a future 345 kV line when conditions warrant. Double-circuit capable poles are constructed to carry two 345 kV circuits with only one circuit installed initially.

In January 2010, the Applicant filed a Route Permit Application ("RPA") for the Hampton – Rochester – La Crosse 345 kV transmission line and the North Rochester – Northern Hills 161 kV Line and associated facilities, including the North Rochester Substation (MPUC Docket No. E002/TL-09-1448). That RPA is currently pending and a decision from the Commission is anticipated in early 2012. The equipment required to connect the Chester Line at North Rochester Substation is included in the 345 kV routing docket.

1.3 Project Description

The Chester Line consists of two segments:

- An east-west segment in which the Applicant proposes to place the Chester Line on the same poles as the Hampton – Rochester – La Crosse 345 kV Transmission Project (345 kV Project).
- A north-south segment in which the Applicant proposes a new route consisting of portions with single-circuit 161 kV construction and portions with 161/69 kV double-circuit construction. The Proposed Route also assumes some existing distribution would be attached to the 161 kV poles.

These two segments are discussed further below.

East-West Segment – Attached to CapX2020 345 kV Line

To minimize the amount of new transmission right-of-way ("ROW") needed, the Applicant proposes to place the Chester Line on the same structures as the 345 kV Project for approximately 13 to 19 miles from the North Rochester Substation to east of the Zumbro River. The route for the 345 kV Project has yet to be determined and is being evaluated in the environmental impact statement (EIS) in docket no. E002/TL-09-1448. In the pending 345 kV route permit proceeding, there are two primary route alternatives and one route option under consideration for the segment of the 345 kV Project that would be double-circuited with the Chester Line (**Figure 2**). The two route alternatives under consideration are the Modified Preferred (White Bridge Road) 345 kV Route and the Alternative (North) 345 kV Route. There is also an alternative segment for crossing the Zumbro River, the Zumbro Dam Route Option, which could be used with either route.

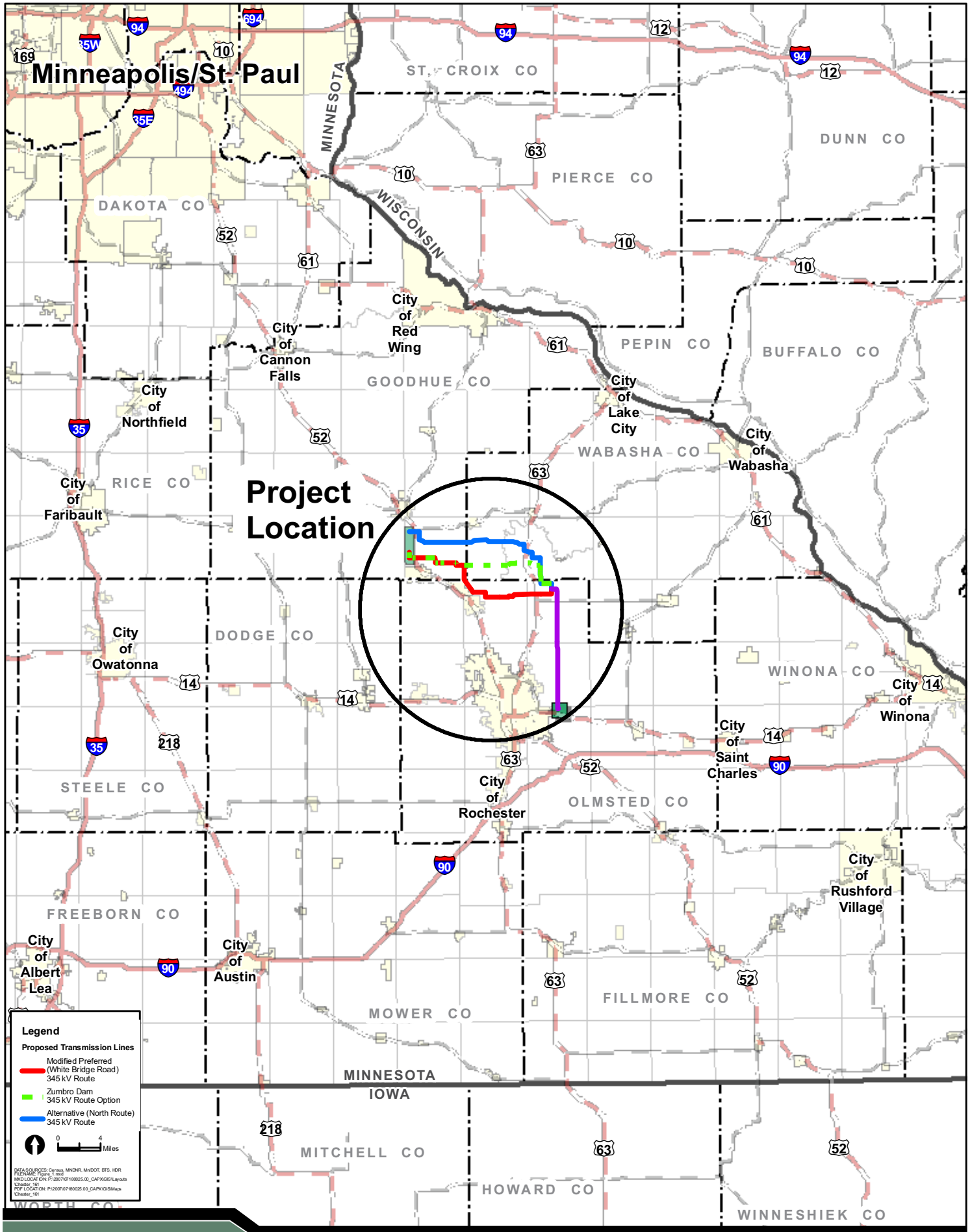
The Chester Line is proposed to be co-located on the 345 kV transmission line from the North Rochester Substation to a point southwest of Hammond, Minnesota that is dependent on the 345 kV Route selected.

This approach takes advantage of the double-circuit capable design from the Minnesota CON order. Because the 161 kV circuit would be strung on the same poles as the 345 kV circuit, no additional right-of-way would be required. This double-circuit would be built as a 345kV/345kV double-circuit, but would be energized as a 345 kV/161 kV double-circuit.

The single-pole, self weathering steel 345 kV double-circuit structures are typically 130 to 175 feet tall and placed 600 to 1,000 feet apart. The typical ROW for the double-circuit 345 kV transmission line design is 150 feet.

North-South Segment – New 161 kV Line

The north-south segment of the Chester Line would begin at one of three locations, referred to as "tap" points, dependent on the 345 kV Route selected. These tap locations are identified Tap 1, Tap 2 and Tap 3. This north-south segment of the proposed Chester 161 kV route is shown in Figure 3.



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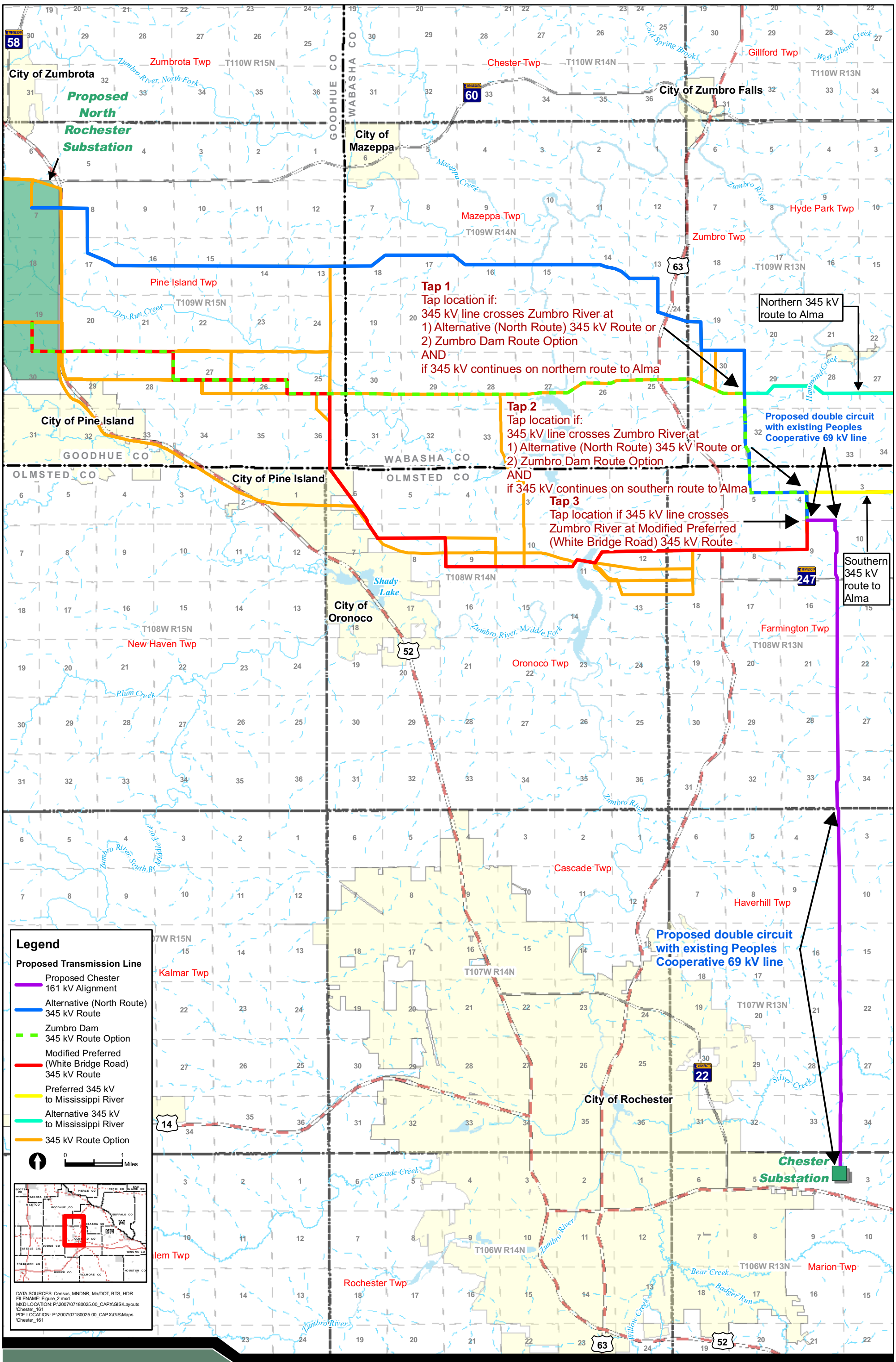
North Rochester - Chester 161 kV Transmission Project

Figure 1
Project Location
September 2011



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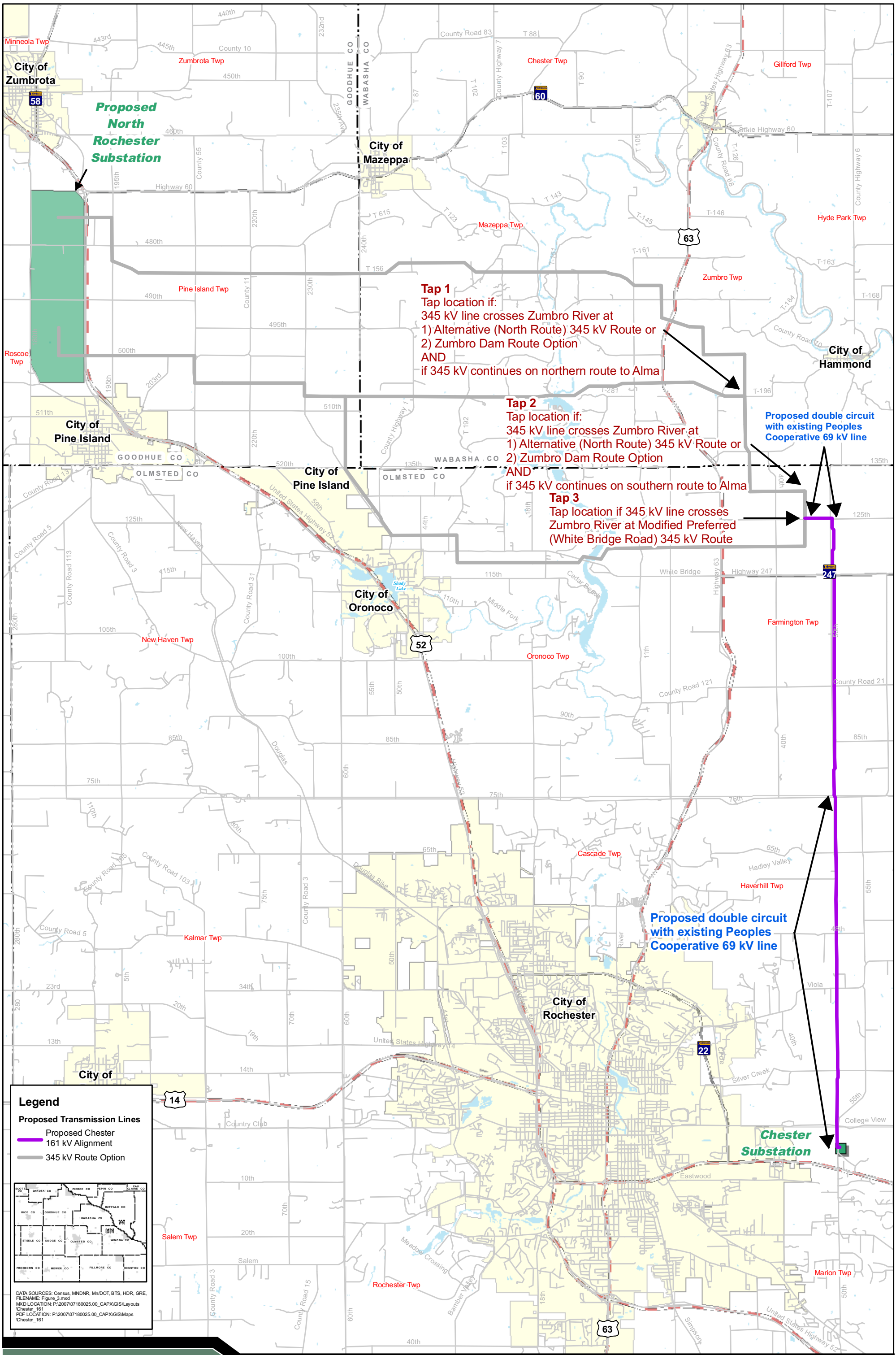
North Rochester - Chester 161 kV Transmission Project

Figure 2
East-West Segment
345 kV Double-Circuit Alternatives

September 2011



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North Rochester - Chester 161 kV Transmission Project

Figure 3
North-South Segment
161 kV Proposed Chester Route

September 2011

Future Second 345 kV Circuit on Double-Circuit Capable Poles

As noted, the Commission ordered the 345 kV Project to be built on double-circuit capable 345 kV poles to facilitate a future 345 kV circuit. This Application proposes to use this second side of the 345 kV poles to carry a portion of the Chester 161 kV Project. If this proposal is approved by the Commission, and later a second 345 kV line is determined to be needed, it could be placed on the 345 kV double-circuit poles, displacing the Chester 161 kV circuit. One potential reconfiguration would be to construct a new 345/161 kV substation at or near the tap point to power the north-south segment of the Chester 161 kV line. A new east/west segment for the 161 line would also be an alternative. There are, however, no current proposals for a second 345 kV connection between North Rochester and the Mississippi River.

Depending upon the 345 kV Route selected by the Commission one of the three following scenarios would occur (**Figures 2 and 3**).

- Scenario 1 – If 345 kV Route is: Zumbro Dam Route Option or Alternative (North) Route in combination with north route to Alma:
    - The east-west segment of the Chester 161 kV line would be double-circuited with the 345 kV line from the North Rochester Substation to Tap 1.
    - The Chester 161 kV line would then continue 3.2 miles south and east from Tap 1 as 161 single-circuit to 125th Street NE. From there the Chester Line would continue approximately 0.5 miles east along 125th Street NE as a double-circuit with the Peoples Cooperative 69 kV line.
    - The Chester Line would then turn south and continue along 50th Avenue NE as a 161 single-circuit line for approximately 5 miles to 75th Street NE.
    - From 75th Street NE for approximately 6.5 miles south to the Chester Substation, the Chester Line would be double-circuited with the Peoples Cooperative 69 kV line.
    - Impacts related to extending the 161 kV line from (Tap 3) to Tap 1 are addressed in **Table 11** that includes the analysis of a 345 kV line in this area. The 161 kV line would require less ROW and would result in lower impacts than the 345 kV line.

- Scenario 2 – If 345 kV Route is: Zumbro Dam Route Option or Alternative (North) Route in combination with the south route to Alma:
    - The east-west segment of the Chester Line would be double-circuited with the 345 kV line from the North Rochester Substation to Tap 2.
    - The Chester Line would then continue 0.5 miles south from Tap 2 as 161 single – circuit to 125th Street NE. From there the Chester Line would be identical to that described under Scenario 1.
    - Impacts related to extending the 161 kV line from tap location (Tap 3) to Tap 2 are already addressed in **Table 12** that includes the analysis of a 345 kV line in this area. The 161 kV line would require less ROW and lower impacts than the 345 kV line.

- Scenario 3 - If 345 kV Route is: Modified Preferred (White Bridge Road) Route including the south route to Alma:

- The east-west segment of the Chester Line would be double-circuited with the 345 kV line from the North Rochester Substation to Tap 3.
- From Tap 3, the Chester Line would continue approximately 0.5 miles east along 125th Street NE as a double-circuit with the Peoples Cooperative 69 kV line. From there the Chester Line would be identical to that described under Scenario 1.

For the North-South segment, the Applicant proposes to use single-pole self-weathering steel poles as follows:

- Double-circuit 161/69 kV poles for the 0.5 miles from Tap 3 along 125th Ave NE to 50th Ave NE, carrying both the proposed 161 kV line and an existing 69 kV line.
- Single-circuit poles for approximately 5 miles south along 50th Avenue NE from 125th Street NE to 75th Street NE.
- Double-circuit 161/69 kV poles carrying both the proposed 161 kV line and an existing 69 kV line for the remaining 6.4 miles of the route to the Chester Substation.
- Portions of the Proposed Route would require existing Peoples Cooperative distribution to be attached in an underbuilt position. In this situation a mid-span pole would be required to support the distribution circuit.

Modifications to the Chester substation would consist of the addition of a 161 kV circuit breaker, switches, line termination and expanded box structure, electrical bus and associated equipment. The substation yard would be expanded by approximately one acre to accommodate the equipment. One to three existing transmission poles at the substation would be relocated to accommodate the expansion.

The Applicant proposes to construct the new 161 kV transmission line in conjunction with the 345 kV transmission line construction. The anticipated in-service date is fall of 2015. The Applicant estimates that the transmission line and modifications at the North Rochester and Chester substations would cost between $23.8 and $25.3 million in 2011 dollars depending on which route is selected for the 345 kV line.

1.4 Proposed Route

Minnesota Statutes Section § 216E.04 and Minnesota Rules 7850.2800 to 7850.3900 provide for an Alternative Permitting Process for certain high voltage transmission line ("HVTL") facilities. The proposed new 161 kV transmission line qualifies for consideration under the Alternative Permitting Process because the proposed new transmission line is between 100 and 200 kV. Minn. Stat. § 216E.04, subd. 2(3); Minn. R. 7850.2800, Subp. 1(C) (authorizing alternative process for HVTLs between 100 and 200 kV). This Application is submitted pursuant to the Alternative Permitting Process outlined in Minnesota Rules 7850.2800 to 7850.3900.

For the east-west segment of the Chester Line that would be attached to the 345 kV Project, the Applicant requests that the Commission approve the same route width described in the RPA for

that project (Docket E002/TL-09-1448.). For the north-south segment of the Chester Line, the Applicant requests that the Commission approve the Proposed Route and authorize a route width of 300 feet on each side of the route centerline (600 feet total width).

A detailed discussion of the Project proposal, engineering, construction and ROW requirements are located in Sections 3.0, 4.0 and 5.0. Section 6.0 addresses land use, recreation and historic and natural resources.

1.5 Completeness Checklist

The content requirements for an application with the Commission under the Alternative Permitting Process are identified in Minnesota Rules 7850.2800 to 7850.3900. The rule requirements are listed in **Table 1** with references indicating where the information can be found in this Application.

Table 1: Completeness Checklist

Authority	Required Information	Where
Minn. R. 7850.2800, Subp. 1(C)	**Subpart 1. Eligible Projects**	
	An applicant for a site permit or a route permit for one of the following projects may elect to follow the procedures of parts 7850.2800 to 7850.3900 instead of the full permitting procedures in part 7850.1700 to 7850.2700 for high voltage transmission lines of between 100 and 200 kilovolts.	Section 2.5
Minn. R. 7850.2800 Subp. 2	**Subpart 2. Notice to Commission**	
	An applicant for a permit for one of the qualifying projects in subpart 1, who intends to follow the procedures of parts 7850.2800 to 7850.3700, shall notify the PUC of such intent, in writing, at least 10 days before submitting an application for the projects.	Section 2.6; Appendix B
Minn. R. 7850.3100	**Contents of Application (alternative permitting process)**	
	The applicant shall include in the application the same information required in part 7850.1900, except the applicant need not propose any alternative sites or routes to the preferred site or route. If the applicant has rejected alternative sites or routes, the applicant shall include in the application the identity of the rejected sites or routes and an explanation of the reasons for rejecting them.	(*See also* Minn. R. 7850.1900, Subp. 2 below)
Minn. R. 7850.1900, Subp. 2 (applicable per Minn. R. 7850.3100)	**Route Permit for HVTL**	
A.	A statement of proposed ownership of the facility at the time of filing the application and after commercial operation	Section 2.2
B.	The precise name of any person or organization to be initially named as permittee or permittees and the name of any other person to whom the permit may be transferred if transfer of the permit is contemplated	Section 2.3
C.	At least two proposed routes for the proposed high voltage transmission line and identification of the applicant's preferred route and the reasons for the preference	Not applicable, per Minn. R. 7850.3100

Authority	Required Information	Where
D.	A description of the proposed high voltage transmission line and all associated facilities including the size and type of the high voltage transmission line	Sections 3.3, 4.1, 4.2 and 6.2
E.	The environmental information required under 7850.1900, Subp. 3	*See* Minn. R. 7850.1900, Subp. 3 (A)–(H) below
F.	Identification of land uses and environmental conditions along the proposed routes	Sections 6.3, 6.4 and 6.6; Tables 11 and 12
G.	The names of each owner whose property is within any of the proposed routes for the high voltage transmission line	Appendix G
H.	United States Geological Survey topographical maps or other maps acceptable to the chair showing the entire length of the high voltage transmission line on all proposed routes	Figure 9
I.	Identification of existing utility and public rights-of-way along or parallel to the proposed routes that have the potential to share ROW, the land used by a public utility (as for a transmission line), with the proposed line	Section 4.2; Table 13; Appendix C
J.	The engineering and operational design concepts for the proposed high voltage transmission line, including information on the electric and magnetic fields of the transmission line	Sections 5.1 and 5.2
K.	Cost analysis of each route, including the costs of constructing, operating and maintaining the high voltage transmission line that are dependent on design and route	Section 3.5
L.	A description of possible design options to accommodate expansion of the high voltage transmission line in the future	Section 4.7
M.	The procedures and practices proposed for the acquisition and restoration of the ROW, construction and maintenance of the high voltage transmission line	Sections 5.1.3, 5.1.4, 5.1.5 and 5.1.6
N.	A listing and brief description of federal, state and local permits that may be required for the proposed high voltage transmission line	Section 5.4
O.	A copy of the Certificate of Need or the certified HVTL list containing the proposed high voltage transmission line or documentation that an application for a Certificate of Need has been submitted or is not required	Section 2.4; Appendix A
Minn. R. 7850.1900, Subp. 3	**Environmental Information**	
A.	A description of the environmental setting for each site or route	Section 6.4
B.	A description of the effects of construction and operation of the facility on human settlement, including, but not limited to, public health and safety, displacement, noise, aesthetics, socioeconomic impacts, cultural values, recreation and public services	Sections 6.5 and 6.6
C.	A description of the effects of the facility on land-based economies, including, but not limited to, agriculture, forestry, tourism and mining	Section 6.7

Authority	Required Information	Where
D.	A description of the effects of the facility on archaeological and historic resources	Section 6.8
E.	A description of the effects of the facility on the natural environment, including effects on air and water quality resources and flora and fauna	Section 6.9
F.	A description of the effects of the facility on rare and unique natural resources	Section 6.10
G.	Identification of human and natural environmental effects that cannot be avoided if the facility is approved at a specific site or route	Section 6
H.	A description of measures that might be implemented to mitigate the potential human and environmental impacts identified in items A to G and the estimated costs of such mitigative measures	Section 6

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2.0 Introduction

2.1 Applicant

The Applicant is a Minnesota corporation with its headquarters in Minneapolis, Minnesota. The Applicant is a wholly-owned subsidiary of Xcel Energy, Inc., a utility holding company with its headquarters in Minneapolis. Xcel Energy provides electricity services to approximately 1.2 million customers and natural gas services to 425,000 residential, commercial and industrial customers in Minnesota. Xcel Energy Services, Inc. is the service company for Xcel Energy and its personnel prepare, submit and administer regulatory applications to the Commission on behalf of Xcel Energy, including RPAs. As discussed in Section 2.2, Xcel Energy is managing the project on behalf of the other CapX2020 utilities.

The Chester 161 kV Transmission Line and the Hampton – Rochester – La Crosse 345 kV Transmission Project are part of several transmission projects proposed by the CapX2020 utilities, referred to as the Group 1 projects. CapX2020 is a joint initiative of 11 transmission-owning utilities in Minnesota, Wisconsin and the surrounding region whose goal is to study, develop, permit and construct transmission infrastructure needed to implement long-term and cost-effective solutions for customers to meet the growth in electricity demand expected between 2009 and 2020. The 11 utilities participating in the CapX2020 Transmission Expansion Initiative include Xcel Energy, Dairyland, Great River Energy, Central Minnesota Municipal Power Agency, Minnesota Power, Minnkota Power Cooperative, Missouri River Energy Services, Otter Tail Power Company, RPU, SMMPA and WPPI Energy. The three other Group 1 projects, which have been permitted separately, are identified below:

- Monticello–St. Cloud 345 kV Project and the Fargo–St. Cloud 345 kV Project – jointly, a 345 kV transmission line from Fargo, North Dakota to Monticello, Minnesota;
- Brookings County–Hampton 345 kV Project (Brookings Project), a 345 kV transmission line between Brookings County, South Dakota and Hampton, Minnesota;
- Bemidji–Grand Rapids 230 kV Project, a 230 kV transmission line from Bemidji to Grand Rapids, Minnesota.

2.2 Project Ownership

The utilities listed in **Table 2** are the anticipated co-owners of the Chester Project. Each of the participants fully anticipates becoming an owner at the share designated in Table 2. The discussion below describes the Project's organizational structure.

A Project Development Agreement ("PDA") was executed in March 2007 for each of the Group 1 projects and is available at: http://www.capx2020.com/Regulatory/State/Minnesota/route-permit-app-HRL/Appendix_A_PDA.pdf

Each PDA identifies a lead utility or a Development Manager that is responsible for obtaining major permits and developing and implementing a project if construction is authorized. Xcel Energy is

identified as the Development Manager for this Project to manage the permitting process, engineering, procurement and construction of all of the Project facilities in accordance with the PDA executed by Xcel Energy, Dairyland, RPU, SMMPA and WPPI Energy. Other utilities may assist Xcel Energy in some of the duties outlined above. Xcel Energy reports progress to the Project's Management Committee, which consists of one representative from each project's participating utilities. The ownership of the proposed facilities would be determined pursuant to the PDA. Toward the end of the development phase, when critical permits and approvals have been obtained, the participating utilities would have the opportunity to decide whether to take an ownership stake in the Project. At that time, each CapX2020 participant has the option to: (1) take ownership up to a designated level, (2) take some lesser percentage to minimize capital expenditures or (3) "opt out" of ownership entirely. Ownership decisions would occur toward the end of the development phase, as state, federal and other approvals and consents are realized. The current Project development percentages (and potential/non-binding ownership percentages) are identified in **Table 2**.

Table 2: Current Project Development Percentages

Utility	Applicable Project Development Percentage
Dairyland Power Cooperative	11
Rochester Public Utilities	9
Southern Minnesota Municipal Power Agency	13
WPPI Energy	3
Xcel Energy	64
Total	100

If a participant does not elect to invest in the Project, other participants, including third parties, may take on that investment percentage share by following the procedures provided in the Project PDA. Agreements pertaining to the construction, ownership, operation and maintenance of the Project are being negotiated and participants would continue to refine the commercial arrangements as the regulatory process proceeds.

The Applicant respectfully requests that the Commission approve the Proposed Route and authorize a 600-foot route width along the Proposed Route.

The Application demonstrates that construction of the Project along the Proposed Route will comply with the applicable standards and criteria set out in Minn. Stat. § 216E.03, subd. 7 and Minn. R. 7850.4100. The Project will support the State's goals to conserve resources, minimize environmental and human settlement impacts and land use conflicts and ensure the State's electric energy security through the construction of efficient, cost-effective transmission infrastructure.

2.3 Permittee

The permittee for the proposed Project is Northern States Power Company, a Minnesota corporation, on behalf of itself and the anticipated other co-owners: Dairyland, RPU, SMMPA and WPPI Energy. Contact information for the Permittee is shown below:

Permittee:	Northern States Power Company, a Minnesota corporation
Contact:	Tom Hillstrom Supervisor, Siting and Land Rights
Address:	The Applicant Services Inc. 414 Nicollet Mall, MP-8A Minneapolis, MN 55401
Phone:	(612) 330-6538
E-mail:	thomas.g.hillstrom@xcelenergy.com

2.4 Certificate of Need Issued

Minnesota Statutes Section 216B.243, subd. 2 states that no large energy facility shall be sited or constructed in Minnesota without the issuance of a CON by the Commission. A large energy facility includes "any high-voltage transmission line with a capacity of 200 kV or more and greater than 1,500 feet in length," Minn. Stat. § 216B.2421, subd. 2(2). On May 22, 2009, the Commission granted CONs for three 345 kV transmission line projects in Minnesota. Order Granting Certificates of Need with Conditions, In the Matter of the Application of Great River Energy, Northern States Power Company (d/b/a Xcel Energy) and others for Certificates of Need for the CapX 345 kV Transmission Projects, Docket No. ET-2, E-002 et al./CN-06-115, May 22, 2009, as modified (August 10, 2009) (CON Order) (**Appendix A**).

The CON Order approved the need for the Hampton – Rochester – La Crosse 345 kV Transmission Project, including the North Rochester – Chester 161 kV Line, the Hampton – Rochester – La Crosse 345 kV Line, the North Rochester – Northern Hills 161 kV Line and associated facilities. The Hampton – Rochester – La Crosse 345 kV Line, the North Rochester – Northern Hills 161 kV Line and their associated facilities are being routed separately (Docket No. E002/TL-09-1448). An RPA for these two lines was filed in January 2010 and it is anticipated that a Route Permit will be issued by the Commission at the beginning of 2012.

The Commission found that the three identified 345 kV projects are needed to address three needs; to improve regional reliability of the transmission system, to improve community reliability of the transmission system in specified communities and to increase generation outlet. The Commission specifically determined that both the Rochester and Winona/La Crosse areas are facing electric reliability issues due to increasing growth in the demand for power and that, without transmission system improvements, these communities and the surrounding rural areas are at risk for loss of

service under certain critical contingencies. The Commission concluded that the Hampton – Rochester – La Crosse 345 kV Line, North Rochester – Chester 161 kV Line, North Rochester – Northern Hills 161 kV Line and associated facilities are needed to maintain community reliability, to improve regional reliability, and to support generation outlet capacity in southeastern Minnesota. Commission proceedings, Findings of Fact and the order granting the CON can be found in **Appendix A**.

2.5 Route Permit, Alternative Permitting Process

The proposed Project involves construction of a new 161 kV transmission line. The Project therefore qualifies for review under the Alternative Permitting Process authorized by Minnesota Statutes Section 216E.04, subd. 2(3) and Minnesota Rules 7850.2800, Subp. 1(C) (establishing alternative process for HVTLs between 100 and 200 kV). Accordingly, The Applicant is following the provisions of the Alternative Permitting Process outlined in Minnesota Rules 7850.2800 to 7850.3900 for this Project.

2.6 Notice to the Commission

The Applicant notified the Commission on July 26, 2011, by letter (mailed and electronically filed) that the Applicant intended to use the Alternative Permitting Process for the Project. This letter complies with the requirement of Minnesota Rules 7850.2800, Subp. 2, to notify the Commission of this election at least 10 days prior to submitting an application for a Route Permit. A copy of the letter is attached in **Appendix B.**

2.7 Requested Action

This Application is submitted under the Alternative Permitting Process under Minn. Stat. § 216E.04, subd. 2(3) and Minn. R. 7850.2800 to 7850.3900 (see Minn. R. 7850.2800, Subp. 1(C)). For the reasons presented herein, the Applicant prefers the Proposed Route for the new transmission line. For the east-west segment of the Chester Line from the North Rochester Substation to east of the Zumbro River, the Applicant's Proposed Route for the Chester Line is the same route approved by the Commission for the 345 kV Project as shown in **Figure 2.** For the north-south segment of the Chester Line the Applicant requests that the Commission grant a Route Permit for the Proposed North-South Chester Route (**Figure 3)**.

3.0 Project Information

3.1 Project Location

The Project is located in Goodhue, Wabasha and Olmsted counties, near the cities of Zumbrota, Pine Island, Oronoco and Rochester. **Figure 1** provides a general overview of the Project location and the Proposed Route is shown in **Figures 2 and 3**. Counties and townships potentially affected by the Project are listed in **Table 3**.

Table 3: Project Location – Proposed North Rochester Substation to Chester Substation

County	Civil Township	Town and Range	Sections
Goodhue County	Pine Island	Township 109W Range 15N	19, 20, 21, 25, 26, 27, 28, 29, 30 and 36
Olmsted	Farmington	Township 108W Range 13N	3, 4, 5, 8, 9, 10, 15, 16, 21, 22, 27, 28, 33 and 34
Olmsted	Haverhill	Township 107W Range 13N	3, 4, 9, 10, 15, 16, 21, 22, 27, 28, 33 and 34
Olmsted	Marion	Township 106W Range 13N	3 and 4
Olmsted	Oronoco	Township 108W Range 14N	6, 7, 8, 9, 10, 11 and 12
Wabasha	Hyde Park	Township 109W Range 13N	19, 29, 30, 31 and 32
Wabasha	Mazeppa	Township 109W Range 14N	13, 14, 15, 16, 17, 18, 24, 25, 26, 27, 28, 29 and 30

3.2 Notice to Local Government Units

The Applicant notified local government units ("LGUs") of the Project by letters dated June 8, 2011 which described the Project, stated that the Applicant intended to apply for a Route Permit for the Project from the Commission and invited LGUs to request a meeting with the Applicant. See Minn. Stat. § 216E.03, subd. 3a. An exemplar letter and affidavit of mailing and list of the LGUs that were sent the letter is included in **Appendix B.**

3.3 Project Proposal

The proposed Project measures approximately 29-30 miles in length depending upon the route selected. The 345 kV Project would use single-pole, self-weathering double-circuit structures and the Applicant proposes to string the proposed Chester Line on the second side of these double-circuit structures from the North Rochester Substation to a point east of the Zumbro River. The proposed ROW for the 345 kV transmission line is 150 feet. No additional right-of-way would be required for the Chester Line.

For the remainder of the route (north-south segment), the Applicant proposes to use a combination of single-pole, self-weathering steel, single-circuit and double-circuit structures. The typical ROW width for the 161 kV transmission line is 80 feet, with less required from private landowners, depending on the amount of sharing possible with existing ROWs.

Modifications to the Chester Substation are required to accommodate the North Rochester – Chester Line. These specific modifications are described in Section 4.5. The equipment required to connect the Chester Line at North Rochester Substation was included in the 345 kV routing docket.

3.4 Project Schedule

Construction for the Project is expected to begin in the Spring of 2013. The Applicant anticipates a 2015 in-service date for the Project. **Table 4** is an expected permitting and construction schedule summary, with anticipated end dates.

Table 4: Anticipated Project Schedule

Project Task	Date
File Route Permit Application with the Commission	September 2011
Route Permit Review Process Complete	July – September 2012
Begin Transmission Line Construction • East-West portion (with the 345 kV line segment) • North-South portion	 Spring 2013 Late 2014
In-Service Date	Spring 2015

This schedule is based on information available at the date of this filing and planning assumptions that balance the timing of implementation with the availability of crews, materials and other practical considerations. This schedule may be revised as further information is developed.

3.5 Project Costs

The Applicant estimates that the transmission line and modifications at the North Rochester and Chester substations would cost between $23.8 and $25.3 million in 2011 dollars depending on which route is selected for the 345 kV line.

Operating and maintenance costs for the Project would be nominal for several years, since the line would be new and minimal vegetation management would be required. Typical annual operating and maintenance costs for 161 kV transmission lines across the Applicant's Upper Midwest system area are on the order of $300 to $500 per mile of transmission ROW. The principal operating and maintenance cost would include inspections, which are usually done by fixed-wing aircraft and by helicopter on a regular basis.

The Applicant performs periodic inspections of substations and equipment. The type and frequency of inspection varies depending on the type of equipment. Typical inspection intervals are semi-annual or annual. Maintenance and repair are performed on an as-needed basis and therefore the cost varies from substation to substation.

4.0 Facility Description and Route Selection Rationale

4.1 Transmission Line Description

The Project involves constructing a new 161 kV transmission line from the proposed North Rochester Substation to the Chester Substation. As described, the Proposed Route for this new line is divided into two segments, the east-west segment from the North Rochester Substation to east of the Zumbro River and the north-south segment from east of the Zumbro River to the Chester Substation.

4.2 East-West Segment: Attached to CapX2020 345 kV Line North Rochester Substation to East of the Zumbro River

The Applicant proposes to place the Chester Line on the same structures as 345 kV Transmission Project for approximately 13 to 19 miles from the North Rochester Substation to a point east of the Zumbro River to minimize the amount of new transmission ROW needed. The route for the 345 kV Project has yet to be determined. In the pending 345 kV Project Route Permit proceeding, there are two primary route alternatives and one route option under consideration for the segment of the 345 kV Project that would be double-circuited with the Chester Line. The two route alternatives are the Modified Preferred (White Bridge Road) 345 kV Route and the Alternative (North) 345 kV Route. The route option is referred to as the Zumbro Dam Route Option which is an alternative Zumbro River crossing location that could be used with either route. These route alternatives are described below and are shown in **Figure 2**. All of the options are being evaluated in the EIS in docket no. E002/TL-09-1448.

4.2.1 *Modified Preferred (White Bridge Road) 345 kV Route*

The Modified Preferred (White Bridge Road) 345 kV Route begins at the Preferred Siting Area for the North Rochester Substation, crosses US-52 and then follows 500th Street east for approximately 2 miles, then turns 90 degrees and heads south along County Highway 11 to a point north of Pine Island. The route then primarily follows property lines east for approximately 2.3 miles, then diverts south 0.25 mile to avoid residences and again primarily follows property lines for 2.25 miles in an easterly direction. The route then follows property lines south for approximately 1.3 miles and parallels 230th Avenue for 1 mile and 53rd Avenue NW for 0.5 mile in a southeasterly direction. The route then follows property lines east for 1.2 miles before crossing to the south side of White Bridge Road for 2.2 miles to the western shoreline of the Zumbro River. The route crosses the Zumbro River on the north side of White Bridge Road to avoid residences located southeast of the bridge. East of the Zumbro River, the route follows property lines east for approximately 3.8 miles and for 1 mile north to a point approximately 0.5 miles east of the intersection of 40th Avenue NE and 125th Street NE.

4.2.2 *Alternative (North) 345 kV Route*

The Alternative (North) 345 kV Route begins at the Alternative Siting Area for the North Rochester Substation. After crossing US-52, approximately 0.5 mile north of 480th Street, the Alternative 345 kV Route follows 195th Avenue south for approximately 0.75 mile. The route then follows property lines wherever possible in an easterly direction for approximately 9 miles, diverting from

property lines where necessary to avoid residences. The route crosses the Zumbro River along a property line approximately 2.2 miles north of the Zumbro Dam. East of the Zumbro River, the route follows property lines wherever possible, east and south, crossing highway US-63 and following 375th Avenue for 0.4 mile. From this point, the route follows property lines south for 1.75 miles, then east for 1 mile and then again south for 1 mile where it connects with the Modified Preferred (White Bridge Road) 345 kV Route on the east side of the Zumbro River.

4.2.3 *Zumbro Dam Route Option*

The Zumbro Dam Route Option was identified as an alternative river crossing because existing infrastructure crosses the river at this location and the route is located in Goodhue and Wabasha counties. The Dam Route Option begins approximately 4 miles west of the Zumbro River where it primarily follows property lines to an existing infrastructure crossing of the river (Zumbro Dam and Hydroelectric Generation Facility). On the east side of the river, the Dam Route Option follows property lines east, veering north to avoid residences, for approximately 2.8 miles to 375th Avenue, which it then follows east for approximately 0.4 mile. From this point, the route follows property lines south for 1.75 miles, then east for 1 mile and then again south for 1 mile where it connects with the Modified Preferred 345 kV Route on the east side of the Zumbro River.

The Applicant requests that the route that is selected by the Commission for the 345 kV line be incorporated as the east-west segment of Proposed Route for the Chester Line.

4.2.4 *North-South Chester 161 Route*

The north-south segment of the Proposed Route starts at Tap 3 and continues to the Chester Substation as a combination of single-circuit 161 kV line and double-circuit 161/69 kV line (**Figure 2**). Impacts related to extending the 161 kV line from Tap 3 to Tap 2 or Tap 1 are addressed in Table 12 that includes the analysis of a 345 kV line in this area. The 161 kV line would require less ROW and lower impacts than the 345 kV line.

The Applicant proposes to use single-pole self-weathering steel poles as follows:

- Double-circuit 161/69 kV poles for the 0.5 miles from Tap 3 along 125th Ave NE to 50th Ave NE, carrying both the proposed 161 kV line and an existing 69 kV line.
- Single-circuit poles for approximately 5 miles south along 50th Avenue NE from 125th Street NE to 75th Street NE.
- Double-circuit 161/69 kV poles carrying both the proposed 161 kV line and an existing 69 kV line for the remaining 6.4 miles of the Proposed Route to the Chester Substation.
- Portions of the Proposed Route would require existing Peoples Cooperative distribution to be attached in an underbuilt position. In this situation a mid-span pole would be required to support the distribution circuit.

4.3 Route Width and Alignment Selection Process

The Power Plant Siting Act ("PPSA"), Minn. Stat. Chapter 216E, directs the Commission to locate transmission lines in a manner that "minimize[s] adverse human and environmental impact while ensuring continuing electric power system reliability and integrity and ensuring their electric needs are met and fulfilled in an orderly and timely fashion." Minn. Stat. § 216E.02, subd. 1. The PPSA also authorizes the Commission to meet its routing responsibility by designating a "route" for a new transmission line when it issues a Route Permit. The route may have a "variable width of up to 1.25 miles" within which the ROW for the facilities can be located. Minn. Stat. §216E.01, subd. 8.

Xcel Energy respectfully requests that the Commission authorize a total route width of 600 feet. Detailed maps showing the proposed route widths and proposed alignments are provided on **Figures 1 through 62** in **Appendix C**.

4.4 Route Selection Process

The Proposed Route was developed by the Applicant's permitting and engineering personnel based on their investigation of the overall Project area and input from government entities and the public. The Applicant also performed an analysis of environmental resources in the Project area by using Geographic Information System ("GIS") mapping, aerial photographs, topographic maps and field reviews. Environmental resources identified within the Project area are discussed in Section 6.0 of this Application. The Proposed Route is designed to best minimize the overall impacts of the Project. The Applicant sought to minimize the new ROW required for the Project by co-locating the western portion of the Chester Line with the 345 kV Project and co-locating a 7-mile portion of the North Rochester – Chester 161 kV Line with a Peoples Cooperative 69 kV transmission line.

The proposed transmission line locations were developed with the following primary objectives:

- Minimize environmental impacts.
- Minimize new ROW required.
- Minimize proximity to residential structures, to the extent possible.

The Applicant believes the proposed new transmission line route for the Project best meets the objectives stated above. In particular, the proposed Project would follow 100% of existing road and transmission line ROW.

4.5 Alternative Routes Considered and Rejected

4.5.1 *East-West Segment*

For the east-west segment of the Proposed Route that would be double-circuited with the 345 kV Project, the Applicant considered all of the alternative routes proposed in the pending Route Permit proceeding for this 345 kV line. After the Commission selects a final route for the 345 kV Project, this approved route would become the Proposed Route for the east-west segment of the Chester Line and the remaining route alternatives considered for this segment shall be deemed rejected.

4.5.2 *North-South Segment*

For the north-south segment of the Chester Line, one alternative route and six alternative segments (1, 2, 3, 4, 5 and 6) were considered and eliminated as part of the route development process.

Alternative 161 kV Route Considered and Rejected

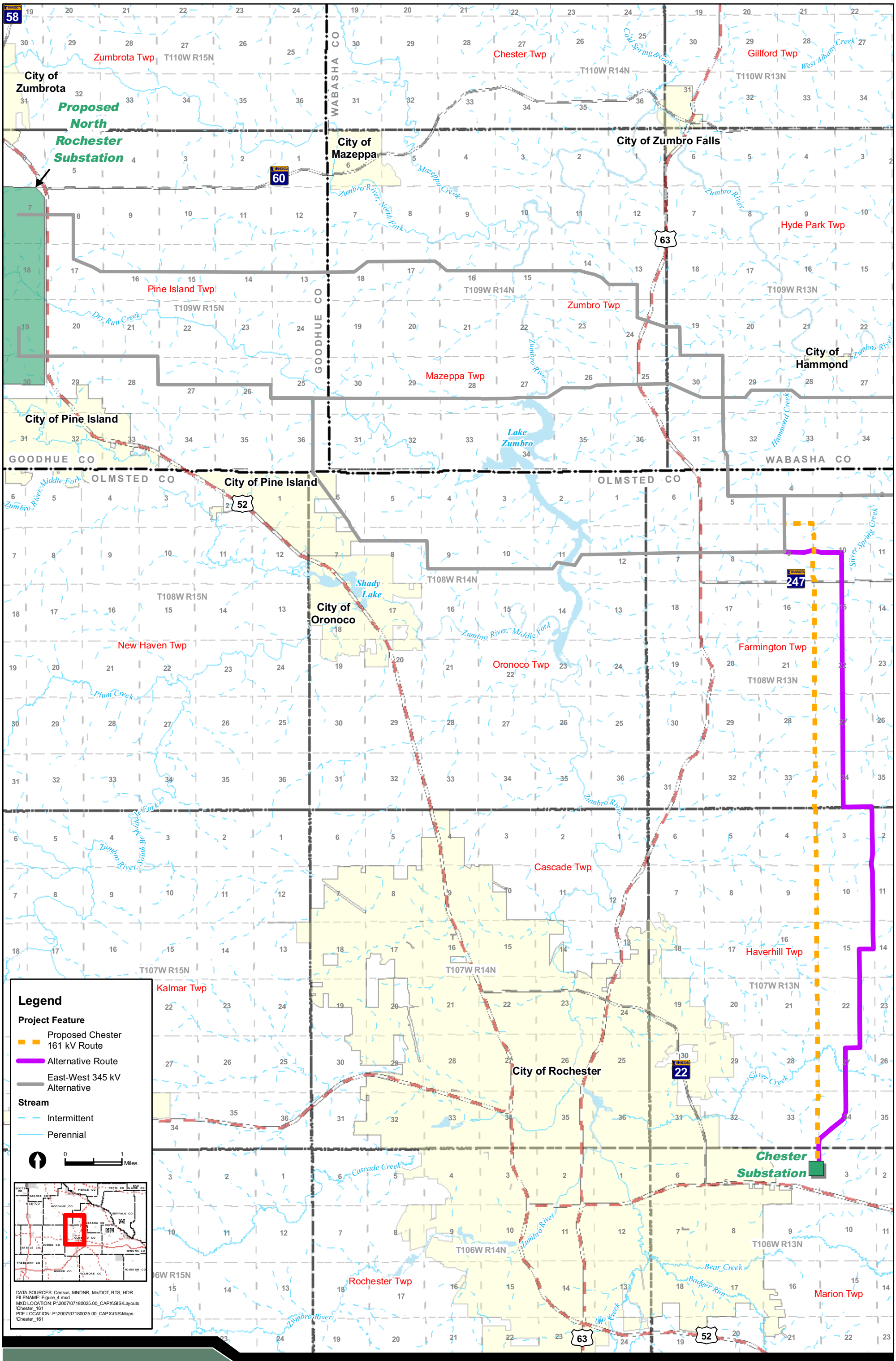
The Proposed Route and an Alternative 161 kV Route for the north-south segment are shown on **Figure 4**. The number of residences near these routes along with route sharing is presented in **Table 5**.

Alternative 161 kV Route

The Alternative 161 kV Route starts at a tap location 0.5 miles south of Tap 3 where the Proposed Route taps into the 345 kV line. The route then continues east along property lines for 1 mile as a 161 single-circuit transmission line. It then turns south and continues along property lines for 4.5 miles to 55th Avenue NE and 75th street NE. From there it turns east and continues along 75th Street NE for 0.5 miles to its intersection with 60th Avenue NE. From there it turns south and continues along property lines for 2.5 miles. From this point it turns west for 0.25 miles and continues to follow property lines. From the property corner it turns south for 1.75 miles and continues to follow property lines to 23rd Street NE. At 23rd Street NE it turns west for 0.25 miles to 55th Avenue NE. From there it turns south, then southwest for 1.75 miles and would be double-circuited with the 161 kV line to 50th Avenue SE. As it joins the 69 kV line on 50th Avenue SE it continues south for 0.6 miles to the Chester Substation.

Table 5 compares the Alternative 161 kV Route to the Proposed 161 kV Route. The Alternative was eliminated from further consideration because the:

- Alternative Route is 1.2 miles longer;
- Proposed Route follows more existing transmission lines (6.9 miles vs. 2.8 for the Alternative Route);
- Alternative Route has 10.3 miles that does not follow existing transmission lines or roads; the Proposed Route follows transmission lines or roads in its entirety.



CapX2020

North Rochester - Chester 161 kV Transmission Project

Figure 4

Route Alternatives Considered

September 2011

Table 5: Summary Comparison of the Alternative North-South Route to the Proposed North-South Route

Resource Category	Proposed 161 kV Route		Alternative 161 kV Route	
Residences				
Number of Residences 0-75 feet from route centerline	0		0	
Number of Residences 76-150 feet from route centerline	8		1	
Number of Residences 151-300 feet from route centerline	11		6	
Number of Residences 0-300 feet from route centerline	19		7	
Revised Density (residences/linear mile within 300 feet of route centerline)	0.3		0.1	
Use or Paralleling of Exisitng ROW (tranportation, pipeline and electrical transmission systems) and Property Lines				
Total length of route segment (miles)	11.9		13.1	
	Miles	**Percent**	**Miles**	**Percent**
Existing transmission lines	6.9	58%	2.8	22%
Roads but not transmission lines	5	42%	0	0%
Property lines but not transmission or roads	0	0%	7.2	55%
Not following transmission line, roads or property lines	0	0%	3	23%
Subtotals				
Existing transmission lines or roads	11.9	100%	2.8	22%
Transmission line, roads or property lines	11.9	100%	10	77%
New corridor created (not following transmission or road corridor)	0.0	0%	10.3	78%

Alternative 161 kV Segments Considered and Eliminated

Alternative 161 kV Segments 1, 2, 3, 4, 5 and 6 are shown on **Figure 5**. The number of residences near these routes along with route sharing is presented in **Table 6**.

Alternative Segment 1

Alternative Segment 1 starts at a tap location 0.5 miles south of Tap 3 where the Proposed Route taps into the 345 kV line. Alternative Segment 1 continues east along property lines for 0.5 miles to 50th Avenue NE. At 50th Avenue NE it continues south for 4.5 miles following the Proposed Route Segment.

This alternative segment is 0.5 miles shorter than the corresponding segment of the Proposed Route. Alternative Segment 1 follows existing road ROW (90%) or property lines (10%) for 100% of its length, whereas the corresponding segment of the Proposed Route Segment follows existing transmission ROW (10%) or road ROW (90%) for 100% of its length. There are 8 residences within 300 feet of the route centerline for both Alternative Segment 1 and the corresponding segment of the Proposed Route.

Alternative Segment 1 was eliminated from further consideration because the Proposed Route Segment followed more transmission and road ROW as opposed to property lines.

Alternative Segment 2

Alternative Segment 2 also starts at a tap location 0.5 miles south of Tap 3 where the Proposed Route Segment taps into the 345 kV line. This segment continues south for 4.5 miles along property lines to 75th Street NE. At 75th Street NE it turns east for 0.5 miles to 50th Avenue NE.

This alternative segment is 0.5 miles longer corresponding segment of the Proposed Route. Alternative Segment 2 follows existing transmission ROW (10%),or property lines (70%) for 80% of its length, whereas the corresponding segment of the Proposed Route follows existing transmission ROW (10%) or road ROW (90%) for 100% of its length. There are 3 residences within 300 feet of the route centerline for Alternative Segment 2 and 8 within 300 feet of the route centerline of the corresponding segment of the Proposed Route.

Alternative Segment 2 was eliminated from further consideration because the Proposed Route Segment followed more transmission and road ROW as opposed to property lines and shared 100% with these features.

Alternative Segment 3

Alternative Segment 3 starts at a tap location 0.5 miles north of Tap 3 where the Proposed Route taps into the 345 kV line. This segment continues east for 1.5 miles along property lines. From this point it turns south along property lines and joins 60th Avenue NE for 5.5 miles to 75th Street NE. At 75th Street NE it turns west and continues for 1 mile to 50th Avenue NE.

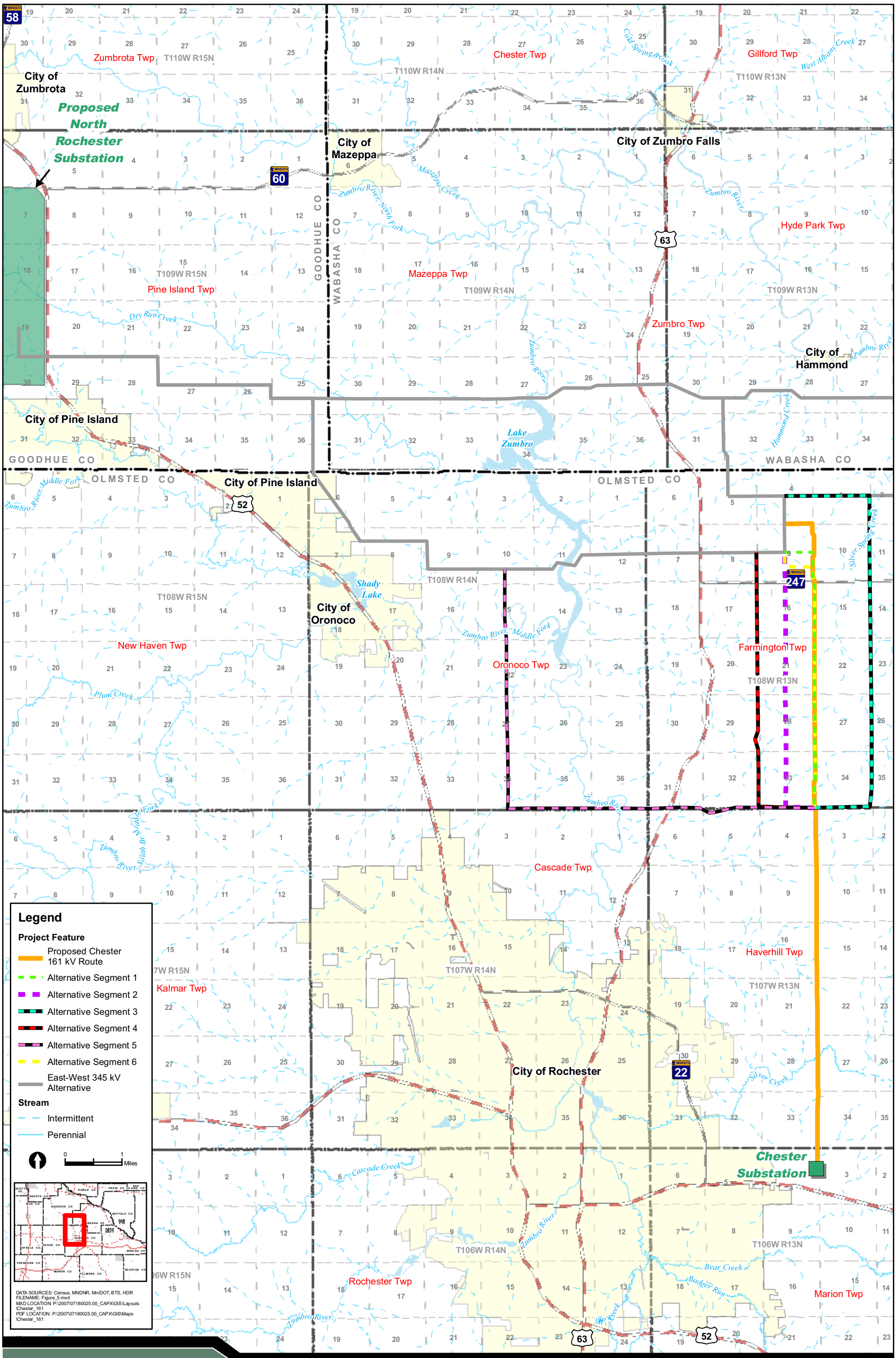
This alternative segment is 2.5 miles longer than the corresponding segment of the Proposed Route. Alternative Segment 3 follows existing transmission ROW (13%), road ROW (50%), or property lines (32%) for 95% of its length, whereas the corresponding segment of the Proposed Route follows existing transmission ROW (10%) or road ROW (90%)for 100% of its length. There are 9 residences within 300 feet of the route centerline for Alternative Segment 3 and 8 within 300 feet of the route centerline of the corresponding segment of the Proposed Route.

Alternative Segment 3 was eliminated from further consideration because the Proposed Route Segment followed more transmission and road ROW as opposed to property lines and shared 100% with these features as opposed to 95% for the alternative segment and has 2 fewer residences within 300 feet of the route centerline. The Alternative Segment 3 is 2.5 miles longer than the Proposed Route Segment.

Alternative Segment 4

Alternative Segment 4 starts at a tap location 0.5 miles south and 0.5 miles west of Tap 3 where the Proposed Route Segment taps into the 345 kV line. This segment continues south along 40th Avenue for 4.5 miles to 75th Street NE. At 75th Street NE it turns east and continues along 75th Street NE for 1 mile to 50th Avenue NE.

The alternative segment is the same length as the corresponding segment of the Proposed Route. Alternative Segment 4 follows existing transmission ROW (18%) or road ROW (82%) for 100% of its length, whereas the corresponding segment of the Proposed Route follows existing transmission ROW (10%) or road ROW (90%) for 100% of its length. There are 14 residences within 300 feet of



CapX2020

North Rochester - Chester 161 kV Transmission Project

Figure 5
Segment Alternatives Considered
September 2011

the route centerline for Alternative Segment 4 and 8 within 300 feet of the route centerline of the corresponding segment of the Proposed Route.

Alternative Segment 4 was eliminated because it resulted in 7 more residences within 300 feet of the route centerline than the corresponding segment of the Proposed Route.

Alternative Segment 5

Alternative Segment 5 starts at a tap location 5 miles west of Tap 3 where the Proposed Route taps into the 345 kV line at 18th Avenue NW. Alternative Segment 5 continues south along 18th Avenue NW for 4.2 miles as a 161/69 kV transmission line to 75th Street NW. At 75th Street NW it turns east for 5.5 miles to 50th Avenue NE.

Alternative Segment 5 is 9.7 miles longer than the Proposed Route Segment. Alternative Segment 5 follows existing transmission ROW for 100% of its length, whereas the Proposed Route Segment follows existing transmission ROW (10%) or road ROW (90%) for 100% of its length. There are 94 residences within 300 feet of the route centerline for Alternative Segment 5 (18 of which fall within 75 feet of the Proposed Route centerline) and 8 within 300 feet of the route centerline for the Proposed Route Segment.

The corresponding east-west segment of the 345 kV line from the Alternative Segment 5 to Tap 3, where the Propose Route taps into the 345 kV line, has 4 residences within 300 feet of the route centerline that would already be affected by the 345 kV line.

Alternative Segment 5 was eliminated from further consideration because of the more densely populated area resulted in 86 more residences within 300 feet of the route centerline (10 within the 80-foot ROW). It also added an additional 9.7 miles to the length of the Proposed Route (5.4 miles that run parallel to east-west segment 345 kV).

Alternative Segment 6

Alternative Segment 6 is a segment presented by the Applicant at a public meeting for the Chester Project held August 2, 2011. Based on input received at the meeting, it was determined that a portion of this route along what was thought to be a property line, actually bisected a property. As a result other potential alignments were reviewed leading to identification of the route currently proposed.

Alternative Segment 6 also starts at a tap location 0.5 miles south of Tap 3 where the Proposed Route taps into the 345 kV line. Alternative Segment 6 continues south along property lines for 0.25 miles and then continues east for 0.5 miles bisecting a property to 50th Avenue NE. At 50th Avenue NE it continues south for 4.25 miles following the Proposed Route Segment.

Alternative Segment 6 is 0.5 miles shorter than the Proposed Route Segment. Alternative Segment 6 follows existing transmission ROW (0%), road ROW (85%) or property lines (5%) for 90% of its length, whereas the Proposed Route Segment follows existing transmission ROW (10%) or road ROW (90%) for 100% of its length. There are 6 residences within 300 feet of the route centerline for Alternative Segment 6 and 8 within 300 feet of the route centerline for the Proposed Route Segment.

Alternative Segment 6 was eliminated from further consideration because it bisected a property rather than following the property line and shared less ROW than the Proposed Route Segment.

Table 6: Summary Comparison of Considered but Eliminated Chester 161 kV Segments

Resource Category	Proposed Route Segment	Alternative Segment 1	Alternative Segment 2	Alternative Segment 3	Alternative Segment 4	Alternative Segment 5	Alternative Segment 6
Residences							
Number of Residences 0-75 feet from route centerline	0	1	1	0	1	18	0
Number of Residences 76-150 feet from route centerline	4	3	0	3	6	32	3
Number of Residences 151-300 feet from route centerline	4	4	2	6	7	44	3
Number of Residences 0-300 feet from route centerline	8	8	3	9	14	94	6
Revised Density (residences/linear mile within 300 feet of route centerline)	0.1	0.1	0.1	0.1	0.2	1.7	0.1
Use or Paralleling of Exisitng ROW (tranportation, pipeline and electrical transmission systems) and Property Lines							
Total length of route segment (miles)	5.5	5	5	8	5.5	9.7	5
Length following Transmission Line (miles)	0.5	0	0.5	1	1	9.7	0
Percentage of route following Transmission Line	10%	0%	10%	13%	18%	100%	0%
Length following road but not Transmission Line (miles)	5	4.5	0	4	4.5	0	4.25

Table 6: Summary Comparison of Considered but Eliminated Chester 161 kV Segments

Resource Category	Proposed Route Segment	Alternative Segment 1	Alternative Segment 2	Alternative Segment 3	Alternative Segment 4	Alternative Segment 5	Alternative Segment 6
Percentage of route following road but not Transmission Line	90%	90%	0%	50%	82%	0%	85%
Length following property line but not transmission line or roads (miles)	0	0.5	3.5	2.6	0	0	.25
Percentage of route following property line but not transmission line or roads	0%	10%	70%	32%	0%	0%	5%
Total length following transmission line, roads or property lines (miles)	5.5	5	3.5	7.5	5.5	9.7	4.5
Percentage of route following transmission line, roads or property lines	100%	100%	80%	95%	100%	100%	90%
Length not following transmission line, roads or property lines (miles)	0	0	1	0.4	0	0	.5
Percentage of route not following transmission line, roads or property lines	0%	0%	20%	5%	0%	0%	10%

4.6 Associated Facilities

4.6.1 *North Rochester Substation*

The North Rochester Substation is being permitted in the 345 kV Project docket (E002/TL-09-1448). Equipment specifically assigned in the 345 kV Project include one 161 kV circuit breaker and associated switches, bus work, line termination and controls necessary for the Chester Line interconnection.

4.6.2 *Chester Substation*

The existing Chester Substation, owned by RPU, would be expanded on existing property to include an additional 161 kV circuit breaker and associated switches, bus work and controls. The expanded area is anticipated to be approximately one acre.

4.7 Design Options to Accommodate Future Transmission Lines

The proposed Chester Line is designed to meet current and projected needs. In addition, the new North Rochester Substation is being designed with sufficient space to accommodate additional transmission line connections in the future.

5.0 Engineering Design, Construction and ROW Acquisition

5.1 Structures, ROW, Construction and Maintenance

5.1.1 *Transmission Structures*

For the east-west segment, the Applicant proposes to place the proposed Chester Line on double-circuit structures with the 345 kV Project. Double-circuit structures vary from 130 to 175 feet tall. Spans between structures can vary from 600 to 1,000 feet with a ROW of 150 feet.

For the remainder of the Proposed Route (north-south segment), the Applicant proposes to use a combination of single-pole, self-weathering steel, single-circuit and double-circuit structures. The Applicant proposes to use:

The Applicant proposes to use single-pole self-weathering steel poles as follows:

- Double-circuit 161/69 kV poles for the 0.5 miles from Tap 3 along 125th Ave NE to 50th Ave NE, carrying both the proposed 161 kV line and an existing 69 kV line.
- Single-circuit poles for approximately 5 miles south along 50th Avenue NE from 125th Street NE to 75th Street NE.
- Double-circuit 161/69 kV poles carrying both the proposed 161 kV line and an existing 69 kV line for the remaining 6.4 miles of the route to the Chester Substation.
- Portions of the Proposed Route would require existing Peoples Cooperative distribution to be attached in an underbuilt position. In this situation a mid-span pole would be required to support the distribution circuit.

The 161 kV single-circuit structures are typically 70 to 105 feet tall and the double-circuit 161/69 kV structures are typically 85 to 120 feet tall, both would be spaced approximately 400 to 700 feet apart with a ROW of 80 feet.

Representative drawings of the proposed structure types are shown in **Figures 6 through 8. Table 7** summarizes the structure design for the line.

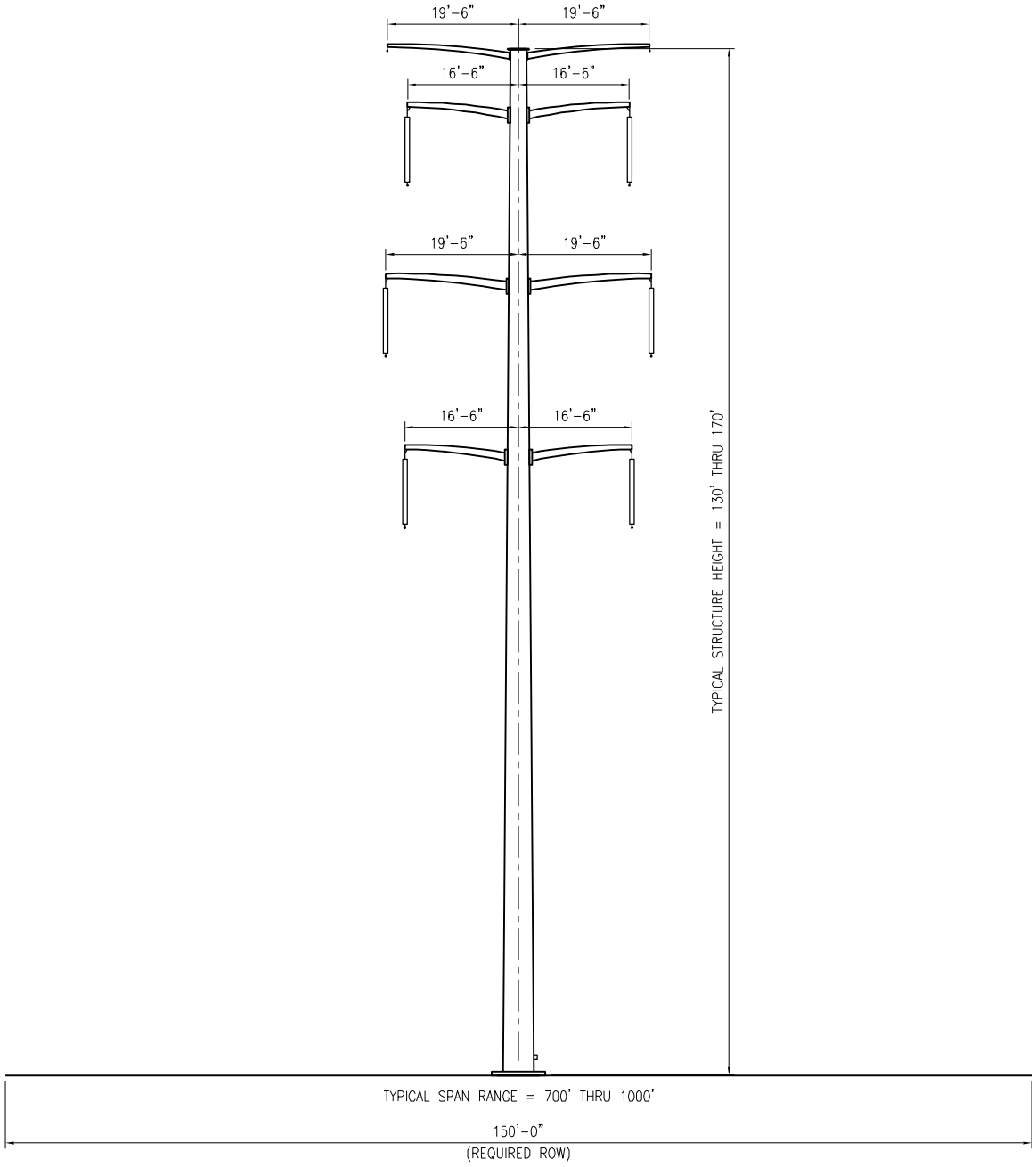
Table 7: Structure Design Summary

Line Type	Structure Type	Structure Material	ROW Width (feet)	Structure Height (feet)	Foundation	Foundation Diameter (feet)	Span Between Structures (feet)
161 kV Single-Circuit	Single-pole, davit arm	Weathering steel	80	70-105	Direct embedded for tangents and self-supporting for angle/ dead-end structures	5-8	400 to 700
161/69 kV Double-Circuit	Single-pole, davit arm	Weathering steel	80	85-120	Direct embedded for tangents and self-supporting for angle/ dead-end structures	5-8	400 to 700[1]
345 kV/345 Double-Circuit (energized at 345/161 kV)	Single-pole, davit arm	Weathering Steel	150	130-175	Drilled pier concrete foundations	6-12	600 to 1,000

[1]In sections where existing distribution would be attached would require an additional pole at mid span to carry only the distribution circuit.

The proposed transmission line would be designed to meet or surpass relevant local and state codes including the National Electric Safety Code ("NESC") and Company standards. Appropriate standards would be met for construction and installation and applicable safety procedures would be followed during and after installation.

345/345kV
DOUBLE CIRCUIT
(OPERATED AT 345/161kV)



DSGN	PEI	7/28/11	CapX2020	JOB NUMBER	REV
DRN	PEI	7/28/11	TYPICAL CONFIGURATION STRUCTURE DRAWING	118645	A
CKD	PEI	7/28/11		DRAWING NUMBER	
SCALE: NTS FOR 8.5x11 DWG ONLY			345/161kV DOUBLE CIRCUIT I-STRING TANGENT	FIGURE 6	

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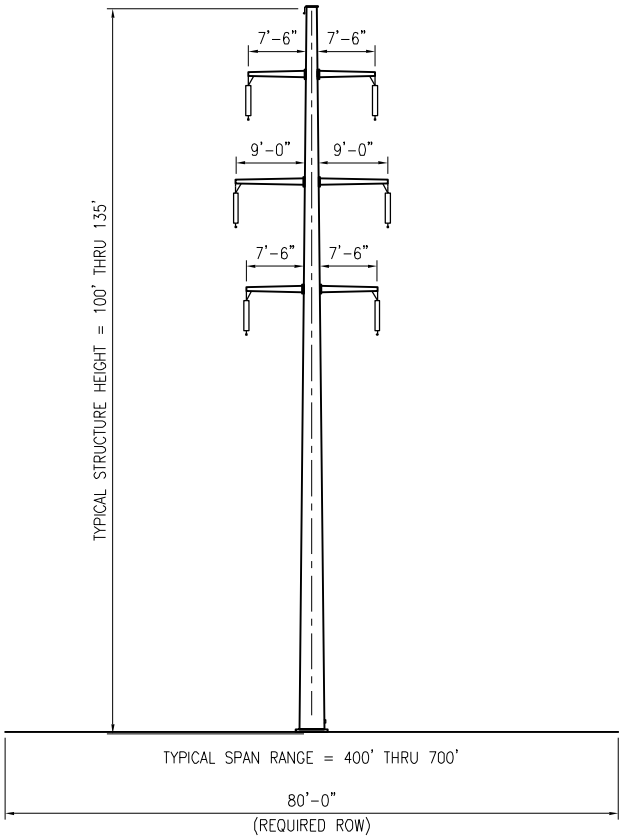
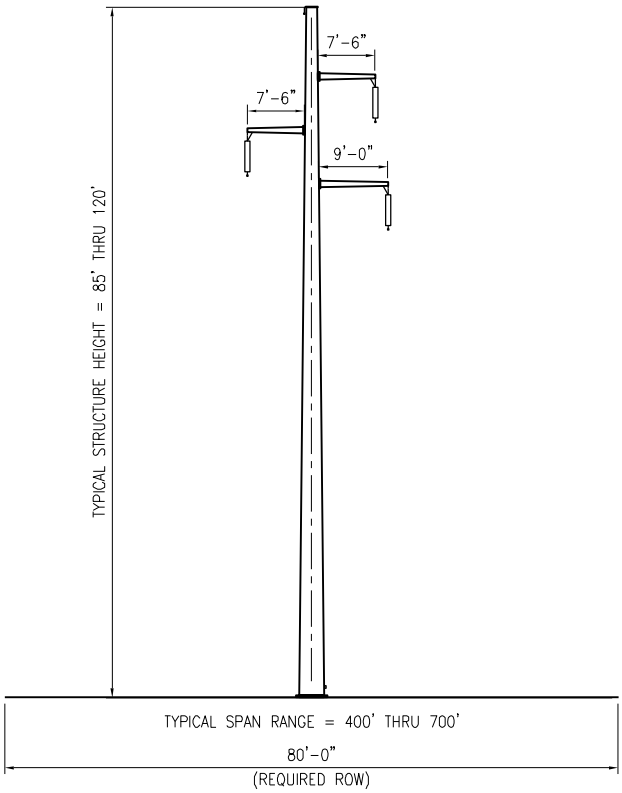
161/69kV
DOUBLE CIRCUIT



DSGN	PEI	7/28/11	CapX2020	JOB NUMBER	REV
DRN	PEI	7/28/11	TYPICAL CONFIGURATION STRUCTURE DRAWING	118645	A
CKD	PEI	7/28/11		DRAWING NUMBER	
SCALE: NTS FOR 8.5x11 DWG ONLY			161/69kV DOUBLE CIRCUIT I-STRING TANGENT	FIGURE 7	

CapX2020 Delivering electricity you can rely on

161kV
SINGLE CIRCUIT



DSGN	PEI	7/28/11	CapX2020	JOB NUMBER	REV
DRN	PEI	7/28/11	TYPICAL CONFIGURATION STRUCTURE DRAWING	118645	A
CKD	PEI	7/28/11		DRAWING NUMBER	
SCALE: NTS FOR 8.5x11 DWG ONLY			161kV SINGLE CIRCUIT I-STRING TANGENT DELTA	FIGURE 8	

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The 161 kV conductor proposed for the Project would be:

- East-West Segment (on 345 kV poles): 345 kV conductor and insulators energized at 161 kV to support the future double-circuit capable design. This includes two 954 kcmil 54/7 Aluminum Core Steel Supported ("ACSS") conductors or conductors of comparable capacity. This design does not increase the capacity of the 345 kV circuit. The second circuit would be installed contemporaneously with the first 345 kV circuit.

- North-South Segment: 795 kcmil 26/7 or Aluminum Core Steel Supported – Trapezoidal Wound ("ACSS-TW") for the 161 kV circuit and 477 kcmil conductors for portions double-circuited with the Peoples Cooperative 69 kV circuit. One or two shield wires would be used to protect the conductors from lightening strikes. One of these shield wires would incorporate fiber optic to facilitate relay control communications between substations and between substations, utility offices such as control centers. Fiber optics would be used only for utility purposes.

5.1.2 *Right-of-Way (ROW) Width*

The Applicant would require an 80-foot wide ROW for the 161 kV transmission line including 161/69 kV double-circuit segments. For the double-circuit 345/345 kV (energized at 345/161 kV) portions of the line, a 150 foot ROW is required.

When the transmission line parallels existing infrastructure ROW (e.g., existing transmission lines, roads, railroads or other utilities), the new ROW required may be reduced. The Applicant's typical practice when paralleling existing ROW is to place the poles on adjacent private property, near the ROW. With this pole placement, the transmission line shares the existing infrastructure ROW, thereby reducing the size of the easement required from the private landowner(s). For example, if the required ROW is 150 feet, and the transmission pole is place 5 feet off an existing road ROW, on an 80-foot ROW easement would be required from the landowner. The additional 70 feet of required ROW would be shared with the road ROW.

Figures 6 through 8 show pole dimensions and general ROW requirements for the Chester Line.

5.1.3 *ROW Evaluation and Acquisition*

Where the Project is expected to use existing ROW, the ROW agent would evaluate all existing easements. If the terms of the existing easement are sufficient and no new ROW is needed, the ROW agent would continue to work with the landowner to address any construction needs, impacts, damages or restoration issues. To the extent new ROW acquisition is necessary the ROW agent would work with landowners to determine how to expand existing easements.

For those segments of the Project where new ROW would be necessary, the acquisition process begins early in the detailed design phase. For transmission lines, utilities acquire easement rights across certain parcels to accommodate the facilities. The evaluation and acquisition process includes title examination, initial owner contacts, survey work, document preparation and purchase. Each of these activities, particularly as it applies to easements for transmission line facilities, is described in more detail below.

The first step in the ROW process is to identify all persons and entities that may have a legal interest in the real estate upon which the facilities would be built. To compile this list, a ROW agent or other persons engaged by the utility would complete a public records search of all land involved in the project. A title report is then developed for each parcel to determine the legal description of the property and the owner(s) of record of the property, and to gather information regarding easements, liens, restriction, encumbrances and other conditions of record.

After owners are identified, a ROW representative contacts each property owner or the property owner's representative. The ROW agent describes the need for the transmission facilities and how the Project may affect each parcel. The ROW agent also seeks information from the landowner about any specific construction concerns. A list of property owners along the Proposed Route is located in **Appendix G**.

The next step in the acquisition process is evaluation of the specific parcel. For this work, the ROW agent may request permission from the owner for survey crews to enter the property to conduct preliminary survey work. Permission may also be requested to take soil borings to assess the soil conditions and determine appropriate foundation design. Surveys are conducted to locate the ROW corridors, natural features, man-made features and associated elevations for use during the detailed engineering of the line. The soil analysis is performed by an experienced geotechnical testing laboratory.

During the evaluation process, the location of the proposed transmission line or substation facility may be staked with permission of the property owner. This means that the survey crew locates each structure or pole on the ground and places a surveyor's stake to mark the structures or substation facility's anticipated location. By doing this, the ROW agent can show the landowner where the structure(s) would be located on the property. The ROW agent may also delineate the boundaries of the easement area required for safe operation of the line.

Prior to the acquisition of easements or fee purchase of property, land value data would be collected. Based on the impact of the easement or purchase to the market value of each parcel, a fair market value offer would be developed. The ROW agent then contacts the property owner(s) to present the offer for the easement and discuss the amount of just compensation for the rights to build, operate and maintain the transmission facilities within the easement area and reasonable access to the easement area. The agent would also provide maps of the line route or site, and maps showing the landowner's parcel. The landowner is allowed a reasonable amount of time to consider the offer and to present any material that the owner believes is relevant to determining the property's value. This step is often performed prior to full evaluation in the form of an "option to purchase" contract and can be very helpful in obtaining permission for completion of all necessary evaluations.

In nearly all cases, utility companies are able to work with the landowners to address their concerns and an agreement is reached for the utility's purchase of land rights. The ROW agent prepares all of the documents required to complete each transaction. Some of the documents that may be required include: easement; purchase agreement; contract; and deed.

In rare instances, a negotiated settlement cannot be reached and the landowner chooses to have an independent third party determine the value of the rights taken. Such valuation is made through the

utility's exercise of the right of eminent domain pursuant to Minnesota Statutes, Chapter 117. The process of exercising the right of eminent domain is called condemnation.

Before commencing a condemnation proceeding, the ROW agent must obtain at least one appraisal for the property proposed to be acquired and a copy of that appraisal must be provided to the property owner. Minn. Stat. § 117.036, subd. 2(a). The property owner may also obtain another property appraisal and the company must reimburse the property owner for the cost of the appraisal according to the limits set forth in Minnesota Statute § 117.036, Subd. 2(b). The property owner may be reimbursed for reasonable appraisal costs up to $1,500 for single-family and two-family residential properties, $1,500 for property with a value of $10,000 or less, and $5,000 for other types of properties.

To start the formal condemnation process, a utility files a Petition in the district court where the property is located and serves that Petition on all owners of the property. If the court grants the Petition, the court then appoints a three-person condemnation commission that would determine the compensation for the easement. The three people must be knowledgeable of applicable real estate issues. Once appointed, the commissioners schedule a viewing of the property over and across which the transmission line easement is to be located. Next, the commission schedules a valuation hearing where the utility and landowners can testify as to the fair market value of the easement or fee. The commission then makes an award as to the value of the property acquired and files it with the court. Each party has 40 days from the filing of the award to appeal to the district court for a jury trial. In the event of an appeal, the jury hears land value evidence and renders a verdict. At any point in this process, the case can be dismissed if the parties reach a settlement.

As part of the ROW acquisition process, the ROW agent would discuss the construction schedule and construction requirements with the owner of each parcel. To ensure safe construction of the line, special consideration may be needed for fences, crops or livestock. For instance, fences may need to be moved, temporary or permanent gates may need to be installed; crops may need to be harvested early; and livestock may need to be moved. In each case the ROW agent and construction personnel coordinate these processes with the landowner.

5.1.4 *Transmission Construction Procedures*

Construction would begin after all federal, state and local approvals are obtained, property and rights-of-way are acquired, soil conditions are determined and the design is completed. The precise timing of construction would take into account various requirements that may be in place due to permit conditions, system loading issues, available workforce and materials.

The actual construction would follow standard construction and mitigation practices that have been developed from experience with past projects. These best practices address ROW clearance, staging, erecting transmission line structures and stringing transmission lines. Construction and mitigation practices to minimize impacts would be developed based on the proposed schedule for activities, permit requirements, prohibitions, maintenance guidelines, inspection procedures, terrain and other practices. In certain cases some activities, such as schedules, are modified to minimize impacts to sensitive environments.

Typical construction equipment used on transmission projects includes tree removal equipment, mowers, cranes, backhoes, digger-derrick line trucks, track-mounted drill rigs, dump trucks, front end loaders, bucket trucks, bulldozers, flatbed tractor-trailers, flatbed trucks, pickup trucks, concrete trucks and various trailers. Many types of excavation equipment are set on wheel or track-driven vehicles. Wood or steel poles are transported on tractor-trailers.

Steel poles are proposed to be used for the structures for the Project. Steel pole tangent structures are proposed to be directly embedded into the ground if soil conditions warrant. Rock-filled culvert foundations may be required in areas with poor soils. This method typically involves digging a hole for each pole, filling it partially with crushed rock and then setting the pole on top of the rock base. The area around the pole is then backfilled with crushed rock and/or soil. Culvert foundations involve auguring a hole for each pole, installing a galvanized steel culvert, filling the annular space outside the culvert with hole spoils, filling the culvert partially with crushed rock and then setting the pole on top of the rock base. The annular space between the pole and culvert is filled with crushed rock.

Long span, angle and dead end structures along the route would require concrete foundations. In those cases, holes would need to be drilled in preparation for the concrete foundations. Drilled pier foundations may vary from five to eight feet in diameter and 20 to 30 feet deep, depending on soil conditions. Steel reinforcing bars and anchor bolts are installed in the drilled holes prior to concrete placement. Concrete trucks are required to bring the concrete in from a local concrete batch plant. Steel pole structures are hauled unassembled on pole trailers to the staked location and placed within the ROW until the pole sections are assembled and the arms attached. Insulators and other hardware are attached while the steel pole is on the ground. The pole is then lifted, placed and secured on the foundation using a crane.

Construction staging areas are usually established for transmission projects. Staging involves delivering the equipment and materials necessary to construct the new transmission line facilities. Construction of the Project would likely include one or two staging areas. Structures are delivered to staging areas and materials are stored until they are needed for the project. The materials are stored until they are needed for the Project and then sorted and loaded onto structure trailers for delivery to the staked location.

In some cases, additional space (temporary lay down areas) may be required. These areas would be selected for their location, access, security and ability to efficiently and safely warehouse supplies. The areas are chosen to minimize excavation and grading. The temporary lay down areas outside of the transmission line ROW would be secured from affected landowners through rental agreements.

Typically, access to the transmission line ROW corridor is made directly from existing roads or trails that run parallel or perpendicular to the transmission line ROW. In some situations, private field roads or trails are used. Where easements exist, the Applicant notifies the property owner that it would access the easement area. Where necessary to accommodate the heavy equipment used in construction, including cranes, concrete trucks and foundation drilling equipment, existing access roads may be upgraded or new roads may be constructed. New access roads may also be constructed where no current access is available or the existing access is inadequate to cross roadway ditches.

Environmentally sensitive areas and wetland areas may also require special construction techniques in some circumstances. During construction, the most effective way to minimize impacts to wet areas would be to span wetlands, streams and rivers. In addition, the Applicant would not allow construction equipment to be driven across waterways except under special circumstances and only after discussion with the appropriate resource agency. Where waterways must be crossed to pull in the new conductors and shield wires, workers may walk across, use boats or drive equipment across ice in the winter. These construction practices help prevent soil erosion and ensure that equipment fueling and lubricating would occur at a distance from waterways.

Wetlands present within the Project area are dominated by Palustrine or grassland/meadow type wetlands with a lesser number of Lacustrine or open water wetlands. If impacts to wetlands occur, they would be minimized through construction practices. Construction crews would maintain sound water and soil conservation practices during construction and operation of the facilities to protect topsoil and adjacent water resources and to minimize soil erosion. Practices may include containing excavated material, protecting exposed soil and stabilizing restored soil. Crews would avoid major disturbance of individual wetlands and drainage systems during construction. This would be accomplished by strategically locating new access roads and spanning wetlands and drainage systems where possible.

When it is not feasible to span the wetland, construction crews would consider the following options during construction to minimize impacts:

- When possible, construction would be scheduled during frozen ground conditions.
- When construction during winter is not possible, construction mats will be used where wetlands would be impacted.
- Crews would attempt to access the wetland with the least amount of physical impact to the wetland (i.e., shortest route).
- Structures would be assembled on upland areas before they are brought to the site for installation.

5.1.5 *Restoration Procedures*

During construction, crews would attempt to limit ground disturbance wherever possible. However, areas are typically disturbed during the normal course of work, which can take several weeks in any one location. As construction on each parcel is completed, disturbed areas will be restored to their original condition to the maximum extent practicable. The ROW agent contacts each property owner after construction is completed to determine whether any damage has occurred as a result of the project.

If damage has occurred to crops, fences or the property, the Applicant would fairly reimburse the landowner for the damages sustained. In some cases, the Applicant may engage an outside contractor to restore the damaged property to as near as possible to its original condition. Portions of vegetation that are disturbed or removed during construction of transmission lines would naturally reestablish to pre-disturbance conditions. Resilient species of common grasses and shrubs

typically reestablish with few problems after disturbance. Areas with significant soil compaction and disturbance from construction activities along the proposed transmission line corridor would require assistance in reestablishing vegetation and controlling soil erosion.

Commonly used methods to control soil erosion and assist in reestablishing vegetation include, but are not limited to:

- Erosion control blankets with embedded seeds.
- Silt fences.
- Hay bales.
- Hydro seeding.
- Planting individual seeds or seedlings of native species.

These erosion control and vegetation establishment practices are regularly used in construction projects and are referenced in the construction storm water permit plans. Long-term impacts are also minimized by utilizing these construction techniques.

5.1.6 *Maintenance Procedures*

Transmission lines and substations are designed to operate for decades and require only moderate maintenance, particularly in the first few years of operation.

The estimated service life of the proposed transmission line for accounting purposes is approximately 40 years. However, practically speaking, high voltage transmission lines are seldom completely retired. Transmission infrastructure has very few mechanical elements and is built to withstand weather extremes that are normally encountered. With the exception of severe weather such as tornadoes and heavy ice storms, transmission lines rarely fail.

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

The principal operating and maintenance cost for transmission facilities is the cost of inspections, which is usually done monthly by air. Annual operating and maintenance costs for transmission lines in Minnesota and surrounding states vary. However, past experience shows that costs are approximately $300 to $500 per mile for voltages from 69 kV through 345 kV. Actual line-specific maintenance costs depend on the setting, the amount of vegetation management necessary, storm damage occurrences, structure types, materials used and the age of the line.

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

5.2 Electric and Magnetic Fields

The term electromagnetic fields ("EMF") refer to electric and magnetic fields that are associated with all electrical devices and are coupled together, such as in high frequency radiating fields. For the lower frequencies associated with power lines (referred to as "extremely low frequencies" ("ELF")), EMF should be separated into electric fields ("EFs") and magnetic fields ("MFs"), measured in kilovolts per meter ("kV/m") and milliGauss ("mG"), respectively. These fields are dependent on the voltage of a transmission line (EFs) and current carried by a transmission line (MFs). The intensity 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).

In January 2010, the Applicant filed a RPA for the Hampton – Rochester – La Crosse 345 kV transmission line and the North Rochester – Northern Hills 161 kV Line and associated facilities, including the North Rochester Substation (MPUC Docket No. E002/TL-09-1448). This RPA is currently pending and a decision from the Commission is anticipated in early 2012. EMF calculations associated with the East-West 345/345 kV Segment (energized as a 345/161 kV double-circuit) can be found in Section 3.6, Tables 3.6-1 and 3.6-2 (pages 3-25 and 3-28) in the above referenced RPA. The remainder of this section presents EMF information related to the proposed North-South Chester Route.

5.2.1 *Electric Fields*

There is no federal standard for transmission line electric fields. The Commission, however, has imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground. *In the Matter of the Route Permit Application for a 345 kV Transmission Line from Brookings County, South Dakota to Hampton, Minnesota,* Docket No. ET-2/TL-08-1474, Order Granting Route Permit (*adopting* ALJ Findings of Fact, Conclusions and Recommendation at Finding 194 (April 22, 2010 and amended April 30, 2010)) (September 14, 2010). The standard was designed to prevent serious hazard from shocks when touching large objects parked under alternating current ("AC") transmission lines of 500 kV or greater. The maximum electric field, measured at one meter above ground, associated with the Project is calculated to be 1.83 kV/m (**Table 8**).

Table 8: Calculated Electric Fields (kV/m) for Proposed 161 kV Transmission Line Designs (3.28 feet above ground)

Structure Type	Maximum Operating Voltage (kV)	-300'	-200'	-100'	-75'	-50'	0'	50'	75'	100'	200'	300'
Single-Pole Davit Arm 161 kV Single-Circuit	169	0.02	0.04	0.21	0.39	0.8	1.64	0.76	0.32	0.18	0.04	0.02
Single-Pole Davit Arm 161/69 kV Double-Circuit	169/72.5	0.02	0.04	0.08	0.07	0.46	1.83	0.16	0.03	0.06	0.04	0.02

5.2.2 *Magnetic Fields*

There are presently no Minnesota 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 MF profiles around the proposed transmission lines for each structure and conductor configuration being considered for the Project is shown in **Table 9**. Magnetic fields are calculated under normal system conditions (system intact) for the expected peak and average (60% peak load) current flows as projected for the planned in service year, 2015. The peak MF values are calculated at a point directly under the transmission line and where the conductor is closest to the ground. The same method is used to calculate the magnetic field at the edge of the ROW. The MF profile data show that MF levels decrease rapidly as the distance from the centerline increases (proportional to the inverse square of the distance from source).

The magnetic field produced by the transmission line is dependent on the current flowing on its conductors. Therefore, the actual MF when the Project is placed in service is typically less than shown in the charts. This is because the charts represent the MF with current flow at expected normal peak based on projected regional load growth through 2025, the maximum load projection timeline available. Actual current flow on the line would vary, so MFs would be less than peak levels during most hours of the year.

Table 9: Calculated Magnetic Flux Density (milliGauss) for Proposed 161 kV Transmission Line Designs (3.28 feet above ground)

Segment	System Condition	Current (Amps)	-300'	-200'	-100'	-75'	-50'	0'	50'	75'	100'	200'	300'
Single-Pole Davit Arm 161kV Single-Circuit	Peak	93.24	0.19	0.42	1.47	2.38	4.31	14.03	5.31	2.74	1.62	0.41	0.18
	Average	56	0.12	0.25	0.88	1.43	2.59	8.42	3.19	1.65	0.97	0.25	0.11
Single-Pole Davit Arm 161kV/69kV Double-Circuit	Peak	93.24/92	0.32	0.69	2.48	3.96	6.76	11.11	6.72	3.94	2.47	0.69	0.32
	Average	56/55.22	0.19	0.41	1.49	2.37	4.05	6.66	4.03	2.36	1.48	0.41	0.19

Considerable research has been conducted throughout the past three decades to determine whether exposure to power-frequency (60 hertz) MFs causes biological responses and health effects. Epidemiological and toxicological studies have shown no statistically significant association or weak associations between MF exposure and health risks. 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 electric fields pose no risk to humans, the question of whether exposure to MFs can cause biological responses or health effects continues to be debated.

In 1999, the National Institute of Environmental Health Sciences ("NIEHS") issued its final report on "Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields" in response to the Energy Policy Act of 1992. The NIEHS concluded that the scientific evidence linking MF exposures with health risks is weak and that this finding does not warrant aggressive regulatory concern. However, because of the weak scientific evidence that supports some association between MFs and health effects and the common exposure to electricity in the United States, passive regulatory action, such as providing public education on reducing exposures, is warranted.

In 2007, the World Health Organization ("WHO") concluded a review of the health implications of electromagnetic fields. In this report, the WHO stated:

> Uncertainties in the hazard assessment [of epidemiological studies] include the role that control selection bias and exposure misclassification might have on the observed relationship between magnetic fields and childhood leukemia. In addition, virtually all of the laboratory evidence and the mechanistic evidence fail to support a relationship between low-level ELF magnetic fields and changes in biological function or disease status. Thus, on balance, the evidence is not strong enough to be considered causal, but sufficiently strong to remain a concern (*Environmental Health Criteria Volume N°238 on Extremely Low Frequency Fields* at p. 12, WHO (2007)).

Also, regarding disease outcomes, aside from childhood leukemia, the WHO stated that:

> A number of other diseases have been investigated for possible association with ELF magnetic field exposure. These include cancers in children and adults, depression, suicide, reproductive dysfunction, developmental disorders, immunological modifications and neurological disease. The scientific evidence supporting a linkage between ELF magnetic fields and any of these diseases is much weaker than for childhood leukemia and in some cases (for example, for cardiovascular disease or breast cancer) the evidence is sufficient to give confidence that magnetic fields do not cause the disease. (*Id.* at p. 12.)

Furthermore, in their "Summary and Recommendations for Further Study" WHO emphasized that:

> The limit values in [ELF-MF] exposure guidelines [should not] be reduced to some arbitrary level in the name of precaution. Such practice undermines the scientific foundation on which the limits are based and is likely to be an expensive and not necessarily effective way of providing protection. (*Id.* at p. 12).

Although WHO recognized epidemiological studies indicate an association on the range of three to four mG, WHO did not recommend these levels as an exposure limit but instead provided: "The best source of guidance for both exposure levels and the principles of scientific review are international guidelines." *Id.* at pp. 12-13. The international guidelines referred to by WHO are the International Commission on Non-Ionizing Radiation Protection ("ICNIRP") and the Institute of Electrical and Electronic Engineers ("IEEE") exposure limit guidelines to protect against acute effects. *Id.* at p. 12. The ICNIRP-1998 continuous general public exposure guideline is 833 mG and the IEEE continuous general public exposure guideline in 9,040 mG. In addition, WHO determined that "the evidence for a casual relationship [between ELF-MF and childhood leukemia] is limited, therefore exposure limits based on epidemiological evidence is not recommended, but some precautionary measures are warranted." *Id.* at 355-56.

WHO concluded that:

> given both the weakness of the evidence for a link between exposure to ELF magnetic fields and childhood leukemia, and the limited impact on public health if there is a link, the benefits of exposure reduction on health are unclear. Thus, the costs of precautionary measures should be very low. Provided that the health, social and economic benefits of electric power are not compromised, implementing very low-cost precautionary procedures to reduce exposure is reasonable and warranted. (*Id.* at p. 13).

Wisconsin, Minnesota and California have all conducted literature reviews or research to examine this issue. In 2002, Minnesota formed an Interagency Working Group ("Working Group") to evaluate the body of research and develop policy recommendations to protect the public health from any potential problems resulting from HVTL EMF effects. The Working Group consisted of staff from various state agencies and published its findings in a White Paper on Electric and

Magnetic Field Policy and Mitigation Options in September 2002, (Minnesota Department of Health, 2002). The report summarized the findings of the Working Group as follows:

> Research on the health effects of EMF has been carried out since the 1970s. Epidemiological studies have mixed results – some have shown no statistically significant association between exposure to EMF and health effects, some have shown a weak association. More recently, laboratory studies have failed to show such an association, or to establish a biological mechanism for how magnetic fields may cause cancer. A number of scientific panels convened by national and international health agencies and the United States Congress have reviewed the research carried out to date. Most researchers concluded that there is insufficient evidence to prove an association between EMF and health effects; however, many of them also concluded that there is insufficient evidence to prove that EMF exposure is safe. (*Id.* at p. 1.)

The Public Service Commission of Wisconsin ("PSCW") has periodically reviewed the science on MFs since 1989 and has held hearings to consider the topic of EMF and human health effects. The most recent hearings on EMF were held in July 1998. Recently, January 2008, the PSC published a fact sheet regarding EMF. In this fact sheet the PSC noted that:

> Many scientists believe the potential for health risks for exposure to EMF is very small. This is supported, in part, by weak epidemiological evidence and the lack of a plausible biological mechanism that explains how exposure to EMF could cause disease. The magnetic fields produced by electricity are weak and do not have enough energy to break chemical bonds or to cause mutations in DNA. Without a mechanism, scientists have no idea what kind of exposure, if any, might be harmful. In addition, whole animal studies investigating long-term exposure to power frequency EMF have shown no connection between exposure and cancer of any kind. (*EMF-Electric & Magnetic Fields*, PSC (January 2008)).

The Minnesota Public Utilities Commission, based on the Working Group and World Health Organization findings, has repeatedly found that "there is insufficient evidence to demonstrate a causal relationship between EMF exposure and any adverse human health effects." *In the Matter of the Application of Xcel Energy for a Route Permit for the Lake Yankton to Marshall Transmission Line Project in Lyon County*, Docket No. E-002/TL-07-1407, Findings of Fact, Conclusions of Law and Order Issuing a Route Permit to The Applicant for the Lake Yankton to Marshall Transmission Project at p. 7-8 (Aug. 29, 2008); *See also*, *In the Matter of the Application for a HVTL Route Permit for the Tower Transmission Line Project*, Docket No. ET-2, E015/TL-06-1624, Findings of Fact, Conclusions of Law and Order Issuing a Route Permit to Minnesota Power and Great River Energy for the Tower Transmission Line Project and Associated Facilities at p. 23 (Aug. 1, 2007)("Currently, there is insufficient evidence to demonstrate a causal relationship between EMF exposure and any adverse human health effects.").

During a 2011 Route Permit proceeding before the Commission, ALJ Heydinger established the following finding in her report, which was later adopted by the Commission in its Order issuing the Route Permit:

Over the past 30 years, many epidemiological studies have been conducted to determine if there is a correlation between childhood leukemia and proximity to electrical structures. Some studies have shown that there is an association and some have not. Although the epidemiological studies have been refined and increased in size, the studies do not show a stronger related effect. In addition, a great deal of experimental, laboratory research has been conducted to determine causality, and none has been found. *In the Matter of the Application for a Route Permit for the Fargo to St. Cloud 345 kV Transmission Line Project,* Docket No. ET-2, E002/TL-09-1056, Findings of Fact, Conclusions of Law, and Order Issuing an HVTL Route Permit to Xcel Energy and Great River Energy, adopting ALJ Findings of Fact, Conclusions and Recommendation at Finding 125 (June 24, 2011).

5.2.3 *Stray Voltage*

Stray voltage (also known as Neutral to Earth Voltage ("NEV")) is a condition that can occur on the electric service entrances to structures from distribution lines, not transmission lines. More precisely, stray voltage is a voltage that exists between the neutral wire of the service entrance and grounded objects in buildings, such as barns and milking parlors. Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses or residences. Transmission lines, however, can induce stray voltage on a distribution circuit that is parallel to and immediately under the transmission line.

5.3 Farming Operations, Vehicle Use and Metal Buildings Near Power Lines

Insulated electric fences used in livestock operations can pick up an induced charge from transmission lines. Usually, the induced charge would drain off 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. Potential shocks can be prevented by using a couple of methods including:

i) *one or more of the fence insulators can be shorted out to ground with a wire when the charger is disconnected; or*

ii) *an electric filter can be instilled that grounds out charges induced from a power line while still allowing the charger to be effective.*

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

There is a potential for vehicles under HVTLs to build up an electric charge. If this occurs, the vehicle can be grounded by attaching a grounding strap to the vehicle long enough to touch the earth. Such buildup is 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, vehicles would not normally build up a charge 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 prohibited 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 ROW could damage a transmission line. As a result, NESC guidelines establish clear zones for transmission facilities. Metal buildings may have unique issues. For example, metal buildings near power lines of 200 kV or greater must be properly grounded. Any person with questions about a new or existing metal structure can contact the Applicant for further information about proper grounding requirements.

If a customer suspects that stray voltage/NEV is a concern on their property, they can call the Applicant stray voltage hotline. The customer can contact an Xcel Energy technician or engineer and discuss the situation. If an on-farm investigation is warranted it would be scheduled. On the day of the investigation, the Xcel Energy team would arrive and conduct an investigation of the utility system serving the farm and the farm wiring. The team would discuss the preliminary results with the customer before leaving the farm. In most instances, recording volt meters would be set to measure activity over several days. A few days later these would be retrieved and taken to the Applicant for analysis. Upon completing the analysis, an Xcel Energy engineer or technician would call the farmer to discuss the results.

5.4 List of Permits

Table 10 summarizes the federal, state and local permits that may need to be obtained prior to construction of the proposed transmission line and substation facilities.

Table 10: List of Potential Required Permits

Permit Description	Jurisdiction
Federal Approvals	
Section 404 Permit, Clean Water Act ("CWA") (Local/State/Federal Application for Water/Wetland Projects, for discharge of fill due to placement of poles in wetlands) Section 106 review	USACE
Part 7460 review (to ensure compliance with CFR Title 14 Part 77)	Federal Aviation Administration ("FAA")
Spill Prevention, Control and Countermeasure ("SPCC") Plan (North Rochester and Chester Substations)	Environmental Protection Agency ("EPA")
Federal Environmental Impact Statement	Rural Utility Service ("RUS")
Minnesota State Approvals	
Route Permit Hampton Rochester-La Crosse 345 kV Transmisison Project (to provide double-curcuiting opportunity)	MPUC
License to Cross Public Waters or State Lands	Minneosta Department of Natural Resources ("MnDNR") – Lands and Minerals
Utlitiy Permit (Road Crossing Permits to cross or occupy state trunk highway road ROW)	Minnesota Department of Transportation ("MnDOT")
National Pollution Discharge Ellimination Sysytem ("NPDES") Permit (for line construction and substation construction and expansion)	Minnesota Pollution Control Agency ("MPCA")
Minnesota Local Approvals	
Land Permits, including road crossing/ROWpermits (may be required)	County, Township
Minnesota Wetland Conservation Act Exemption	County
Road Crossing Permits	County, Township
Overwidth Loads Permit	County, Township
Driveway/Access Permits	County, Township

5.4.1 *Federal Permits*

A Section 404 Permit for the CWA would be required for the discharge of water from areas filled with soil due to the placement of poles or other structures in a wetland. A Section 106 Review for the Tribal Water Pollution Control Grant program would be conducted to determine if the proposed project would impact a Tribal funded project.

The Part 7460 review determines if the proposed project would create a vertical obstruction to navigable airspace in the vicinity of a public use or military airport. An SPCC is required to prevent discharge of oil or other chemicals into navigable waters, wetlands or adjoining shorelines.

5.4.2 *Other State Permits*

A License to Cross Public Waters or State Lands is required if the Proposed Route crosses public waters or state lands. The permit would be submitted to the MnDNR and would identify the specific resource crossed, potential impacts to the natural resources and identify mitigative measures.

A Utility Permit is required by the MnDOT to occupy or cross a state-maintained road or highway by an aerial line. The permit provides MnDOT review for the installation of poles, guy wires and anchors, placing temporary obstructions in the road ROW and vegetation removal. A traffic management plan may be required by MnDOT if there is the potential of obstruction of traffic.

A NPDES permit would be required for construction of the project. Permits would be required because more than one acre of disturbance would occur during the construction of the transmission line and modification of the Chester Substation. The NPDES permit for industrial discharge would not be required because the transmission line and substation would not generate wastewater that would be discharged off-site.

5.4.3 *County Permits*

The Chester 161 kV Project is located in Olmsted County. The Rochester-Olmsted County Planning Division oversees planning and permitting in Marion Township. If the poles would be placed in a floodplain, a Certificate of Compliance with Floodplain provisions may be required. A Certificate from an Environmental Specialist is required to confirm that the project would not use public water or generate wastewater.

5.4.4 *Local Permits*

Several townships in Olmsted County created the Township Cooperative Planning Association ("TCPA") in 1997 to implement individual strategic land use planning and zoning in townships and issues related to it. TCPA performs daily activities related to the filing of land use actions and provides a central repository of information for member townships. Farmington is an associate member of TCPA and Haverhill is a full member of TCPA. Marion Township is not a member of the TCPA and their planning and permitting is performed by the Rochester-Olmsted County Planning Division.

A road permit would be required for the use of heavy equipment and machinery on township roads during project construction. A township construction permit would be required if any part of a township road ROW is occupied during project construction.

Road and ROW permits for use of township roads would be authorized by the township road authority. A temporary construction permit is required if the duration of construction is less than ninety days. A conditional use permit is required if the duration of construction is greater than ninety days. An overweight/overwidth permit is required for construction equipment on township roads. A traffic management plan, including signage and traffic control devices, is required by the township as a part of the ROW use permit.

A road permit would be required from Marion Township for the use of heavy equipment and machinery.

6.0 Land Use, Recreation and Historic and Natural Resources

6.1 East-West Segment – Attached to CapX2020 345 kV Line

For the east-west segment of the Project to east of the Zumbro River, the Applicant proposes to place the proposed North Rochester – Chester 161 kV Line on double-circuit structures with the 345 kV Project. No additional ROW would be required to do this.

As described, the Applicant filed an Application for the Hampton – Rochester – La Crosse 345 kV Transmission Project the North Rochester – Northern Hills 161 kV Line and associated facilities, including the North Rochester Substation in January 2010 (MPUC Docket No. E002/TL-09-1448). This Application is currently pending and a decision from the Commission is anticipated by the end of 2011.

In the pending Route Permit proceeding, there are two primary route alternatives and one route option under consideration for the segment of the 345 kV Project that would be double-circuited with the Chester Line. The two route alternatives are the Modified Preferred (White Bridge Road) 345 kV Route and the Alternative (North) 345 kV Route. The route option is referred to as the Zumbro Dam Route Option, which is an alternative Zumbro River crossing location that could be used in combination with either the Modified Preferred 345 kV Route or the Alternative 345 kV Route. These route alternatives, along with additional segment alternatives under consideration, are shown in **Figure 2**. All of the options are being evaluated in the EIS in docket no. E002/TL-09-1448.

Tables 11 and 12 provide a summary comparison of the environmental setting, human settlement, land-based economics, archeological and historic resources and the natural environment associated these 345 kV route alternatives. **Table 11** provides this information for the 345 kV route alternatives to the point where the single-circuit 161 kV line would tap into it if the Commission selected the Alternative (North) 345 kV Route to the Mississippi River Crossing at Alma, Wisconsin. **Table 12** provides this information for the 345 kV routes to the point where the single-circuit 161 kV line would tap into it if the Commission selected the Modified Preferred (White Bridge Road) 345 kV Route to Alma. The remainder of the 161 kV route to the Chester substation to complete the Project is termed North-South Chester Route **(Figure 3)**.

Table 11: Summary Comparison of East-West Segment 345 kV Alternatives to Tap 1 (Connecting with Alternative 345 kV Route to Mississippi River Crossing at Alma-see Figure 2)

Resource Category	Alternative (North) Route to Tap 1	Zumbro Dam Route Option to Tap 1
Residences		
Revised Number of Residences 0-75 feet from route centerline	0	0
Revised Number of Residences 76-150 feet from route centerline	0	2
Revised Number of Residences 151-300 feet from route centerline	3	9
Revised Number of Residences 301-500 feet from route centerline	8	5
Number of Residences 0-500 feet from route centerline	11	16
Revised Density (residences/linear mile within 500 feet of route centerline)	0.2	0.3
Revised Density (residences/linear mile within 300 feet of route centerline)	0.1	0.2
Use or Paralleling of existing ROW (transportation, pipeline and electrical transmission systems) and property lines		
Total length of route (miles)	15.3	13.7
Length following Transmission Line (miles)	1.3	0
Percentage of route following Transmission Line	8%	0%
Length following road but not Transmission Line (miles)	2.4	1.3
Percentage of route following road but not Transmission Line	16%	9%
Length following property line but not transmission line or roads (miles)	2.4	8.2
Percentage of route following property line but not transmission line or roads	16%	60%
Total length following transmission line, roads or property lines (miles)	6.1	9.5
Percentage of route following transmission line, roads or property lines	40%	69%
Length not following transmission line, roads or property lines (miles)	9.2	4.2
Percentage of route not following transmission line, roads or property lines	60%	31%
Archaeological and Historic Resources Sites Within 1-mile of Route Centerline		
Archaeological	1	1
Architectural		
National Register of Historic Places	1	2
Architectural	12	17

Table 11: Summary Comparison of East-West Segment 345 kV Alternatives to Tap 1 (Connecting with Alternative 345 kV Route to Mississippi River Crossing at Alma-see Figure 2)

Resource Category	Alternative (North) Route to Tap 1	Zumbro Dam Route Option to Tap 1
Natural Environment		
Water Resources		
Permanent Wetlands Impacts	<1 acre	<1 acre
Temporary Wetlands Impacts	<0.5 acres	<0.5 acres
Potential Tree Clearing in Wetlands	1.9 acres	1.2 acres
Stream Crossings	18	14
Permanent Impacts to Floodplains	<0.5 acres	<0.5 acres
Flora		
Percent Cropland	68%	70%
Percent Grassland	19%	20%
Percent Shrubland	0%	0%
Percent Forested Land	12%	9%
Percent Aquatic	1%	1%
Fauna		
Conservation Reserve Program Lands Crossed	9	3
Conservation Reserve Enhancement Program Lands Crossed	0	0
Length of Important Bird Areas Crossed	0 miles	0 miles
Length of Grassland Bird Conservation Areas Crossed	0 miles	0 miles
Number of Federal Rare and Unique Species Known to Occur Within 1-mile of Route Centerline		
Threatened	0	0
Endangered	0	0
Candidate	0	0
Number of State Rare and Unique Species Known to Occur Within 1-mile of Route Centerline		
Threatened	6	5
Endangered	0	0
Species of Concern	9	9
DNR Rare Native Communities	22	23
Length of Outstanding Biodiversity Sites Crossed	0 miles	0 miles
Length of High Biodiversity Sites Crossed	0 miles	0.6 mile
Length of Moderate Biodiversity Sites Crossed	0.5 mile	0 mile
Estimated Costs[1]		
Cost	$ 4,600,000	$ 4,100,000

[1] Costs in this table are the incremental cost to string the second side of the double-circuit 345 kV poles only. Total project cost is determined by summing 1) east-west segment cost; 2) north-south segment cost; 3) Chester Substation expansion ($3,000,000); 4) permitting, engineering and construction management ($1,600,000). Total project cost is presented in Section 3.5.

Table 12: Summary Comparison of East-West Segment 345 kV Alternatives to Tap 3 (Connecting to Preferred 345 kV Route to Mississippi River Crossing at Alma-see Figure 2)

Resource Category	Modified Preferred (White Bridge Road) Route to Tap 3	Zumbro Dam Route Option to Tap 3	Alternative (North) Route to Tap 3
Residences			
Number of Residences 0-75 feet from route centerline	0	0	0
Number of Residences 76-150 feet from route centerline	1	2	0
Number of Residences 151-300 feet from route centerline	6	9	3
Number of Residences 301-500 feet from route centerline	11	7	10
Number of Residences 0-500 feet from route centerline	18	18	13
Revised Density (residences/linear mile within 300 feet of route centerline)	0.1	0.2	0.1
Revised Density (residences/linear mile within 500 feet of route centerline)	0.3	0.3	0.2
Use or Paralleling of existing ROW (transportation, pipeline and electrical transmission systems) and property lines			
Total length of route segment (miles)	17.8	17.0	18.5
Length following Transmission Line (miles)	0.5	1.3	0
Percentage of route following Transmission Line	3%	8%	0%
Length following road but not Transmission Line (miles)	4.3	5.7	4.0
Percentage of route following road but not Transmission Line	24%	34%	22%
Length following property line but not transmission line or roads (miles)	7.3	3.8	9.7
Percentage of route following property line but not transmission line or roads	41%	22%	52%
Total length following transmission line, roads or property lines (miles)	12.1	10.8	13.7
Percentage of route following transmission line, roads or property lines	68%	64%	74%
Length not following transmission line, roads or property lines (miles)	5.7	6.2	4.8
Percentage of route not following transmission line, roads or property lines	32%	36%	26%
Archaeological and Historic Resources Sites Within 1-mile of Route Centerline			
Archaeological	1	1	0
Architectural			
National Register of Historic Places	0	2	1
Architectural	19	21	18
Natural Environment			
Water Resources			
Permanent Wetlands Impacts	<1 acre	<1 acre	<1 acre
Temporary Wetlands Impacts	<0.5 acres	<0.5 acres	<0.5 acres
Potential Tree Clearing in Wetlands	0 acres	1.2 acres	1.9 acres

Table 12: Summary Comparison of East-West Segment 345 kV Alternatives to Tap 3 (Connecting to Preferred 345 kV Route to Mississippi River Crossing at Alma-see Figure 2)

Resource Category	Modified Preferred (White Bridge Road) Route to Tap 3	Zumbro Dam Route Option to Tap 3	Alternative (North) Route to Tap 3
Stream Crossings	21	20	24
Permanent Impacts to Floodplains	<0.5 acres	<0.5 acres	<0.5 acres
Flora			
Percent Cropland	67%	68%	66%
Percent Grassland	25%	22%	21%
Percent Shrubland	0%	0%	0%
Percent Forested Land	7%	9%	12%
Percent Aquatic	1%	1%	1%
Fauna			
Conservation Reserve Program Lands Crossed	9	6	12
Conservation Reserve Enhancement Program Lands Crossed	0	0	0
Length of Important Bird Areas Crossed	0 miles	0 miles	0 miles
Length of Grassland Bird Conservation Areas Crossed	0 miles	0 miles	0 miles
Number of Federal Rare and Unique Species Known to Occur Within 1-mile of Route Centerline			
Threatened	0	0	0
Endangered	0	0	0
Candidate	0	0	0
Number of State Rare and Unique Species Known to Occur Within 1-mile of Route Centerline			
Threatened	5	5	6
Endangered	0	0	0
Species of Concern	3	9	9
DNR Rare Native Communities	14	23	22
Length of Outstanding Biodiversity Sites Crossed	0 miles	0 miles	0 miles
Length of High Biodiversity Sites Crossed	0 miles	0.6 mile	0 miles
Length of Moderate Biodiversity Sites Crossed	0.9 mile	0 miles	0.5 mile
Estimated Costs[1]			
Cost	$ 5,400,000	$ 5,000,000	$ 5,000,000

[1] Costs in this table are the incremental cost to string the second side of the double-circuit 345 kV poles only. Total project cost is determined by summing 1) east-west segment cost; 2) north-south segment cost; 3) Chester Substation expansion ($3,000,000); 4) permitting, engineering and construction management ($1,600,000). Total project cost is presented in Section 3.5.

6.2 Modification of the North Rochester Substation

The North Rochester Substation, as proposed in the 345 kV Project RPA would contain the necessary equipment to connect the Chester Line. No additional work would be required.

6.3 Proposed North-South Chester 161 kV Route

The remainder of this Application provides an inventory of the environmental setting, human settlement, land-based economics, archeological and historic resources and the natural environment associated Chester Line that would be constructed as a combination of 161 kV single-circuit and 161/69 kV double-circuit transmission line and related modifications to the Chester substation **(Figure 3)**.

Table 13: Use or Paralleling of Existing ROW (transportation, pipeline and electrical transmission systems) and Property Lines

Resource Category	Chester Route
Total length of route segment (miles)	11.9
Length following Transmission Line (miles)	6.9
Percentage of route following Transmission Line	58%
Length following road but not Transmission Line (miles)	5
Percentage of route following road but not Transmission Line	42%
Length following property line but not transmission line or roads (miles)	0
Percentage of route following property line but not transmission line or roads	0%
Total length following transmission line, roads or property lines (miles)	11.9
Percentage of route following transmission line, roads or property lines	100%
Length not following transmission line, roads or property lines (miles)	0
Percentage of route not following transmission line, roads or property lines	0%

6.4 Description of Environmental Setting

The area is currently primarily in rural agricultural land use. Also present along the Proposed Route are grasslands, forests, wetland and rural residential land.

The Project area is located within the Rochester Plateau subsection of the Paleozoic Plateau Section identified by the Ecological Classification System (MnDNR, http://www.dnr.state.mn.us/ecs/index.html, accessed on June 27, 2011). The environmental setting within the Project area includes hydrologic features such as rivers, creeks, ditches, wetlands and riparian areas, with associated wildlife habitat. A mix of groundcover is present along the Proposed Route. The physiographic features (topography, soils, geology and farmland) are typical of this area and do not preclude the development of this Project.

Wildlife habitat exists in pockets throughout the Project area. There are three vertebrate animals within the Project Area that are listed in the MnDNR Natural Heritage Program database.

Land use in the Project area includes a mix of public, residential, business, open space and some agricultural lands. The residential areas within the Project area are primarily single-family homes of varying density. Open space areas include forest, wetlands, grasslands and a few areas of cultivated land.

Vegetation of the area consists primarily of row crops, pasture and hay lands (**Appendix E**). Row crops in the area include corn and soybeans. Scattered areas of shrub lands and fragmented deciduous forests are located throughout or adjacent to the Proposed Route. Surrogate grasslands are also common in this region of Minnesota and include old fields, hayfields, pastures and roadside grasslands dominated by non-native cool-season grasses. Wetland habitats along the Proposed Route are primarily wet meadow and marsh communities. These may include graminoid, forb or shrub-dominated communities located near a marsh or open water.

6.4.1 *Topography*

The Project area is characterized by rolling till plains transitioning to the dissected landscape of the adjoining Blufflands Subsection. It has a well-developed branched drainage system with few lakes. Prior to settlement, the landscape was characterized by tall grass prairie and burr oak savanna. **Figure 9** shows the Proposed Route on a USGS topographic quadrangle map. Existing streams and surface water drainage patterns are also shown.

The surface elevation varies between 1,100 feet mean sea level (MSL) to 1,300 feet MSL in rolling topography. Surface water in the Project area generally flows into intermittent tributaries to the Zumbro River from where it then flows north and east toward the Mississippi River.

6.4.2 *Geology and Soils*

The surficial geology of the Proposed Route include loess deposits over glacial till and bedrock and deposits of alluvium, hillslope colluvium (weathered bedrock fragments and loess) and sandy outwash near the Zumbro River. Boulders and rocks may occur in the glacial till. Bedrock in the area consists primarily of the Shakopee Formation (Prairie du Chien Group) dolomite with other bedrock formations present dependent on the presence of bedrock valleys. Bedrock outcrops are common in the area. The bedrock is generally within 50 feet of the ground surface. Karst features exist in the area. Soils in the area formed in 5 to 10 feet of loess (wind-blown silt) and consist of silt loam to silty clay loam textures.

One karst feature was identified within 300 feet of the route centerline.

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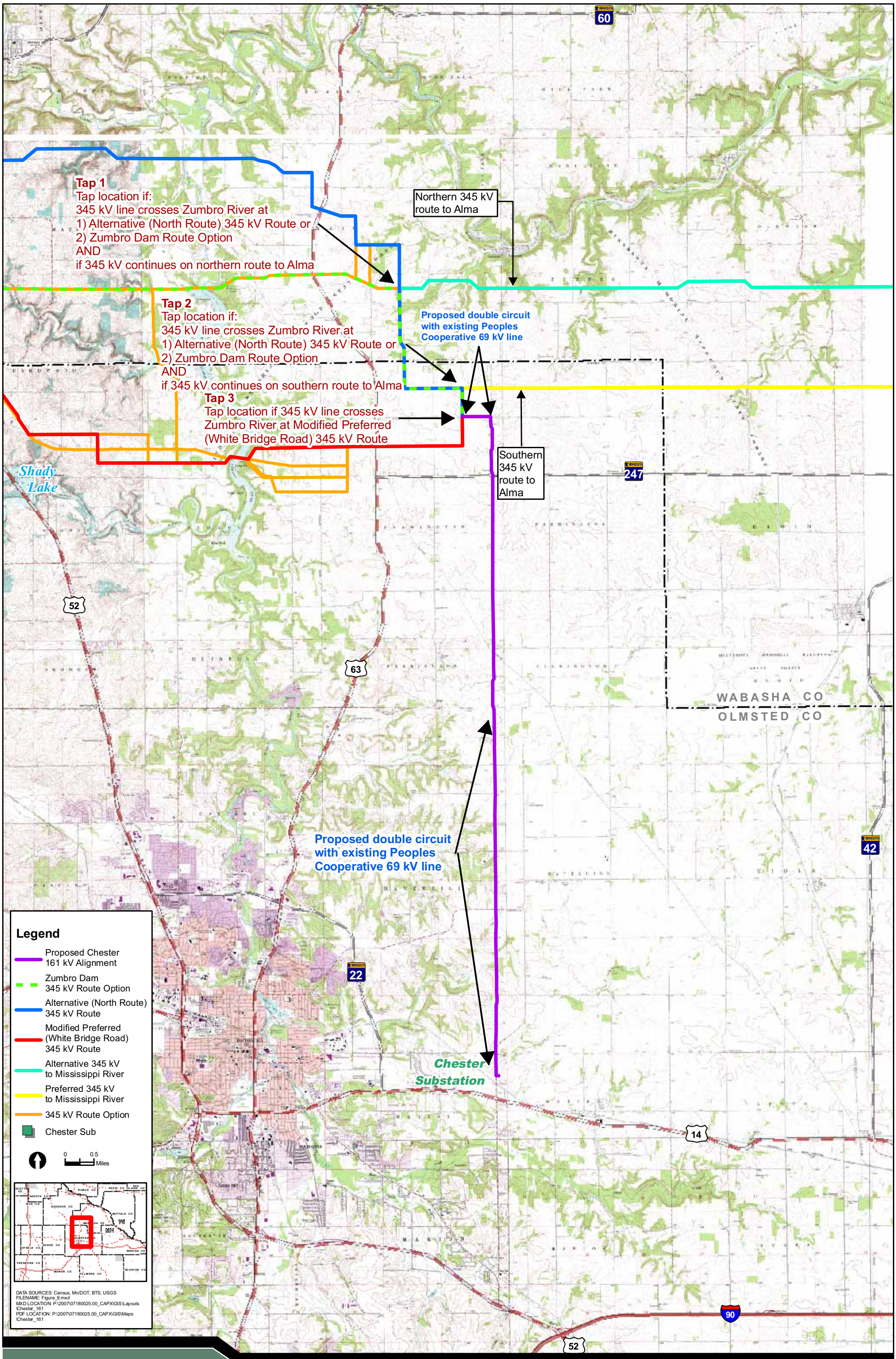

CapX2020

North Rochester - Chester 161 kV Transmission Project

Figure 9
USGS 7.5-Minute Quadrangle
September 2011

6.5 Public Health and Safety

The issue of the potential health impacts of electric and magnetic fields is addressed in Section 5.2. In addition, the Project would be designed in compliance with local, state, NESC and Xcel Energy standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials and right-of-way widths. Xcel Energy construction crews and/or contract crews would comply with local, state, NESC and Xcel Energy standards regarding installation of facilities and standard construction practices. Established Xcel Energy and industry safety procedures would be followed during and after installation of the transmission line. This would include clear signage during all construction activities. The proposed transmission line would be equipped with protective devices to safeguard the public from the transmission line if an accident occurs, such as a structure or conductor falling to the ground. The protective devices are circuit breakers and relays located where the line connects to the substation. The protective equipment would de-energize the line should such an event occur. In addition, the substation facility would be fenced and access limited to authorized personnel. Proper signage would be posted warning the public of the risk of coming into contact with the energized equipment.

Mitigative Measures

The Applicant would meet electrical safety codes and Company standards in construction of the line and would minimize proximity to residences. No additional mitigative measures are proposed.

6.6 Commercial, Industrial and Residential Land Use

The North-South Route is located in a rural area northeast of Rochester. The area is generally characterized by agricultural and rural residential land uses. Agricultural areas consist of row crops and pasture with some animal husbandry. Rural residences are generally associated with agricultural areas. Several low density residences not associated with agriculture are located at the southern end of the Proposed Route. There are several commercial or business land uses scattered along the Proposed Route, with the corridor adjacent to a large commercial building south of Viola Road NE. There are no industrial land uses along the Proposed Route.

Land cover along the Proposed Route is primarily agricultural fields in active production. The Proposed Route is adjacent to and passes through some areas of woodlands and wetlands. Some of the wetland areas are interconnected to larger systems.

The Proposed Route does not pass by existing schools, libraries or other community facilities. However, the Proposed Route does cross over several local and county roads. The roads the Proposed Route crosses includes 125th Street NE, County Road 128 NE, State Road 247, County Highway 21, 85th Street NE, County Highway 14, 65th Street NE, 48th Street NE, Viola Road, Silver Creek Road NE, 50th Avenue NE and College View Road E.

6.6.1 *Displacement*

Displacement is required when a business or residence is located within the right-of-way for a new transmission facility. No displacement is anticipated as a result of this Project. The line would be designed so that all existing structures are located outside of the ROW. **Table 14** provides a summary of residences with the 300 feet of either side of the Proposed Route centerline.

Table 14: Distance to Residences

Resource Category	Chester Route
Number of Residences 0-40 feet from route centerline	0
Number of Residences 41-150 feet from route centerline	8
Number of Residences 151-300 feet from route centerline	11
Revised Density (residences/linear mile within 300 feet of route centerline)	0.3

Mitigative Measures

Because no displacement would occur, no mitigative measures are proposed.

6.6.2 *Noise*

Noise is defined as unwanted sound. It may consist of a variety of sounds with differing intensities across the entire frequency spectrum. Transmission conductors and transformers at substations can produce noise under conditions of high moisture content in the air such as fog, high humidity or during a rain event. Under these conditions, for example, power lines can create a subtle crackling sound due to the small amount of electricity ionizing the moist air near the wires. The noise level can vary based on conductor conditions, voltage level and weather conditions. Noise levels produced by a 161 kV transmission line are generally less than outdoor background levels and are therefore not usually audible.

The following **Table 15** provides estimates for some common noise sources.

Table 15: Decibel Levels of Common Noise Sources[1]

Noise Source	Sound Pressure Level (dBA)
Whisper	20
Secluded Woods	30
Bedroom	40
Library	50
Conversational Speech	60
Business Office	70
Heavy Truck Traffic	80
Chainsaw	90
Jointer/Planer	100
Pneumatic Chipper	110
Rock and Roll Concert	120
Jet Aircraft (at 100 meters)	130
Jet Engine (at 25 meters)	140

[1] (A Guide to Noise Control in Minnesota • October 2008 Minnesota Pollution Control Agency. http://www.pca.state.mn.us/index.php/view-document.html?gid=5355)

Noise pollution control statutes are defined in Minnesota Rules 7030. The MPCA has assigned regulatory standards for allowable noise levels to limit levels of sound that "are consistent with speech, sleep, annoyance and conversation requirements for receivers based on the present

knowledge for preservation of public health and welfare." Minn. Rules 7030.0040. Noise Area Classifications ("NAC") were established based on land use and noise sensitivity. The most sensitive group of receptors based on land usage is NAC group 1. Example land usages for NAC group 1 include; household units (including farm houses), residential hotels, religious activities, resorts, group camps, medical/health services and picnic areas. Commercial type land use activities are included in NAC group 2 and industrial-type land use activities are included in NAC 3.

NAC standards vary between daytime and nighttime allowable limits as illustrated in **Table 16** below. The NAC standards are expressed in terms of L_{50} ("the decibels ["dBA"] that may be exceeded 50% of the time within one hour") and L_{10} ("the dBA that may be exceeded 10% of the time within one hour").

Table 16: Noise Standards by Noise Area Classification[1]

Noise Area Classification	Daytime		Nighttime	
	L_{10}	L_{50}	L_{10}	L_{50}
1	65	60	55	50
2	70	65	70	65
3	80	75	80	75

[1] (A Guide to Noise Control in Minnesota • October 2008 Minnesota Pollution Control Agency. http://www.pca.state.mn.us/index.php/view-document.html?gid=5355)

The noise generated from the transmission lines in not expected to exceed background noise levels and would therefore not be audible at any receptor location. Any audible noise would be well below the MPCA noise standards established for NAC group 1, as shown in **Tables 15** and **16** above.

The proposed transmission lines were modeled using the Bonneville Power Administration CF18X model to evaluate audible noise from transmission lines. Where possible, the model was executed as a worst-case scenario benchmark, to ensure that noise was not under-predicted. **Table 17** presents the L_5 and L_{50} noise levels predicted for proposed transmission line structures and voltages for the Project.

Table 17: Decibel Levels of Common Noise Sources

Structure Type	L_5 at edge of ROW (dBA)	L_{50} at edge of ROW (dBA)
Braced Post 161 kV, Steel Pole, Single-Circuit	14.2	10.7

Audible noise levels for the transmission line are not predicted to exceed the MPCA Noise Limits outside the ROW for any NAC. Therefore, no mitigation is required for the audible noise generated by the transmission lines. In addition, the substation transformers were modeled to predict the distance to the nighttime L_{50} allowable noise level of 50 dBA for NAC 1 receptors. The noise source levels for each substation were obtained from prospective vendors and compared to the National Electrical Manufacturers Association ("NEMA") Standards Publication Number TR 1-1993 X design noise standards. To conservatively predict future noise levels and the distance to the

nighttime compliance limit of 50 dBA, the NEMA-recommended design noise levels for each transformer were treated as point sources at the substation boundary and propagated to the distance where the noise levels would be reduced to 50 dBA.

Mitigative Measures

Residences are located no closer than 94 feet of the Chester Substation. The substations would be designed to emit noise levels that would attenuate to levels lower than the MPCA noise limits at the nearest receptors. Transmission line noise levels are not predicted to exceed the MPCA noise standards outside the ROW for all NACs. Likewise, substation noise would not exceed applicable limits, including the MPCA noise limits. Therefore, no mitigation is required for the audible noise generated by the transmission lines or substations.

6.6.3 *Television and Radio Interference*

Under certain circumstances, corona from transmission line conductors can generate electromagnetic "noise" at the same frequencies that radio and television signals are transmitted. This noise can cause interference with the reception of these signals depending on the frequency and strength of the radio and television signal. Television interference is rare, but may occur when a large transmission structure is aligned between the receiver and a weak distant signal, creating a shadow effect. Loose and/or damaged hardware may also cause television interference. Tightening loose hardware on the transmission line usually resolves the interference issue.

If radio interference from transmission line corona does occur, satisfactory reception from AM radio stations presently providing good reception can be obtained by adjusting the receiving antenna. Moreover, AM radio frequency interference typically only occurs immediately under a transmission line and dissipates rapidly within the right-of-way to either side. FM radio receivers usually do not pick up interference from transmission lines because corona generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (88-108 Megahertz). Also, the excellent interference rejection properties inherent in FM radio systems make them virtually immune to amplitude type disturbances.

A two-way mobile radio located immediately adjacent to and behind a large metallic structure (such as a steel tower) may experience interference because of signal-blocking effects. Movement of either mobile unit so that the metallic structure is not immediately between the two units should restore communications. This would generally require a movement of less than 50 feet by the mobile unit adjacent to a metallic tower.

Mitigative Measures

No impacts are anticipated and therefore no mitigative measures are proposed. If radio or television interference were to occur because of the transmission line, the Applicant would work with the affected landowner to mitigate the problems so that reception is restored. If television or radio interference is caused by or from the operation of the proposed facilities in those areas where good reception is presently obtained, The Applicant would inspect and repair any loose or damaged hardware in the transmission line or take other necessary action to restore reception to the pre-Project level, including the appropriate modification of receiving antenna systems if necessary.

6.6.4 *Aesthetics*

Land use within the Project area is predominantly agricultural. Topography is relatively flat with gently rolling hills. The visual landscape consists primarily of agricultural fields, farmsteads, shelterbelts (wooded wind breaks) and State and County roadways. The Proposed Route does not parallel or cross any designated National Scenic Byways.

The transmission line structures will be visible throughout the Project Area.

Mitigative Measures

Although the line would be a contrast to some surrounding land uses, the Applicant has identified the route that utilizes existing transmission line and road corridors and avoids homes to the extent possible.

6.6.5 *Socioeconomic Impacts*

This Project would be constructed in conjunction with the 345 kV Project. Approximately eight to twelve workers would be required by the Applicant for the construction of the 161 kV Project. The transmission crews are expected to spend approximately six months constructing the transmission line. During construction, it is expected there would be a small positive impact on the community due to the expenditures by the construction crews in the local community such as increased spending for lodging, meals and other consumer goods and services. It is not anticipated that the Project would create new permanent jobs.

Once the Project is operational, its socioeconomic effects are generally positive because of their impacts on the local tax base. Long-term beneficial impacts from the new transmission lines, include an increase to the tax base of local governmental units resulting with incremental increase in revenue from utility property taxes. In rural areas with relatively small tax bases, the added valuation resulting from transmission lines can be significant. Also, indirect impacts may occur through the increased capability of the electric system to supply energy to commercial and industrial users, which would contribute to the economic growth of the region. The availability of reliable power in the area would have a positive effect on local businesses and residents.

The population and economic characteristics based on the 2010 U.S. Census are presented in **Table 18**.

Table 18: Population and Economic Characteristics

Location	Population	Minority Population (Percent)	Caucasian Population (Percent)	Per Capita Income	Percentage of Population Below Poverty Level
State Of Minnesota	5,303,925	15.0%	83.1%	$29,431	10.9%
Goodhue County	46,183	5.7%	93.2%	$26,873	7.5%
Olmsted County	144,248	14.6%	83.4%	$32,716	7.6%
Wabasha County	21,676	3.7%	95.6%	$26,040	8.3%

Source: U.S. Census Bureau, Quick Facts, Http://Quickfacts.Census.Gov/Qfd/Index.Html, Date Of Access June 17, 2011

As reported in the 2010 U.S. Census, the population densities of Goodhue, Olmsted and Wabasha Counties are 60.9, 220.9, and 41.3 people per square mile, respectively. As shown in **Table 18** the minorities and persons living in poverty in the Project area are less than the state as a whole. The majority of the Project area is outside municipal boundaries and therefore reduces the affected population.

The Project would not result in economic losses to property owners. Also, the Project is not expected to displace or economically affect low-income or minority populations as the Project area does not contain disproportionately high minority populations or low-income populations.

Mitigative Measures

No impacts are anticipated and therefore no mitigative measures are proposed.

6.6.6 *Cultural Values*

Cultural values include those perceived community beliefs or attitudes that provide a framework for unity in a given community. Key community values were identified in the Olmsted County General Land Use Plan which was updated in March of 2011. (http://www.co.olmsted.mn.us/planning/ordinances/Documents/Olmsted%20County/CountyGLUPlan.pdf, Accessed June 27, 2011). These community values are expected to be applicable to the Project area as a whole. The key community values identified were beautiful, efficient, accessible, competitive, habitable, equitable and sustainable. The planning principles derived from these values included goals that emphasize wise use of resources, by concentrating urban and suburban development and by creating an orderly pattern of development and conserving natural resources including agricultural resources.

The Land Use Plan also states that "The location of communication towers, high voltage power transmission lines, petroleum/natural gas pipelines and other similar special uses should be controlled to the extent allowable to minimize potential aesthetic and other public health or welfare impacts including property impacts. Where available, communications facilities should share towers in order to minimize the need for scattered locations and resulting impacts."

Consistent with these goals the Project transmission lines are located within or adjacent to existing utility, roadway or other public ROWs and would provide the energy for surrounding communities to achieve the planning principles identified above.

Mitigative Measures

No impacts are anticipated and therefore no mitigative measures are proposed.

6.6.7 *Recreation*

No regional parks, national scenic byways, state bike trails or state wildlife management areas ("WMAs") are crossed by the Proposed Route.

The Proposed Route does not cross any Richard J Dorer ("RJD") Memorial Hardwood State Forest land.

No lands purchased by the Land and Water Conservation ("LAWCON") fund are crossed by the Proposed Route. There are no parks or public lands with improvements funded by LAWCON crossed by the Proposed Route.

Mitigative Measures

No impacts to recreational lands are anticipated and therefore no mitigative measures are proposed.

6.6.8 *Public Services*

MnDOT has no planned roadway expansions within the Project area for Highways 52, 63 and 247 based on the MnDOT proposed roadwork website. (http://www.dot.state.mn.us/roadwork/current.html#six , accessed June 29, 2011).

Mitigative Measures

No impacts are anticipated and therefore no mitigative measures are proposed.

6.7 Land-Based Economies

General

The US Department of Agriculture ("USDA") 2007 Census of Agriculture found that Goodhue, Olmstead and Wabasha Counties have 81.9%, 70.8% and 78.4% of land area in farms, respectively. The predominant acreage in cultivation were corn, soybean and forage as shown in **Table 19**. Cattle and hogs are the predominant livestock operations (http://www.agcensus.usda.gov/, accessed on June 27, 2011).

Table 19: Cropland Acreage and Production Characteristics

County	Total Cropland (acres)	Corn for Grain Production (acres)	Soybean Production (acres)	Forage Production (acres)
Goodhue	322,809	162,973	89,765	31,686
Olmstead	227,550	114,567	57,449	21,311
Wabasha	181,667	79,369	31,515	32,915

Although the majority of lands the Proposed Route crosses consist of agricultural lands, agricultural land would be minimally impacted because the Proposed Route is located within or adjacent to existing utility, roadway or other public ROW, minimizing the impacts to agricultural operations. Agricultural impacts would be limited to the footprint of poles located within agricultural areas.

Table 20 provides a summary of prime farmland, farmland of statewide and local importance within the Proposed Route and ROW. It also presents the length of agricultural land crossed and acres within the Proposed Route.

Table 20: Summary of Farmland Types and Impacts

Resource Category	Chester Route (North-South Segment)
Prime farmland within 600 -foot route*	489.7 acres
Prime Farmland within ROW*	65.3 acres
% Prime Farmland within ROW*	56%
Prime Farmland if drained within 600-foot route*	0 acres
Prime Farmland if drained within ROW*	0 acres
% Prime Farmland if Drained within ROW*	0%
Farmland of Statewide Importance within 600-ft route*	3.4 acres
Farmland of Statewide Importance within ROW*	0.41 acres
% Farmland of Statewide Importance within ROW*	0.004%
Farmland of Local Importance within 600-foot route*	0
Farmland of Local Importance within ROW*	0
% Farmland of Local Importance within ROW*	0
Total Agricultural Land Impacts	
Length crossed**	5.2 miles
Acres within 600-foot route**	417.6acres

Data Sources: * NRCS Soil Data, ** USGS National Land Cover Data ("NLCD") 2001

Mitigative Measures

Landowners would be compensated for the use of their land through easement payments. Additionally, to minimize loss of farmland and to ensure reasonable access to the land near the poles, the Applicant intends to place the poles on private property near the public roadway right-of-way. When possible, the Applicant would attempt to construct the transmission line before crops are planted or following harvest. The Applicant would compensate landowners for crop damage and soil compaction that occurs as a result of the Project. Soil compaction would be addressed by compensating the farmer to repair the ground or by using contractors to chisel-plow the site. Normally, a declining scale of payments is set up over a period of a few years. Where possible, the Applicant avoids spring time construction. If construction during spring time is necessary, disturbance to farm soil from access to each structure location would be minimized by using the shortest access route. This may require construction of temporary driveways between the roadway and the structure, but would limit traffic on fields between structures. Construction mats may also be used to minimize impacts on the access paths and in construction areas.

6.7.1 *Forestry*

General

Due to the abundance of farmland in the Project area, there are few wooded areas located along the Proposed Route and minimal impacts are anticipated.

There are no significant lumber mills (>2,000 cords annual production) located in the Project area, which are an important factor in determining markets for wood (Minnesota Forest Resources 2010, MnDNR, http://files.dnr.state.mn.us/forestry/um/forestresourcesreport_10.pdf, accessed on June 27, 2011). Therefore, the Project would not result in forestry-related economic impacts. **Table 21** provides a summary of forest impacts.

Table 21: Forest Impacts

Resource Category	Chester Route (North-South Segment)
Length Crossing Forestry Stand Area	
Acres of Forestry Stand within 600-foot route*	0
Acres of Forestry Stand within ROW*	0

Data Sources: *MnDNR

Mitigative Measures

Minimal impacts to forest are anticipated and therefore no mitigative measures are proposed.

6.7.2 *Tourism*

The Proposed Route does not cross nor is immediately adjacent to parks, cultural event sites or recreation event areas. The rural area and two lane roads with low traffic volume are attractive for bicycling and auto touring. However, the roads along the Proposed Route are not on designated bike routes.

The Chester Woods Park is located in Eyota, Minnesota, approximately 3.5 miles southeast of the Proposed Route. The park has facilities for camping, fishing, equestrian, hiking, picnicking, swimming, boating and cross country skiing. The Proposed Route is not located adjacent to the park.

Two regional events are located east of the Proposed Route. The annual Elgin Cheese Days are located in Elgin and the Eyota Celebration Days are hosted in Eyota, Minnesota. The Proposed Route is not located adjacent to the event locations.

Eastwood Park and Eastwood Golf Course are located approximately 1.9 miles southwest of the Proposed Route. The park has open space and mountain bike trails. The Proposed Route does not cross the golf course or park.

A segment of the Zumbrowath-Wabasha snowmobile trail system crosses the Proposed Route north of County Road 21 and west of County Road 11. The Proposed Route does not cross any designated bicycle trails.

Mitigative Measures

No impacts are anticipated and therefore no mitigative measures are proposed.

6.7.3 *Mining*

Aggregate (sand, gravel and crushed stone) operations occur in the vicinity of the Proposed Route (http://www.dnr.state.mn.us/lands_minerals/mining.html, Accessed on June 27, 2011). The Proposed Route does not cross active aggregate mining operations. (http://www.dnr.state.mn.us/lands_minerals/aggregate_maps/online_maps/index.html, Accessed on June 27, 2011).

One documented aggregate mine exists approximately 1,200 feet from the edge of the Proposed Route south of Viola Road NE. The mine is not active.

High potential for aggregate material exists in two locations along the Proposed Route. The total area of high potential aggregate is approximately 163 acres. The location of the aggregate is approximately 0.3 miles from the centerline of the Proposed Route. There are no other high potential areas for aggregate along the Proposed Route.

Mitigative Measures

No impacts to mining are anticipated and therefore no mitigative measures are proposed.

6.8 Archeological and Historic Resources

The Minnesota State Historic Preservation Office ("SHPO") was contacted regarding archaeological and historic resources within 1-mile of the Proposed Route centerline (**Appendix D**). The SHPO provided results from a search of the Minnesota Archaeological Inventory and Historic Structures Inventory.

Table 22 summarizes the Minnesota Archaeological and Historic Structures Inventory results within 1-mile of the Proposed Route centerline. In addition, National Register of Historic Places ("NRHP") occurrences within 1-mile of the Proposed Route centerline were identified and are summarized in the table below.

Table 22: Archaeological and Architectural Resources

Resource Category	Chester Route (North-South Segment)
Archaeological (within 1-mile)	1
Historic/Architectural (within 1-mile)	
NRHP	0
Historic/Architectural	10

Mitigative Measures

No impacts to cultural resources are anticipated from the construction of Proposed Project therefore no mitigation is proposed. If an artifact is discovered during construction, it would be determined, in consultation with SHPO, whether or not the resource is eligible for listing in the NRHP. If a potentially eligible artifact cannot be spanned to avoid it, additional survey work may be necessary using standard Phase I or Phase II survey methods. Any necessary surveys would be completed prior to construction activities.

6.9 Natural Environment

6.9.1 *Air Quality*

Operation of the transmission line is expected to have negligible impacts on air quality. Most calculations for the production and concentration of ozone assume high humidity or rain, with no reduction in the amount of ozone due to oxidation or air movement. These calculations would therefore overestimate the amount of ozone that is produced and concentrated at ground level. Studies designed to monitor the production of ozone under transmission lines have generally been unable to detect any increase due to the transmission line facility.

The only direct air pollution issue associated with transmission line operation is ozone formation due to the corona effect. Corona consists of the breakdown or ionization of air within a few centimeters of conductors. Usually some imperfection such as a scratch on the conductor or a water droplet is necessary to cause corona. Corona can produce ozone and oxides of nitrogen in the air surrounding the conductor. Ozone also forms in the lower atmosphere from lightning discharges, and from reactions between solar ultraviolet radiation and air pollutants, such as hydrocarbons from auto emissions. The natural production rate of ozone is directly proportional to temperature and sunlight, and inversely proportional to humidity. Thus, humidity and moisture, the same factors that increase corona discharges from transmission lines, inhibit the production of ozone. Ozone is a very reactive form of oxygen molecules and combines readily with other elements and compounds in the atmosphere. Because of its reactivity, it is relatively short-lived.

Currently, both state and federal governments have regulations regarding permissible concentrations of ozone and oxides of nitrogen. The state and national standard for ozone is 0.08 parts per million ("ppm") during an eight-hour averaging period using the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations. Most calculations of the production and concentration of ozone assume high humidity or rain, with no reduction in the amount of ozone due to oxidation or air movement. These calculations would therefore overestimate the amount of ozone that is produced and concentrated at ground level. Studies designed to monitor the actual production of ozone under 161 kV transmission lines have generally been unable to detect any increase due to the transmission line facility.

Construction of the transmission line would result in minor short-term air quality impacts from the operation of heavy-duty construction equipment and fugitive dust due to travel on unpaved roads and excavation for transmission structure foundations. Exhaust emissions from construction equipment would include oxides of nitrogen, volatile organic compounds, carbon monoxide and particulate matter less than 10 microns in size ("PM_{10}"). Due to the short-term nature of the construction activities, local impacts on air quality are expected to be minor.

Mitigative Measures

Construction of the Project is not expected to have any long-term or regionally significant impacts on air quality. Air quality impacts during maintenance and inspection activities would be negligible.

6.9.2 *Water Quality*

General

Several perennial and intermittent streams and ditches are crossed by the Proposed Route. One stream, Silver Creek is designated as a Public Water and listed in the Public Water Inventory ("PWI") by the State of Minnesota and is under the regulatory jurisdiction of the MnDNR. The statutory definition of the PWI can be found in Minn. Stat. §03G.005, Subd. 15 and 15a. A permit from the MnDNR is required to cross this feature. No lakes would be crossed by the Proposed Route, although wetlands are crossed by the Proposed Route (**Appendix C**).

Section 303(d) of the federal CWA requires states to publish, every two years, a list of streams and lakes that are not meeting their designated uses because of excess pollutants (impaired waters). The list, known as the 303(d) list, is based on violations of water quality standards. In Minnesota, the MPCA has jurisdiction over determining 303(d) waters, which are described as "impaired." Reasons for impairment include turbidity, polychlorinated biphenyls, mercury, fecal coliform, perfluorooctane sulfonate and acetochlor. Silver Creek and several unnamed tributaries to Silver Creek are listed as impaired waters by the MPCA.

The Federal Emergency Management Agency ("FEMA") designates areas that are likely to experience flooding in a 100-year rainfall event. There are no FEMA 100-year floodplains crossed by the Proposed Route.

Potential Route Impacts

During construction there is the possibility of sediment reaching surface waters as the ground is disturbed by excavation, grading and construction traffic. Once the construction is complete it should have no long-term impact on surface water quality, as all disturbed areas would be re-vegetated. Twelve wetland areas, described below in Section 6.9.3, were mapped on the ("NWI") and are crossed by the Proposed Route. The Proposed Route crosses 15 intermittent and perennial streams. These waterways are all unnamed except for Silver Creek and are all tributaries of the Zumbro River or Dry Creek. The Proposed Route is not mapped in a 100-year floodplain (FEMA, 1981). Permanent direct impacts to the surface water resources are not anticipated.

The Proposed Route crosses one natural watercourse, Silver Creek, which is listed on MnDNR PWI on the Public Waters Inventory Maps. A MnDNR License to Cross Public Waters would be required for this crossing. Silver Creek is located just south of Silver Creek Road and North of County Highway 2 (**Appendix C**). There are no US Fish and Wildlife Service ("USFWS") Waterfowl Production Areas within the Proposed Route. The closest Waterfowl Production Area, Steele County Waterfowl Production Area, is approximately 33 miles to the west in Steele County.

Mitigative Measures

During construction there is a possibility of sediment reaching surface waters as the ground is disturbed by excavation, grading and construction traffic. Silver Creek, Zumbro River and their tributaries are already impaired by sediment and turbidity, so any sediment reaching these streams has the potential to compound adverse water quality in these impaired waters. An NPDES permit from the MPCA is required for stormwater discharges associated with ground-disturbing construction activities equal to or greater than 1 acre. A requirement of the permit is to develop and implement a Stormwater Pollution Prevention Plan ("SWPPP"), which includes implementation of construction best management practices ("BMPs") intended to establish sediment and erosion control and minimize discharge of pollutants. If an NPDES permit is required, the Applicant would prepare a SWPPP and submit an application to MPCA to obtain permit coverage under General Permit No. MN R100001 prior to beginning construction activities. If an NPDES permit is not required, the Applicant would follow standard erosion control measures identified in the applicable Stormwater Best Management Practices Manual such as using silt fences to minimize the potential for erosion and sedimentation into water bodies within the Proposed Route. The Applicant would maintain sound water and soil conservation practices during construction and operation of the transmission line to protect topsoil and adjacent water resources and minimize soil erosion. Practices may include containing excavated material, protecting exposed soil and stabilizing restored soil. With implementation of BMPs the Project is not expected to affect water quality (*i.e.*, fecal coliform or TSS levels) within the watershed.

6.9.3 *Wetlands*

General

The NWI was reviewed to identify wetland areas that may occur along the Proposed Route (**Appendix C**). The NWI is a comprehensive mapping systems of wetland locations and types across the United States produced based on aerial photographs and the Natural Resource Conservation Service ("NRCS") soils surveys starting in the 1970s. Wetlands identified on the NWI may be inconsistent with current wetland conditions; however, the NWI is the most accurate and readily available database of wetland resources within the Proposed Route. Wetland impacts resulting from construction have been initially assessed using mapping on the NWI. A number of wetland classification systems have been developed, but the Cowardin et al. (1979) classification methods described by the USFWS are the most widely recognized system and have been used for wetland classification within the regional area. Of the five wetland systems described by Cowardin et al., wetlands within the palustrine system were the only ones identified within the Proposed Route. Palustrine refers to smaller (less than 20 acres), shallow (less than 6.5 feet) wetlands.

Pursuant to Section 404 of the CWA, the USACE defines wetlands in 33 CFR 328.3b as those areas that are "inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Jurisdictional wetlands must possess three essential characteristics: "(1) a dominance by hydrophytic vegetation, (2) hydric soils and (3) wetland hydrology" (USACE 1987, 2008). For an area to be classified as a jurisdictional wetland under the federal guidelines, all of the above criteria must be met, and the wetland must have a hydrologic connection to waters of the U.S.

In Minnesota, both jurisdictional and non-jurisdictional wetlands are protected under Minn. R. ch. 8420, the Wetland Conservation Act ("WCA"). Although the Board of Water and Soil Resources ("BWSR") administers the WCA on a statewide basis, LGUs implement the WCA locally. Wetlands may also be regulated by the MnDNR if they are listed as PWI wetlands. The WCA regulates wetland draining and filling activities on all wetlands not covered by the MnDNR Public Waters Work Permit Program. The MnDNR requires a permit to cross or change or diminish the course, current, or cross section of public waters by any means, including filling, excavating or placing of materials in or on the beds of public waters. Local governments may also have their own wetland ordinances.

6.9.4 *Potential Route Impacts*

There are 12 wetland areas along the Proposed Route including: 2 Palustrine Unconsolidated Bottom, Intermittently Exposed, Impounded ("PUBGh") wetlands; 9 Palustrine Emergent, Seasonally Flooded ("PEMC") wetlands and; 1 Palustrine Emergent, Saturated ("PEMB") wetland. Of the twelve wetlands present in the Proposed Route, only two are crossed by the Proposed Route centerline. Based on the relatively small size of these two wetlands it appears that they can be spanned thus avoiding any impact. The NWI review did not show the presence of any forested or shrub-scrub wetlands within the Proposed Route ROW (**Appendix C**). Impacts are summarized in **Table 23**.

Table 23: Wetland Impacts

Resource Category	Chester Route (North-South Segment)
Wetlands Crossed by Proposed Route	12
Wetland Areas crossed by the Proposed Route Centerline	2
Potential Tree Clearing in Wetlands	0 acres
Stream Crossings*	15
Permanent Impacts to Floodplains**	0 acres

Data Sources: * USGS NHD, **FEMA

Mitigative Measures

To avoid direct impacts construction would incorporate spacing of structures to span wetlands and streams. Temporary impacts to wetlands may occur if the wetlands need to be crossed during construction of the transmission line. Staging or stringing setup areas would be placed outside of water resources wherever possible. The Applicant would avoid major disturbance of individual wetlands and drainage systems during construction by spanning wetlands and drainage systems, where possible. Wetland vegetation would be restored following construction.

In order to minimize impacts construction would be scheduled during the winter months when the ground is frozen, as feasible. Crews would attempt to access a wetland using the shortest possible route resulting in the least amount of physical impact to the wetland. As feasible, structures would be assembled on upland areas before they are brought to the site for installation and when construction during winter is not possible, construction mats would be used to minimize wetland impacts. Additionally, the Applicant has access to an all-terrain construction vehicle, which is

designed to minimize soil compaction and damage in damp areas. Temporarily impacted wetlands would be restored as required by the USACE, MnDNR and the BWSR.

6.9.5 *Flora*

General

The majority of the land adjacent to the Proposed Route is in row crops, pasture and hay lands (**Appendix E**). Row crops in the area include corn and soybeans. Scattered areas of shrub lands and fragmented deciduous forests are located throughout or adjacent to the Proposed Route. According to the MnDNR Ecological Classification System ("ECS"), ecological land classifications are used to identify, describe and map progressively smaller areas of land with increasingly uniform ecological features. The Proposed Route is located entirely in the Rochester Plateau Subsection of the Paleozoic Plateau Section.

Historically, the Paleozoic Plateau Section was influenced by slope, aspect, flooding, and fire frequency, which influenced the distribution and condition of the dominant vegetation communities associated with the related subsection. The Rochester Plateau Subsection was historically characterized by two dominant vegetation communities: tallgrass prairie and bur oak savanna. Today, agriculture dominates the landscape, with 69% in cropland and 21% in pasture (MnDNR, 2006.*Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife*, Comprehensive Wildlife Conservation Strategy. Division of Ecological Services, MnDNR). Water quality is a concern in the subsection because of agricultural and urban development.

Surrogate grasslands are common in this region of Minnesota. According to Minnesota Comprehensive Wildlife Conservation Strategy, these are grasslands that have developed as a result of human activities since settlement dominated by non-native, cool-season grasses. Surrogate grasslands include old fields, hayfields, pastures and roadside grasslands (Sample and Mossman 1997). Dominant non-native grasses include smooth brome (*Bromus inermis*), quackgrass (*Agropyron repens*), redtop (*Agrostis stolonifera*), timothy (*Phleum pratense*) and Kentucky bluegrass (*Poa pratensis*). Reed canary grass (*Phalaris arundinacea*), a non-native invasive species, dominates this habitat on wetter sites. Non-native forbs include species of legumes such as yellow sweet clover (*Melilotus officinalis*), white sweet clover (*M. alba*), alfalfa (*Medicago sativa*), bird's-foot trefoil (*Lotus corniculatus*), and Canada thistle (*Cirsium arvense*) and native forbs include goldenrods, milkweeds and asters. When left unmanaged these habitats are typically invaded by non-native species such as Siberian elm (*Ulmus pumila*) and Russian olive (*Elaeagnus angustifolia*) and by natives such as green ash (*Fraxinus pennsylvanica*), cottonwood (*Populus deltoides*) and sumacs (*Rhus* spp), reducing the value of these communities for grassland species (MnDNR, 2006.*Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife*, Comprehensive Wildlife Conservation Strategy. Division of Ecological Services, MnDNR).

Wetland habitats in the Proposed Route are primarily wet meadow and marsh communities. Wet meadows are graminoid, forb or shrub-dominated communities located near a marsh or open water. Species may include arrow-leaved tearthumb (*Polygonum sagittatum*), fen wiregrass sedge (*Carex lasiocarpa*), prairie sedge (*Carex prairea*) and tussock sedge (*Carex stricta*). Marshes are emergent herbaceous communities and can be heavily dominated by cattails (*Typha* spp.), bulrushes (*Scirpus* spp.) and sedges.

The Conservation Reserve Program (CRP) is a federal program administered by the NRCS that converts highly erodible or marginal farmland to native grassland habitats. Easements last 10 to 15 years and are intended to reduce erosion and improve water quality. Conservation Reserve Program lands are found along the Proposed Route.

Potential Route Impacts

Row crops such as corn, as well as other agricultural crops such as soybeans and alfalfa are anticipated to dominate the landscape. Grassland areas are expected to be dominated by grasses such as smooth brome, quackgrass, redtop, timothy and Kentucky bluegrass and forbs including clover, trefoils and alfalfa. Six CRP properties are located in the ROW currently depicted within the Proposed Route.

The total area of forested upland (deciduous and evergreen) within the Proposed Route is approximately 42.4 acres (1,846,944 ft^2). The area of forested upland (deciduous and evergreen) that would be impacted by the ROW is approximately 6.0 acres (260,924 ft^2). A width of 40 feet would be cleared on either side of the centerline for the 161 kV transmission line ROW in areas where trees are present. Forested wetlands are not anticipated to be impacted by construction.

Table 24 provides a summary of the land cover types within the 600-foot route and the 80-foot ROW.

Table 24: Land Cover

Resource Category	Chester Route (North-South Segment)
Land Cover (Acres within 600-foot Route)*	
Percent Developed	15%
Percent Cropland	47.8%
Percent Grassland	18.7%
Percent Pasture/Hay	13.7%
Percent Shrubland	0%
Percent Deciduous Forest	4.1%
Percent Evergreen Forest	0.7%
Percent Aquatic	0%
Land Cover (Acres within 80-foot Row)*	
Percent Developed	16%
Percent Cropland	44.5%
Percent Grassland	21.7%
Percent Pasture/Hay	12.6%
Percent Shrubland	0%
Percent Deciduous Forest	4.1%
Percent Evergreen Forest	1.1%
Percent Aquatic	0%

Data Sources: * USGS NLCD 2001

Mitigative Measures

Impacts to existing vegetation communities caused by implementation and operation of the Proposed Route include both direct and indirect temporary and permanent impacts. Site preparation and installation of support poles may impact 20,000 square feet (less than 0.5 acre) of habitat at each structure location. Except for the final footprint of the installed structure, the majority of the disturbed area at each structure would be reclaimed and allowed to re-vegetate naturally to pre-construction conditions. To minimize impacts to trees along the Proposed Route, the Applicant would only remove trees located in the ROW for the transmission lines, or that would impact the safe operation of the facility. Trees outside the right-of-way that will need to be removed include trees that are unstable and could potentially fall into the transmission facilities.

Other temporary impacts to existing vegetation communities include localized physical disturbance caused by the use of construction equipment during site preparation including grading, excavation and soil stockpiling. The establishment and use of staging areas and stringing areas also would temporarily impact flora by concentrating surface disturbance and equipment use. Grading could occur at the staging areas if these areas are not located in previously disturbed sites.

The Applicant would work with the MnDNR and the USFWS to minimize and avoid impacts to sensitive flora along the Proposed Route. The Applicant would attempt to avoid, minimize and/or mitigate impacts to any areas known to support native vegetation or special status species, as practicable. When native vegetation communities cannot feasibly be spanned, the Applicant would work to minimize the number of structures within these communities.

As an additional mitigation/conservation measures, the Applicant would comply with Minnesota noxious weed laws as described in the Minn. R. ch. 1505 and would observe county weed lists, where appropriate. The Applicant would provide for weed control associated with substation and switch locations in a manner that would reduce the spread of weeds onto adjacent agricultural land during operation of the transmission line.

6.9.6 *Fauna*

General

In general, wildlife near the Proposed Route consists of birds, mammals, fish, reptiles, amphibians, mussels and insects, both resident and migratory, which use the existing habitat for foraging, shelter, breeding and/or stopover sites during migration. WMA's are located throughout Olmsted County and are open for public hunting at various times of the year. The closest WMA is the Eastside WMA located approximately 0.5 miles west of the south end of the Proposed Route. Game animals open to hunting at WMA's in Olmsted county include deer, small game (rabbits and squirrels), forest birds, pheasants, waterfowl, turkey and dove (http://www.dnr.state.mn.us/hunting/index.html). Coyotes would also be expected to frequent the area.

The MnDNR online AniMap (http://www.dnr.state.mn.us/maps/animap/mapper.html) provides lists of species by county where mammals, breeding birds and reptiles and amphibians have been surveyed. For Olmsted County, data was provided for rodents and breeding birds.

Potential Route Impacts

Construction of new transmission lines can affect fauna through temporary impacts, permanent impacts and avian-specific impacts. Temporary impacts include displacement and habitat alteration caused by temporary disturbances and noise associated with construction activities. Such impacts are most likely to affect fauna at the proposed structure locations where activity would be most intense. Approximately 20,000 square feet (<0.5 acre) of temporary impact is anticipated at each new structure or 1.0 acre of temporary impact per span. Similarly, staging and stringing areas also have the potential to temporarily impact fauna within the Project construction area. Grading previously undisturbed sites for staging areas and clearing for access roads has the potential to temporarily impact wildlife by altering habitat. Clearing for access roads would be limited as much as practicable and should only require a maximum width of 16 feet. Such activities have the potential to impact small birds (e.g., eggs or nestlings) and small mammals that may be unable to avoid equipment. Many wildlife species would likely avoid the immediate area during construction. The distance that animals would be displaced is dependent on the species and the tolerance level of each individual. Based on the availability and suitability of other unaffected and similar habitat within and near the Project area, the potential temporary impacts to wildlife are not expected to cause a change in listing status or a detectable change in local populations. The Applicant would make all attempts to schedule construction within forested communities outside of prime bird breeding and nesting seasons.

In addition to temporary and permanent construction impacts to fauna, transmission lines also have the potential to impact birds through electrocution and collision after construction is complete. Electrocution risk is addressed in project wide structure design elements that provide adequate clearance for perching birds.

Mitigative Measures

Avian protection standards that minimize the risk of bird electrocution are well documented in the following resources: the Avian Power Line Interaction Committee's ("APLIC's") *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006* (APLIC 2006), APLIC's *Mitigating Bird Collisions with Power Lines: The State of the Art in 1994* (APLIC 1994) and APLIC's and USFWS' *Avian Protection Plan ("APP") Guidelines* (APLIC and USFWS 2005). The structure designs proposed for this Project are consistent with the recommendations of these resources in that they provide adequate clearance from energized conductors to grounded surfaces and to other conductors. As such, avian electrocution risk is considered minimal and is not addressed in further detail. Conversely, avian collisions with new transmission lines are possible and risk is assessed through an analysis of line span locations relative to surrounding habitats and bird movement. Risk is characterized on a site-specific basis by evaluating surrounding habitat, reviewing bird concentration and movement patterns and examining structure configurations. Habitats are characterized by identifying historical and active nest sites, bird concentration areas, foraging areas, roost sites and rookeries. Potential collision risk is highest at spans or structures located in rural areas with native vegetation where the line crosses habitats typically used by area birds (e.g., rivers and wetlands) and human influence in the immediate vicinity is limited. The Proposed Route is located between the Steele County Waterfowl Production Area and the Mississippi River and waterfowl may cross over the Proposed Route during migration.

Several mitigation strategies and measures would be used to minimize impacts. To mitigate potential impacts to wildlife the transmission line would span designated habitat, conservation areas or other sensitive habitats wherever practical. In areas where complete spanning is not possible, the Applicant would minimize the number of structures placed in high quality wildlife habitat and would work with the MnDNR and USFWS to come up with appropriate mitigation. Additionally, the Applicant would use construction mats to avoid soil compaction where appropriate (e.g., in wetland habitats). Areas temporarily disturbed by construction activities may be restored to pre-construction contours and allowed to re-vegetate naturally, subject to landowner approval.

The Applicant would address avian issues by working with MnDNR and USFWS to identify areas that may require marking transmission line shield wires and/or the use of alternative structures to reduce the likelihood of collisions. If necessary, field surveys to obtain more route specific wildlife data would be completed once a route has been permitted in order to help minimize and mitigate potential impacts.

Table 25 provides a summary of fauna related items potentially affected by the North-South Chester Route.

Table 25: Fauna

Resource Category	Chester Route (North-South Segment)
Trout Streams (number crossed)*	0
Conservation Reserve Program Lands Crossed*	6 properties
Conservation Reserve Enhancement Program Lands Crossed*	0 properties
Length of Important Bird Areas Crossed*	0 miles
Length of Grassland Bird Conservation Areas Crossed*	0 miles

Data Sources: * MnDNR

6.10 Rare and Unique Resources

General

The Minnesota Comprehensive Wildlife Conservation Strategy (MnDNR, 2006.*Tomorrow's Habitat for the Wild and Rare: An Action Plan for Minnesota Wildlife*, Comprehensive Wildlife Conservation Strategy. Division of Ecological Services, MnDNR) breaks the state of Minnesota into 25 ECS subsection profiles. These subsection profiles are used to identify the presence and patterns of occurrence for species of greatest conservation need ("SGCN"), as well as key habitats and priority conservation actions across the state. The Proposed Route runs through the Rochester Plateau, which comprises the majority of Olmsted County.

The Minnesota Natural Heritage Inventory System ("NHIS") was consulted for known occurrences of sensitive species and other rare or unique natural resources within 1-mile of the Proposed Route centerline (**Appendix F**). The Minnesota NHIS provides information on Minnesota's rare plants, animals, native plant communities and other rare features. The NHIS database is continually updated as new information becomes available, and is the most complete source of data on

Minnesota's rare or otherwise significant species, native plant communities and other natural features. The NHIS contains historical data on rare species occurrences from museum collections and published records, as well as more current data obtained from MnDNR's MCBS work. All animal species that are listed as federally endangered or threatened (except the gray wolf) are tracked, as well as all birds, small mammals, reptiles, amphibians, mussels and butterflies that are listed as state endangered, threatened or special concern. Several rare species which currently have no legal status but need further monitoring to determine their status also are tracked in the NHIS database (MnDNR 2009). Threatened species and species identified as special concern, as well as a rare natural community, were identified within 1-mile of the Proposed Route centerline.

Potential Route Impacts

The MnDNR NHIS was consulted for known occurrences of sensitive species and other rare or unique natural resources with the potential to occur along the Proposed Route **(Table 26)**. Two special concern plant species, White Wild Indigo (*Baptisia alba*) and Rattlesnake-master (*Eryngium yuccifolium*) and two threatened reptile species, Blanding's Turtle (*Emydoidea blandingii*) and were documented within 1-mile of the Proposed Route centerline. Three occurrences were recorded for Blanding's Turtle (**Appendix F**).

A sedge meadow was also identified within 1-mile of the Proposed Route centerline. This wetland community was identified as a large meadow dominated mostly by *Carex lacustris* and *Calamagrostis canadensis* with areas dominated by *Carex stricta* and *Typha* species. This community was identified as having moderate species diversity with associate species of various *Carex*, *Polygonum*, *Lathyrus*, *Eleocharis*, *Erythronium* and *Galium* species.

Mitigative Measures

The majority of the land use surrounding the Proposed Route is cultivated cropland and pasture and impacts to rare species are unlikely. To reduce and minimize impacts to rare and unique natural resources the Applicant would, to the maximum extent practicable, span areas of potential habitat for these species. If construction activities are proposed to disturb known endangered or threatened species habitat, surveys would be conducted to determine species presence, as well as to plan avoidance and mitigation strategies. Adjustments to structure configuration and careful pole siting would be used to minimize impacts in sensitive areas. The Applicant would maintain sound water and soil conservation practices during construction of the Project to protect topsoil and adjacent water resources and minimize soil erosion and sedimentation. Upon receipt of a permitted route the Applicant would coordinate with the appropriate agencies (e.g., USFWS, USACE and MnDNR) to determine species-specific survey and wetland delineation needs, as well as additional avoidance and mitigation measures. Surveys for state listed endangered and threatened species would be conducted in suitable habitat within the permitted route as directed by the agencies.

Table 26: Rare and Unique Resources

Resource Category	Chester Route (North-South Segment)
Number of Federal Rare and Unique Species (Occurrences) Known to Occur within 1-mile of Route Centerline*	
Threatened	0
Endangered	0
Candidate	0
Number of State Rare and Unique Species (Occurrences) Known to Occur within 1-mile of Route Centerline*	
Threatened	3
Endangered	0
Species of Concern	2
DNR Rare Native Communities	1
Length of Outstanding Biodiversity Sites Crossed	0 miles
Length of High Biodiversity Sites Crossed	0 miles
Length of Moderate Biodiversity Sites Crossed	0.1 miles
DNR Rare Native Communities Crossed	0.08 miles
DNR RR ROW Prairies within 1-mile	0

Data Source: * MnDNR

6.11 Impact Summary

Table 27 provides a summary of impacts associated with the Chester 161 kV Route (North-South Segment).

Table 27: Summary Inventory Table North-South Chester 161 kV Route

Resource Category	Chester Route (North-South Segment)
Residences	
Number of Residences 0-40 feet from route centerline	0
Number of Residences 41-150 feet from route centerline	8
Number of Residences 151-300 feet from route centerline	11
Revised Density (residences/linear mile within 300 feet of route centerline)	0.3
Use or Paralleling of Existing ROW (transportation, and electrical transmission systems) and property lines	
Total length of route (miles)	11.9
Length following Transmission Line (miles)	6.9
Percentage of route following Transmission Line	58%
Length following road but not Transmission Line (miles)	5
Percentage of route following road but not Transmission Line	42%
Length following property line but not transmission line or roads (miles)	0
Percentage of route following property line but not transmission line or roads	0%
Total length following transmission line, roads, or property lines (miles)	11.9
Percentage of route following transmission line, roads or property lines	100%
Length not following transmission line, roads or property lines (miles)	0
Percentage of route not following transmission line, roads or property lines	0%
Archaeological and Historic Resources within 1-mile of Route Centerline	
Archaeological	1
Historic/Architectural	
National Register of Historic Places	0
Historic/Architectural	10
Natural Environment	
Water Resources	
Wetlands Crossed by Proposed Route	12
Wetland Areas crossed by the Proposed Route Centerline	2
Potential Tree Clearing in Wetlands	0 acres
Stream Crossings	15
Trout Streams (number crossed)	0
Permanent Impacts to Floodplains	0 acres
Flora	
Land Cover (Acres within 600-foot Route)	
Percent Developed	15%
Percent Cropland	47.8%

Resource Category	Chester Route (North-South Segment)
Percent Grassland	18.7%
Percent Pasture/Hay	13.7%
Percent Shrubland	0%
Percent Deciduous Forest	4.1%
Percent Evergreen Forest	0.7%
Percent Aquatic	0%
Land Cover (Acres within 80-foot ROW)	
Percent Developed	16%
Percent Cropland	44.5%
Percent Grassland	21.7%
Percent Pasture/Hay	12.6%
Percent Shrubland	0%
Percent Deciduous Forest	4.1%
Percent Evergreen Forest	1.1%
Percent Aquatic	0%
Fauna	
Conservation Reserve Program Lands Crossed	6 properties
Conservation Reserve Enhancement Program Lands Crossed	0 properties
Length of Important Bird Areas Crossed	0 miles
Length of Grassland Bird Conservation Areas Crossed	0 miles
Number of Federal Rare and Unique Species Known to Occur within 1-mile of Route Centerline	
Threatened	0
Endangered	0
Candidate	0
Number of State Rare and Unique Species Known to Occur within 1-mile of Route Centerline	
Threatened	3
Endangered	0
Species of Concern	2
DNR Rare Native Communities	1
Length of Outstanding Biodiversity Sites Crossed	0 miles
Length of High Biodiversity Sites Crossed	0 miles
Length of Moderate Biodiversity Sites Crossed	0.02 miles
DNR Rare Native Communities Crossed	0.02 miles
DNR R.R. ROW Prairies within 1-mile	0
Estimated Costs[1]	
Cost	$13,800,000

[1] Costs in this table are for constructing the north-south segment of the Chester 161 kV line only. Total project cost is determined by summing 1) east-west segment cost; 2) north-south segment cost; 3) Chester Substation expansion ($3,000,000); 4) permitting, engineering and construction management ($1,600,000). Total project cost is presented in Section 3.5.

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7.0 References

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8.0 Acronyms

AC	alternating current
ACSS	Aluminum Core Steel Supported
ACSS-TW	Aluminum Core Steel Supported - Trapazoidal Wound
APLIC	Avian Power Line Interaction Committee
APP	Avian Protection Plan
BMP	best management practices
BWSR	Board of Water and Soil Resources
CON	Certificate of Need
CRP	Conservation Reserve Program
CWA	Clean Water Act
dBA	decibels
ECS	Ecological Classification System
EF	electric fields
EIS	environmental impact statement
ELF	extremely low frequency
EMF	electromagnetic field
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Agency
GIS	Geographic Information System
HVTL	high voltage transmission line
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IEEE	Institute of Electrical and Electronic Engineers

kV	kilovolt
kV/m	kilovolts per meter
L50	decibels that may be exceeded 50 percent of the time within one hour
L10	decibels that may be exceeded 10 percent of the time within one hour
LAWCON	Land and Water Conservation
LGU	local government unit
MF	magnetic field
mG	milliGauss
MnDNR	Minnesota Department of Natural Resources
MnDOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MPUC	Minnesota Public Utilities Commission
MSL	mean sea level
NAC	Noise Area Classification
NEMA	National Electrical Manufacturer's Association
NESC	National Electric Safety Code
NEV	Neutral to Earth Voltage
NHIS	Natural Heritage Inventory System
NIEHS	National Institute of Environmental Health Sciences
NLCD	National Land Cover Data
NPDES	National Pollution Discharge Elimination System
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory

PDA	Project Development Agreement
PEMB	Palustrine Emergent, Saturated Wetland
PEMC	Palustrine Emergent, Seasonally Flooded Wetland
PM_{10}	particulate matter less than 10 microns in size
ppm	parts per million
PPSA	Power Plant Siting Act
PSCW	Public Service Commission of Wisconsin
PUBGh	Palustrine Unconsolidated Bottom, Intermittently Exposed, Impounded Wetland
PWI	Public Water Inventory
RJD	Richard J. Dorer (State Forest)
ROW	right-of-way
RPA	Route Permit Application
RPU	Rochester Public Utilities
RUS	Rural Utility Service
SGCN	Species of Greatest Conservation Need
SHPO	State Historic Preservation Office
SMMPA	Southern Minnesota Municipal Power Agency
SPCC	Spill Prevention, Control and Countermeasure
SWG	State Wildlife Grant
TCPA	Township Cooperative Planning Association
USACE	US Army Corps of Engineers
USDA	US Department of Agriculture
USFWS	US Fish and Wildlife Service
WCA	Wetlands Conservation Act

WHO	World Health Organization
WMA	Wildlife Management Area