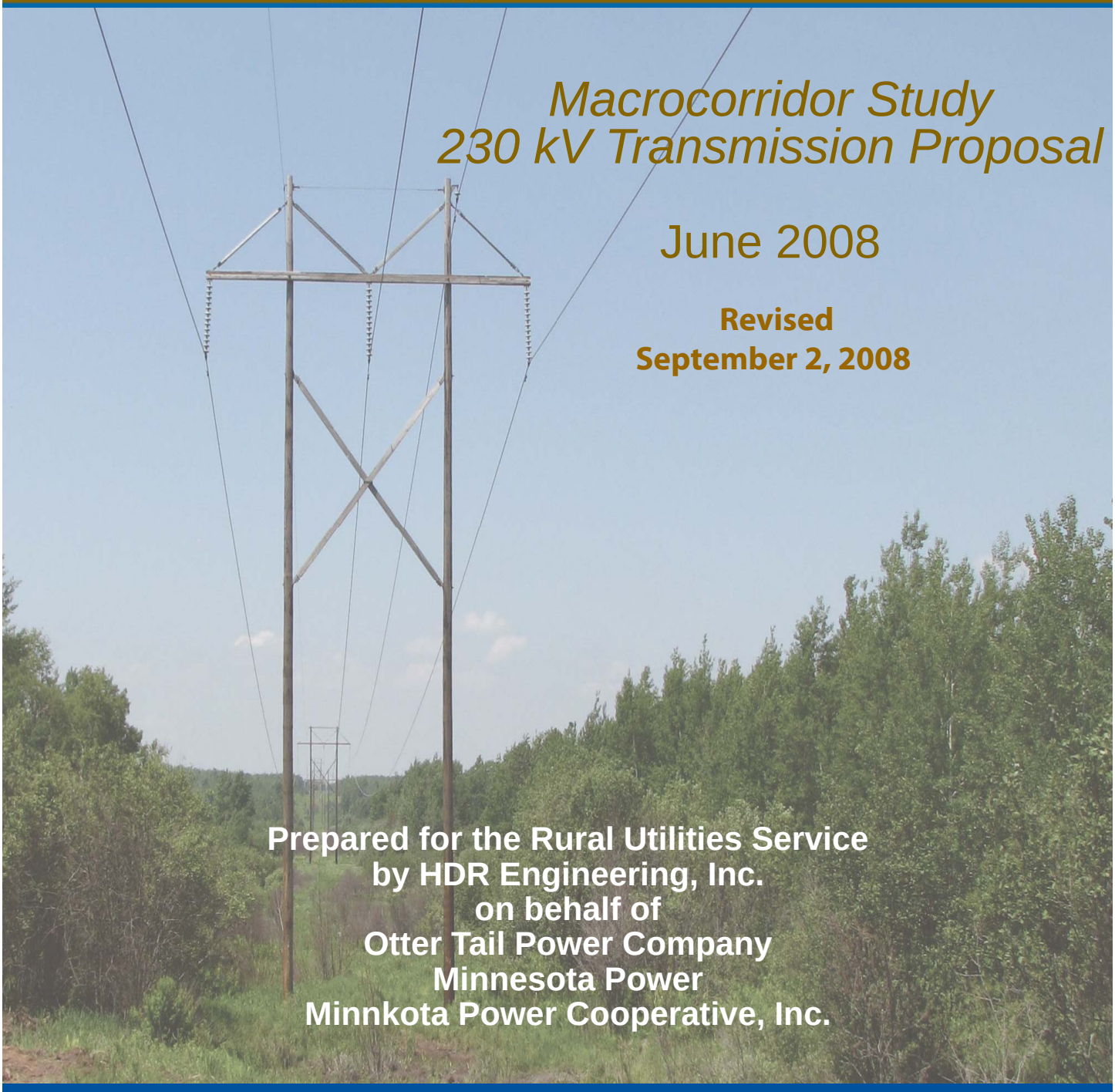
Bemidji-Grand Rapids

230-kV line



Macrocorridor Study
230 kV Transmission Proposal

June 2008

Revised
September 2, 2008

Prepared for the Rural Utilities Service
by HDR Engineering, Inc.
on behalf of
Otter Tail Power Company
Minnesota Power
Minnkota Power Cooperative, Inc.

HDR

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Macrocorridor Study

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June 20, 2008

Revised September 2, 2008

HDR

The following revisions were made in this version of the Macrocorridor Study on September 2, 2008.

Bemidji-Grand Rapids 230 kV Transmission Proposal
Macrocorridor Study Errata Table

Date	Section	Subject	Page Number	Paragraph Number	Change
Sept. 2, 2008	Table of Contents	Table of Contents, List of Tables, List of Figures, List of Photos, List of Appendices, List of Acronyms	ii-vii	n/a	The Table of Contents and associated lists were adjusted to reflect the addition of Diagram 1 in Section 1.0.
Sept. 2, 2008	1.0	Table 1-1	2	Row 3	Added row for New Corridor Required
Sept. 2, 2008	1.0	Table 1-1	3	Row 1, Column 5	For State Forest-owned property in the Non-CNF Macrocorridor, change from 0 Acres to 250 Acres.
Sept. 2, 2008	1.0	Table 1-1	3	Rows 5 and 8, Column 5	Changed to Not Applicable
Sept. 2, 2008	1.0	Summary text	3 & 4	Last paragraph and bullets	Added Non-CNF text and revised others as appropriate.
Sept. 2, 2008	1.0	Diagram 1	5	n/a	Added *Diagram 1: Macrocorridor Alternatives* to Section 1.0, thus creating a new page.
Sept. 2, 2008	2.0	Project Description	6	Paragraph 3, second sentence	Deleted "North, south and central macrocorridors" and changed figure reference to figure 2.
Sept. 2, 2008	2.1	Proposed Project	7	Paragraph 2	Added "Non-CNF" to third sentence. Changed three to four in the last sentence: See Section **Error! Reference source not found.** for a more detailed description of the four macrocorridors (**Error! Reference source not found.**).
Sept. 2, 2008	3.2	Methodology for Estimating Impacts	13	Paragraph 1	Changed three to four in the first sentence: The four macrocorridors constitute wide paths, from two to eight miles wide, between the two endpoints.
Sept. 2, 2008	4.0	Macrocorridor Resources	14	Paragraph 1	Added last sentence and second paragraph.
Sept. 2, 2008	7.1.3	Cost Analysis of Each Corridor	66	Paragraph 1	Added second sentence.
Sept. 2, 2008	Figures cover page	n/a	72	n/a	Added note.
Sept. 2, 2008	Figures	Figure 2	77	n/a	The figure was changed. The Non- CNF Macrocorridor was added to the map.

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List of Acronyms

Abbreviation	Definition
AES	Alternatives Evaluation Study
BNSF	Burlington Northern Santa Fe
CSAH	County State Aid Highway
CNF	Chippewa National Forest
DNR	Minnesota Department of Natural Resources
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
GAP	Gap Analysis Program
gpm	gallons per minute
kV	Kilovolt
LLBO	Leech Lake Band of Ojibwe
MCS	Macrocorridor Study
MDL	Minnesota Drift and Lake Plains Ecological Section
MHB	Mississippi Headwaters Board
MNDNR	Minnesota Dept. of Natural Resources
NEPA	National Environmental Policy Act
NESC	National Electricity Safety Council
NFIP	National Flood Insurance Program
NRHP	National Register of Historic Places

Abbreviation	Definition
NWI	National Wetlands Inventory
PWI	Public Waters Inventory
QCEW	Quarterly Census of Employment and Wages
RMCS	Revised Macrocorridor Study
ROW	Right-of-Way
RUS	Rural Utilities Service
SNA	Scientific and Natural Areas
STATSGO	State Soil Geographic Database
SSURGO	Soil Survey Geographic Database
TH	Trunk Highway
USDA	United States Department of Agriculture
USFS	United States Forest Service
USGS	United States Geological Survey
WMA	Wildlife Management Areas

1.0 Summary of Proposed Action

Minnkota Power Cooperative, Inc. (Minnkota), Otter Tail Power Company (Otter Tail) and Minnesota Power (collectively, the Applicants) propose construction of a 230 kV transmission line between the cities of Bemidji and Grand Rapids in northern Minnesota (Proposed Project) The Rural Utilities Service (RUS) is a federal agency that administers the U.S. Department of Agriculture's Rural Development Utilities Program. The Applicants are requesting funding for a portion of the Proposed Project from RUS, and as a result, it will be reviewed pursuant to the National Environmental Policy Act (NEPA). NEPA requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of proposed actions and reasonable alternatives to those actions.

RUS has developed regulations and a series of guidance documents to facilitate compliance with the requirements of NEPA. The Proposed Project requires an Environmental Assessment with Scoping pursuant to RUS regulations, 7 C.F.R. § 1794.24(b) (1)). RUS Environmental Policies and Procedures of 7CFR Part 1794, Subpart F of the Federal Register require two documents, an Alternatives Evaluation Study (AES) and a Macrocorridor Study (MCS). The Applicant has prepared these studies for the proposed 230 kV Bemidji to Grand Rapids transmission line in accordance with RUS Bulletin 1794A-603 *Scoping Guide for RUS Funded Projects Requiring Environmental Assessments with Scoping and Environmental Impact Statements* (Feb. 2002). The purpose of these documents is to provide information to the public regarding the Proposed Project to support its participation in the process for determining the scope of the environmental review. The AES identifies the electrical problem and identifies and evaluates the best solutions for meeting the electrical need. The Macrocorridor Study identifies the study area encompassing the endpoints of a proposed transmission line and develops macrocorridor options for location of the transmission line. It provides information on environmental, social, and cultural factors for each of the macrocorridors options within the study area.

The Applicants have held preliminary discussions with a broad range of stakeholders including local, state, and federal agencies as well as the Leech Lake Band of Ojibwe and their Department of Resource Management. Feedback from these discussions has been incorporated into this document. This document provides information regarding the environmental, economic, social, and cultural resource impacts of four macrocorridor options identified for the Study Area, which includes the Northern Corridor; Central Corridor; Southern Corridor; and Non-Chippewa National Forest Corridor (Non-CNF corridor).

RUS is conducting the environmental review process in cooperation with other federal agencies and in partnership with the State of Minnesota. It has entered into a Memorandum of Understanding with the Minnesota Department of Commerce. A Route Permit Application for the Proposed Project was filed with the Minnesota Public Utilities Commission in accordance with the requirements of Minnesota Statutes §§ 116C.51 to 214E

and Minnesota Rules chapter 7849. Information from this study was used to support the Route Permit Application and state and federal environmental reviews.[1]

Findings of this report are summarized in Table 1-1. The following sections in this MCS provide a general environmental overview of four macrocorridors in which the route for the proposed transmission line between Bemidji and Grand Rapids could be located.

Table 1-1
Summary Characteristics of the North, Central, South, and Non-CNF Macrocorridor Options

Issue	North Macrocorridor	Central Macrocorridor	South Macrocorridor	Non-CNF Macrocorridor
Macrocorridor Length	116 miles	68 miles	100 miles	126 miles
Existing Linear Infrastructure	91.3 miles transmission lines 8.1 miles pipelines 0 miles railroad 15.0 miles roads	31.8 miles transmission lines 29.5 miles pipelines 5.3 miles railroad 2.6 miles roads	36.7 miles transmission lines 0 miles pipelines 0 miles railroad 52.3 miles roads	63.0 miles transmission lines 0 miles pipelines 0 miles railroad 38.8 miles roads
New Corridor Required (no existing linear infrastructure present)	1.6 miles	2.4 miles	11.5 miles	24.2 miles
Reduction in Metric Tons of CO_2 Emissions/Year	58,000	70,000	60,000	56,000
Anticipated Impact Area (New ROW)	1,672 ac	998 ac	1,470 ac	1,822 ac
Stream/River Crossings	21 Public Water crossings 26 waters of the US	12 Public Water crossings 12 waters if the US	11 Public Water crossings 15 waters if the US	27 Public Water crossings 31 waters if the US
Wetlands	420 ac	278 ac	182 ac	507 ac
Forested Lands	823 ac	545 ac	923 ac	1119 ac
Agricultural Lands	416 ac	133 ac	279 ac	260 ac
Chippewa National Forest - federally owned property	353 ac	318 ac	411 ac	0 ac

[1] *In the Matter of the Application for a Route Permit for the Bemidji-Grand Rapids 230 kV Transmission Project*, MPUC Docket No. E-017, E015, ET-6 TL-07-1327, Application for a Route Permit (June 4, 2008).

Issue	North Macrocorridor	Central Macrocorridor	South Macrocorridor	Non-CNF Macrocorridor
State Forest – state owned property	154 ac	51 ac	180 ac	250 ac
Leech Lake Reservation - tribal-owned property	0 ac	0 ac	0 ac	0 ac
Leech Lake Reservation	3 ac	677 ac	330 ac	0 ac
Federal Listed Species (Known)	0	0	0	0
CNF Species of Concern	16 species	25 species	19 species	NA
State Listed Species (Known)	13 species	18 species	19 species	15 Species
State Identified Natural Communities	1 avian community	1 avian community 9 plant communities	1 avian community 5 plant communities	1 avian community 3 plant communities
LLBO Species	14	24	22	NA
Historic Resources	5 Archeological 7 Historic	9 Archeological 16 Historic	8 Archeological 5 Historic	Data not available
Ethnic Groups[1]	77 to 96% white 2 to 19% American Indian	77 to 96% white 2 to 19% American Indian	77 to 96% white 2 to 19% American Indian	77 to 96% white 2 to 19% American Indian
Individuals Below Poverty Level[2]	10 to 16%	10 to 16%	10 to 16%	10 to 16%

Potential impacts listed in the above table were estimated based on a 125-foot wide ROW. Generally, the ROW may range from 112 feet to 125 feet, depending on features within the macrocorridor. The identified potential impacts reflect a "worst case" estimate based on the best available information. These estimates were developed using the methodology outlined in sections 3.1 and 3.2. Potential impacts will be evaluated in more detail and refined during the environmental review process.

In general, the environmental analysis conducted in this MCS concludes that based on coverage (percent), anticipated ROW width, and macrocorridor length (116 miles for the North Macrocorridor; 68 miles for the Central Macrocorridor; 100 miles for the South Macrocorridor and 126 miles for the Non-CNF Macrocorridor):

- The North Macrocorridor would require the least amount of new corridor and have the highest impact to agricultural lands.

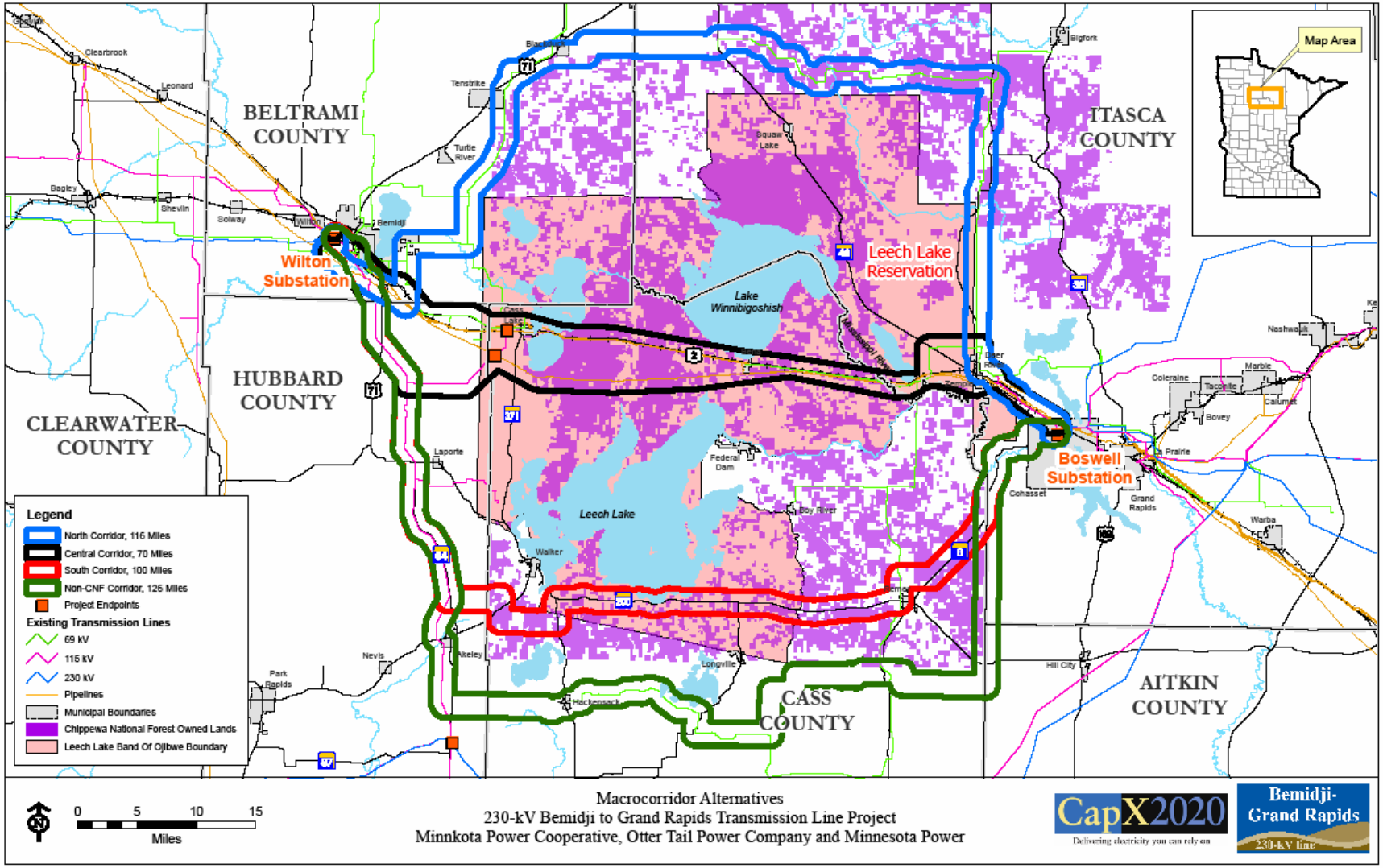
- The Central Macrocoridor has the shortest length, best CO_2 emissions reduction, lowest amount of new ROW, fewest Waters of the US crossings, lowest impact to forest lands, lowest impact to agricultural lands, and lowest impact to State Forest lands, while requiring the most impact to lands located within the Leech Lake Reservation, greatest potential impact to species of concern (CNF and State plant communities) and greatest potential impact to historic resources (archeological and historic)

- The South Macrocorridor would have the fewest Public Water crossings, lowest impact to wetlands and lowest potential impact to historic sites, while having the largest impact on lands owned by the Chippewa National Forest and state listed species.

- The Non-CNF Macrocorridor would having the least impact to lands owned by the CNF, land located within the Leech Lake Reservation, and state identified plant communities, while having the longest length, most new corridor that does not have existing infrastructure, lowest reduction in CO2 emissions, most new ROW, greatest number of Public Water and US Water crossings, most impact to wetlands, and largest impact to forest lands (including State Forest).

The Applicants will prepare a Route Permit Application for the Minnesota Public Utilities Commission focusing on identifying the appropriate route for the Proposal in the Central Macrocorridor. However, the Scoping process may identify other corridor options. A detailed environmental analysis will be conducted on all feasible options that evolve from the Scoping process.

Diagram 1
Macrocorridor Alternatives



2.0 Project Description

The Bemidji area (Figure 1) is served by three transmission lines and limited generation voltage. The area is susceptible to low voltage during winter peak-load conditions at times when the 230 kV transmission line to the area, the Winger-Wilton 230 kV line, is out of service. Voltage support additions in the Bemidji area have delayed, but not entirely eliminated, the need for a new high-voltage transmission line to the area. Electric power demand in the Bemidji area continues to grow. It will soon reach levels such that without the construction of another 230 kV line, the area will be susceptible to brown-outs (low-voltage condition) or black-outs if the Winger-Wilton 230 kV line is out of service. This situation is referred to as a local load serving inadequacy. With respect to the Bemidji area, the peak load by the winter of 2011/2012 is projected to be about 280 MW, which is 60 MW greater than the current system's maximum load-serving capability in 2011. The AES provides a detailed description of this problem and the need for this Project.

In addition, significant growth in customer electric demand throughout Minnesota and the surrounding region has occurred over the last decade or more. New generation sources will likely come on-line to meet this growth and substantial new transmission infrastructure is needed to support it and to maintain reliability of the transmission system. An alliance of cooperatives, municipals, and investor-owned utilities that serve Minnesota and the surrounding states have completed a long-range planning effort, known as CapX 2020, that identifies a comprehensive framework for new transmission infrastructure that will be needed to maintain reliability of the transmission system throughout the region. This analysis projected electric demand to grow in the region at about 1.5 to 3 percent per year, and identified the need for additional transmission into the Bemidji area in order to maintain regional transmission system reliability for 2012

The CapX planning studies identified the end points for the Proposal as (from west to east) the Wilton Substation, located west of Bemidji, and the Boswell Substation, located west of Grand Rapids, near Cohasset. The Study Area (Figure 2) is located in portions of Itasca, Cass, Hubbard and Beltrami Counties in north central Minnesota between the Proposal endpoints. The Study Area includes portions of the Leech Lake Reservation and Chippewa National Forest.

2.1 *Proposed Project*

To address both the Bemidji and Cass Lake area local load serving inadequacy and maintain regional transmission system reliability, the applicants propose to construct a new 230 kV transmission line from the jointly-owned Minnkota/Otter Tail Power Company Wilton 230 kV substation near Bemidji to the Minnesota Power 230 kV Boswell substation near Grand Rapids, Minnesota. The Proposal will also include improvements to the existing Wilton and Boswell substations.

This Proposed Project will provide increased voltage support not only to the Bemidji area, but also throughout the Red River Valley and north central Minnesota. The CapX 2020 planning effort identified the Bemidji-Grand Rapids line as one of four lines needed for regional transmission system reliability. Additional information on the Bemidji-Grand Rapids 230 kV line, as well as the other proposed CapX 2020 lines and the CapX 2020 Vision Plan can be found online at www.capx2020.com. At this time, the Applicants are finalizing their

analysis that identifies and describes the need for the Proposal. This document, the Certificate of Need, will be submitted to the Minnesota Public Utilities Commission for review and approval. Concurrently, the Applicants continue work to verify that the Bemidji to Grand Rapids line is indeed the best alternative to serve the long-term power supply requirements of the local area and region. Review and acceptance of the Applicants analyses by the RUS and MN PUC are required in order to move forward with the environmental review process.

The identification of macrocorridors between the Bemidji and Grand Rapids substation focused on the potential to use existing ROW as well as avoid major water bodies, the Leech Lake Reservation and the Chippewa National Forest. The tribally owned land in the macrocorridors considered includes rights-of-way for existing transmission lines, pipelines, roadways and rail roads. For the purposes of this analysis, the macrocorridors are referred to as the North, Central, South and Non-CNF Macrocorridors. See Section 3.1 for a more detailed description of the four macrocorridors (Figure 2).

The 116-mile North Macrocorridor runs to the north around the Leech Lake Reservation, following existing roads and transmission lines. About 21 percent of the macrocorridor is located in the Chippewa National Forest (CNF). The North Macrocorridor was also selected to avoid major lakes in the area.

The 68-mile Central Macrocorridor is the most direct connection between the two substations. This macrocorridor follows a combination of existing transmission line, pipeline, roadway, and railroad ROW. About 65 percent of the Central Macrocorridor is located within the Leech Lake Reservation, and approximately 25 percent is within the CNF.

The South Macrocorridor is approximately 100-miles in length and follows roadway and transmission line ROW. Eleven and one/half miles of this macrocorridor would run cross-country because there are no existing rights-of-way to parallel. The South Macrocorridor is located south of Leech Lake, with approximately 25 percent of the macrocorridor within the Leech Lake Reservation and 25 percent within the CNF.

The Non-CNF Macrocorridor is approximately 126-miles in length and is similar to the South Macrocorridor, only it would continue further south on TH 6, then head east paralleling TH 200, and go north to TH 6, avoiding the Chippewa National Forest. Preliminary details on this option have been assessed in Tables 1-1, 1-2, 5-4, 5-6, 5-7, 5-8, 5-9, and 6-3. This option was recently added to the analysis. Additional details on this corridor option will be developed during the Environmental Assessment process.

Certain upgrading of the Wilton Substation near Bemidji and the Boswell Substation near Grand Rapids will be required. The upgrades are discussed below.

The proposed improvements to the Boswell and Wilton Substations include:

- Wilton Substation – The Proposal will not require physical expansion of the existing Wilton 230 kV Substation because a second transformer has already been added for transmission system reliability. Two new 230 kV breakers and a line termination structure would be added as a result of the Project, however,

along with modifications to the existing 230 kV buses and relay panels. The Project will also require completion of the new ring bus section associated with the second transformer, as well as five new 230 kV switches with foundations, and steel structures and control panels.

- The Project requires the expansion of the Boswell 230 kV Substation by approximately 1.3 acres. This would be accomplished by extending the existing fence line approximately 120 feet to the east. No land procurement is required because the entire extension of the substation will be on Minnesota Power-owned property. In addition to modifications to the existing 230 kV buses and relay panels, a new 230 kV breaker and a half bay would be added to the substation. This would involve installing two new 230 kV circuit breakers and 230 kV dead-end structures, a new 230 kV bus, five new 230 kV switches, and associated foundations, steel structures, and control panels.

A further consideration is that there is expected to be a need for additional electric power support in the vicinity of Cass Lake in the near future. Cass Lake is located southeast of Bemidji in the Leech Lake Reservation. If the existing 115 kV line between Bemidji and the Nary Switch southeast of Bemidji experiences an outage, Cass Lake has only one electrical source remaining, which is from Badoura to the south. Studies show that any significant growth in the Cass Lake area will be difficult to serve from Badoura alone. Construction of a new 230Kv line between Bemidji and Grand Rapids provides an opportunity to make available low-impact options to reinforce electric service for Cass Lake when the need arises. This could involve segmenting the new line with a 230/115 kV substation located near Cass Lake, or adding a 115 kV circuit between Bemidji and Cass Lake as an underbuild on the Central Macrocorridor line. Either of these options can be accomplished with minimal impact on right-of-way requirements, and at relatively low expense. To comparably improve Cass Lake service if the Bemidji-Grand Rapids 230 kV line is located in the Southern or Northern Macrocorridors, it would be necessary to build a new 10- to 12-mile 115 kV line in new right-of-way to connect either macrocorridor to Cass Lake.

2.2 *General Land Cover*

The Study Area includes four counties in northern Minnesota that are comprised of forestland and a number of water bodies, including large lakes and numerous streams and creeks. Elevations in the Study Area range between 1,250 and 1,450 feet above sea level. It encompasses a number of cities and townships and spans the borders of an Indian reservation and a national forest.

The general land cover within the Study Area consists primarily of deciduous and coniferous forest, large portions of which are managed as state and national forest. Pockets of shrub land are scattered throughout the area. Concentrations of cropland occur in Beltrami County near Blackduck; in Hubbard and Beltrami Counties south of Bemidji; in Itasca County near Deer River and in Cass County near Remer. The Study Area also includes portions of several water features, including: the Mississippi River, the Big Fork River, Pike Bay, Cass Lake, Portage Lake, Lake Winnibigoshish, Ball Club Lake, Leech Lake, Kabekona Lake and Jesse Lake. Figures 9, 10, and 11 display land cover data for the Central, North and South Macrocorridors, respectively.

There are also various resources within the Leech Lake Reservation and CNF, which are important to the Leech Lake Band of Ojibwe's cultural heritage and traditional ways of life.

2.3 *Political Jurisdictions*

The Study Area spans a number of political jurisdictions, including counties, townships, cities, the Leech Lake Reservation, Chippewa National Forest and state forest lands (Figure 1).

2.3.1 Counties

The Study Area includes portions of four northern Minnesota counties: Beltrami, Cass, Hubbard, and Itasca (Figure 1).

2.3.2 Cities

North Macrocorridor

There are five cities in the North Macrocorridor. From west to east, they are Bemidji (Pop. 13,291 and the seat of Beltrami County); Tenstrike (Pop. 207); Blackduck (Pop. 756); Deer River (Pop. 934); and Cohasset (Pop. 2,533).(U.S. Census Bureau, 2006 Population Estimates) (Figure 1).

Central Macrocorridor

There are six cities in the Central Macrocorridor. From west to east, they are Bemidji (Pop. 13,291 and the seat of Beltrami County); Cass Lake (Pop. 832); Bena (Pop. 104); Deer River (Pop. 934); Zemple (Pop. 76); and Cohasset (Pop. 2,533). (U.S. Census Bureau, 2006 Population Estimates) (Figure 1).

South Macrocorridor

There are five cities in or in close proximity to the South Macrocorridor. From west to east, they are Bemidji (Pop. 13,291 and the seat of Beltrami County); Akeley (Pop. 417); Walker (Pop. 1,126); Remer (Pop. 368); and Cohasset (Pop. 2,533). (U.S. Census Bureau, 2006 Population Estimates) (Figure 1).

Non Chippewa National Forest Macrocorridor

There are four cities in or in close proximity to the Non Chippewa National Forest macrocorridor. From west to east, they are Bemidji (Pop. 13,291 and the seat of Beltrami County); Akeley (Pop. 417); Hackensack (Pop. 285); and Cohasset (Pop. 2,533). (U.S. Census Bureau, 2006 Population Estimates) (Figure 1).

2.3.3 Townships

The Study Area encompasses a number of townships in four counties.

North Macrocorridor

The North Macrocorridor includes Bemidji, Frohn, Turtle River, Sugar Bush, Port Hope, Taylor, Hines, Summit, Moose Park, Alvwood, Kinghurst, Wirt, Liberty, Lake Jessie, Stokes, Marcell, Bowstring, Oteneagen, Morse, and Deer River townships.

Central Macrocorridor

Within the Central Macrocorridor are the townships of Bemidji, Helga, Guthrie, Hart Lake, Grant Valley, Frohn, Wilkerson, Farden, Morse, Otter Tail Peninsula (NW), Otter Tail Peninsula (NE), Pike Bay, and Deer River.

South Macrocorridor

The townships in the South Macrocorridor are Bemidji, Helga, Guthrie, Hart Lake, Hendrickson, Lakeport, Thorpe, Steamboat River, Akeley, Shingobee, Turtle Lake, Pine Lake, Kego, Inguadona, Remer, Slater, Lima, and Torrey.

Non Chippewa National Forest Macrocorridor

The townships in the Non Chippewa National Forest Macrocorridor are Grant Valley, Bemidji, Helga, Farden, Hart Lake, White Oak, Hiram and Birch Lake.

2.3.4 Sovereign Native American Nations

Much of the Central and approximately one-quarter of the South Macrocorridor cross the reservation of the Leech Lake Band of Ojibwe (Pop. 10,205; US Census Bureau 2000). This reservation is located in portions of Beltrami, Cass, Hubbard and Itasca Counties. None of the North or Non Chippewa National Forest Macrocorridor is located within the Leech Lake Reservation. The proposal is not expected to have direct impacts to tribal-owned property. Figure 2 displays the location of this reservation in relation to the North, Central, South, and Non Chippewa National Forest Macrocorridors.

2.3.5 National and State Forests

Lands managed by the U.S. Forest Service (USFS) and the Minnesota Department of Natural Resources (DNR) are present within the Study Area (Figures 1 & 2). All three macrocorridors would cross portions of the 667,000-acre Chippewa National Forest. None of the Non Chippewa National Forest Macrocorridor is located within the Chippewa National Forest. State forests identified within the macrocorridors include the Bowstring, Big Fork, Remer, Buena Vista, Paul Bunyan, Badoura, Land O' Lakes, Foothills and Hill River State Forests. Please refer to Section 4.1.7.1 for more detailed information on public lands.

2.3.6 Other Jurisdictions

Another government body with jurisdiction over the Study Area is the Mississippi Headwaters Board (MHB), which was created in 1981. Comprised of eight northern counties (including the four in the Study Area), the MHB is authorized by the state legislature to prepare, adopt, and implement a comprehensive land use plan designed to protect and enhance the headwaters of the Mississippi River and related shore land areas (MHB Comp Plan, 2002).

The Study Area includes a number of unorganized townships, as follows:

North Macrocorridor

The North Macrocorridor passes through Unorganized T56-R26 in Itasca County.

Central Macrocorridor

The Central Macrocorridor passes through Unorganized T56-R26 and Ball Club in Itasca County and spans Unorganized T144N-R25W, Unorganized T144N-R26W, Unorganized T144N-R27W, Unorganized T144N-R28W, Unorganized T145N-R26W, Unorganized T145N-R27W, Unorganized T145N-R28W, Unorganized T145N-R29W, and Unorganized T145N-R30W in Cass County.

South Macrocorridor

The South Macrocorridor passes through Unorganized T56-R26 in Itasca County and through East Cass in Cass County.

Non Chippewa National Forest Macrocorridor

The Non Chippewa National Forest Macrocorridor passes through the unorganized townships of T55-R27, T54-R27 and T53-R27 in Itasca County. In Cass County it crosses the unorganized townships of T140-R25, T140-R26, T140-R27, T140-R28, T139-R28, T140-R29 and in Hubbard County it passes through T144-R33, T143-R33, T142-R33, T142-R32, T141-R32.

The scoping process will define the scope of the environmental review for the proposed project. The scope may include a number of feasible options, including those of this report and others identified by interested parties as part of the scoping process.

3.0 Macrocorridor Development

3.1 Development of the Macrocorridor

The macrocorridors were developed based on an analysis of available land use/land cover data, existing infrastructure, and environmental constraints (Figure 2). The initial focus of the macrocorridor analysis was on the central portion of the study area. After consultation with various agencies, stakeholders and the Leech Lake Band of Ojibwe (LLBO), the Applicants agreed to consider three additional macrocorridors that would avoid the Chippewa National Forest and Leech Lake Reservation.

The Central Macrocorridor is approximately 68 miles long and from two to eight miles wide. It runs parallel with US Highway 2 between Bemidji and Grand Rapids. It follows existing infrastructure ROW (Minnesota Power and Ottertail 115 kV transmission lines, Great River Energy 69 kV transmission lines, US Highway 2, Burlington Northern Santa Fe (BNSF) rail line, Enbridge Pipeline, and TransCanada (formerly doing business as Great Lakes Gas Transmission Company) directly connecting the two end points of Bemidji and Grand Rapids. This macrocorridor is the shortest distance between the Wilton Substation west of Bemidji and Boswell Substation northeast of Grand Rapids.

The North Macrocorridor (approximately 116 miles long and two miles wide) generally follows existing pipeline, transmission lines and county roads to the west, north and east of the Leech Lake Reservation to connect the Wilton and Boswell Substations. From Wilton, the North Macrocorridor alternative follows a pipeline macrocorridor to the southeast, and then travels north along an existing 69 kV line east of Bemidji. The macrocorridor continues to follow the 69 kV line north until just south of Blackduck, then turns east and follows an existing county road for approximately 15 miles. At this point the macrocorridor continues east and then south along an existing 69 kV line to just east of Deer River. The macrocorridor then follows an existing 115 kV line southeast to the Boswell Substation.

The South Macrocorridor (approximately 100 miles long and two miles wide) generally follows existing pipeline, transmission lines, state/county roads to the south of the Leech Lake Reservation to connect the Wilton and Boswell Substations. However, a portion of the South Macrocorridor alternative still traverses the Leech Lake Reservation. From Wilton, the macrocorridor follows an existing 115 kV line east and south to a point southwest of Walker. The macrocorridor then turns east to Hwy 371, then north to Hwy 200 and continues east to the city of Remer. At this point, the macrocorridor turns northeast and follows Trunk Highway (TH) 6 to the Boswell Substation.

The Non Chippewa National Forest Macrocorridor (approximately 126 miles long and two miles wide) is similar to the South Macrocorridor from the Wilton Substation following an existing 115 kV line right-of-way south of Akeley, avoiding the CNF and LLR. It then turns east and follows a number of county roads towards Hackensack. East of Hackensack, the corridor jogs around a number of lakes until connecting with County Road 48, and continues east to until TH 6. At this point the Non-Chippewa National Forest Macrocorridor turns northeast and follows TH 6 to the Boswell Substation.

The initial review of environmental conditions in the Central Macrocorridor also indicates that locating the Bemidji to Grand Rapids line in that macrocorridor would likely have the least environmental impacts. The Scoping process will define the Scope of the environmental review for the proposed Project. The Scope may include a number of feasible options, including those of this report and others identified by interested parties as part of the Scoping process.

3.2 Methodology for Estimating Impacts

The four macrocorridors constitute wide paths, from two to eight miles wide, between the two endpoints. Within each macrocorridor, there are opportunities for construction of a transmission line parallel to existing infrastructure such as transmission lines, pipelines, and roads. While the macrocorridors are miles wide, the final route needed for construction of the transmission line will be a maximum of 125 feet wide.

In order to better evaluate potential impacts within each macrocorridor, representative routes were identified using GIS analysis of existing linear infrastructure. These representative routes are not intended to be final, but to serve as a tool to compare potential impacts in each macrocorridor. Since the Central Macrocorridor has several potential routes, the estimated impact represents an averaging of the centerline options.

While the typical ROW width required for a 230 kV transmission line is 125 feet, the required route width may be slightly reduced if right-of-way sharing is feasible. The following table presents the best case scenario for potential right-of-way requirements.

Table 3-1
Typical ROW widths for various types of macrocorridors.

ROW Type	Width (ft)	Acres/ Mile
New Alignment	125.0	15.15
Existing Pipeline	125.0	15.15
Existing GRE 69 kV	117.5	14.20
Existing MP 115 kV	112.5	13.60
Existing OTP/MPC 115 kV	112.5	13.60
Existing Roads	125.0	15.15
Existing Railroads	125.0	15.15

Potential impacts within a macrocorridor were calculated by using the above right-of-way widths multiplied by the estimated length of the macrocorridor crossing. For example, if 5,000 feet of the macrocorridor crosses a forested area, and the macrocorridor ROW is 125 feet, then the estimated impact would be 5,000 feet by 125 or 625,000 square feet (14.35 acres). This calculation provides a preliminary estimate of potential impacts. Detailed and refined estimates will be provided during the environmental review process.

4.0 Macrocorridor Resources

The following information is intended to summarize the resources within the North, Central and South Macrocorridors and, in certain cases, to estimate potential impacts. The macrocorridors discussed in this section represent possible impacts only, since final routes and right-of-way requirements have not been determined. Appendices A, B and C include additional information for the North, Central, and South Macrocorridors.

The Non-CNF Macrocorridor was not included in the following analysis as it was developed after this analysis was completed. As required, full evaluation of the macrocorridors identified through scoping will be included in the environmental impact statement completed for the project.

4.1 *Natural Environment*

4.1.1 Physical Setting

4.1.1.1 Topography

The topography in all macrocorridors is associated with the most recent period of glaciation, which occurred approximately 15,000 years ago. Moraines, kames, eskers, and depressional wetlands/lakes are examples of topographic glacial features.

North Macrocorridor

The 116-mile long North Macrocorridor generally follows existing transmission lines and roads. It is situated along the Laurentian divide with a majority of segments in the Headwaters of the Mississippi Watershed and the Big Fork River Watershed (Rainy River). A small portion of the North Macrocorridor crosses into the Upper/Lower Red Lake Watershed (Red River of the North). The Mississippi River flows to the south of the North Macrocorridor for most of its length. This macrocorridor would cross the Mississippi River upstream from Lake Irving near Bemidji and at the Southeast end of Stump Lake (Figures 4 and 6).

Central Macrocorridor

The approximately 68-mile long Central Macrocorridor is situated just north of the Itasca moraine complex, which was formed about 15,000 years ago, when the Wadena Lobe glacier stopped its southward advance. High relief and sharp irregular features characterize the moraine. Sediments within the moraine are highly varied and laterally discontinuous. In contrast, the Central Macrocorridor is characterized by low relief, where undulating plains are marked by gently sloping swells, sags and depressions (Carney and Mooers, 1998). Sediments in the Central Macrocorridor are dominated by sandy loam tills.

The area has many streams, marshes, and lakes, which is typical of terrain subjected to geologically recent glacial occupation. The Central Macrocorridor runs between Leech Lake to the south and Cass Lake and Lake Winnibigoshish to the north and is largely devoid of topographic features. One exception is boulder hill, southwest of Bena, which consists of an approximately 45-foot tall kame. The Mississippi River flows through the macrocorridor southwest of Bemidji before generally paralleling the macrocorridor to the north, running

through Cass Lake and Lake Winnibigoshish and crossing the macrocorridor again just west of the community of Ball Club (Figures 3 and 6).

South Macrocorridor

The 100-mile long South Macrocorridor generally follows TH 6 south, TH 200 east and an existing 115 kV line north for much of its length. It is largely situated within the Leech Lake River Watershed (Mississippi River), which is devoid of major topographic features. The Mississippi River flows to the North of this macrocorridor for most of its length. This macrocorridor would cross the river as it parallels State Highway 6 southwest of Grand Rapids and again just upstream of Lake Irving Southwest of Bemidji (Figures 4 and 7). Geology

The Study Area is located within the Pre-Cambrian granite-greenstone belt of northern Minnesota that formed 2.5 to 2.9 billion years ago. The dominant bedrock type is of granitic composition, occupying 67 percent of the area. The remainder of the area bedrock is composed of roughly equal amounts of basalt and monzonite, with minor greywacke sandstone. These remaining lithologies occupy a band that runs from the northeastern corner of the area to the southwest (Morey and Meints, 2000). Within this band are several small faults that run generally parallel to it or define its edges. Despite this, there is only a minor seismic hazard in Minnesota as a whole (United States Geological Survey Earthquake Hazards Program Seismic Hazard Map, 2007).

Approximately 100 to 200 feet of glacially derived sediments overlie the bedrock within the area (Olsen and Mossler, 1982). Slightly over half of the total area is covered with glacial outwash, sands and gravels deposited during glacial melting. About 40 percent of the area is covered with ground moraine, sandy loam till deposited at the base of a glacier that may contain discontinuous layers of sand. There are also a couple small (<5 percent total) areas of peat deposits (Hobbs and Goebel, 1982).

4.1.1.2 Soils

North Macrocorridor

The North Macrocorridor has thirteen different soil associations, based on the United States Department of Agriculture (USDA) State Soil Geographic Database (STATSGO) groupings, one of which is water, which occupies 0.4 percent of the total area and has been omitted from the following table. The remaining twelve associations are listed in Table 4-1.

Table 4-1
Soil Associations (North Macrocorridor)

Map Unit Name	Crop Yield (Bushels/ac)	Woodland Erosion Potential	Percent of Total (%)
Andrusia-Graycalm-Marquette (Mn027)	Irish Potatoes (160)	Slight	2.9
Cutaway-Sandwick-Greenwood (Mn279)	Corn Silage (9)	Slight	2.3
Greenwood-Rifle-Cathro (Mn473)	Oats (85)	Slight	13.4
Indus-Taylor-Dalbo (Mn277)	Oats (35)	Slight	8.2
Menahga-Graycalm-Mooselake (Mn026)	Corn Silage (6)	Slight	17.7
Nebish-Shooker-Beltrami (Mn045)	Corn (80)	Slight	28.4
Rosy-Spooner-Baudette (Mn280)	Oats (85)	Slight	1.9
Sol-Nary-Stuntz (Mn055)	Spring Wheat (25)	Slight	2.8
Suomi-Effie-Mooselake (Mn007)	Oats (70)	Slight	3.0
Suomi-Effie-Wildwood (Mn281)	Oats (70)	Slight	3.7
Warba-Stuntz-Talmoon (Mn261)	Corn Silage (13)	Slight	13.7
Zimmerman-Cowhorn-Mooselake (Mn272)	Corn (50)	Slight	1.6

Central Macrocorridor

The Central Macrocorridor has fifteen different soil associations, based on the United States Department of Agriculture (USDA) State Soil Geographic Database (STATSGO) groupings, one of which is water, which occupies 18.4 percent of the total area and has been omitted from the following table. The remaining fourteen associations are listed in Table 4-2.

Table 4-2
Soil Associations (Central Macrocorridor)

Map Unit Name	Crop Yield (Bushels/ac)	Woodland Erosion Potential	Percent of Total (%)
Andrusia-Graycalm-Marquette (MN027)	Irish Potatoes (160)	Slight	2.1
Cathro-Seelyeville-Markey (MN065)	Canarygrass Hay (2.9)	Slight	0.7
Cutaway-Sandwick-Greenwood (MN279)	Corn Silage (9)	Slight	0.2
Greenwood-Rifle-Cathro (MN473)	Oats (85)	Slight	6.6
Indus-Taylor-Dalbo (MN277)	Oats (35)	Slight	2.3
Menahga-Graycalm-Mooselake (MN026)	Corn Silage (6)	Slight	26.4
Nebish-Shooker-Beltrami (MN045)	Corn (80)	Slight	7.4

Map Unit Name	Crop Yield (Bushels/ac)	Woodland Erosion Potential	Percent of Total (%)
Rifle-Tacoosh-Seelyeville (MN066)	Reed Canarygrass (6)	Slight	7.9
Rosy-Spooner-Baudette (MN280)	Oats (85)	Slight	0.9
Sol-Nary-Stuntz (MN055)	Spring Wheat (25)	Slight	1.3
Spooner-Stuntz-Baudette (MN029)	Spring Wheat (25)	Slight	1.9
Warba-Cutaway-Stuntz (MN015)	Corn Silage (13)	Slight	7.9
Warba-Stuntz-Talmoon (MN261)	Corn Silage (13)	Slight	1.7
Zimmerman-Cowhorn-Mooselake (MN272)	Corn (50)	Slight	14.4

South Macrocorridor

The South Macrocorridor has fifteen different soil associations, based on the United States Department of Agriculture (USDA) State Soil Geographic Database (STATSGO) groupings, one of which is water, which occupies 1.8 percent of the total area and has been omitted from the following table. The remaining fourteen associations are listed in Table 4-3.

Table 4-3
Soil Associations (South Macrocorridor)

Map Unit Name	Crop Yield (Bushels/ac)	Woodland Erosion Potential	Percent of Total (%)
Andrusia-Graycalm-Marquette (Mn027)	Irish Potatoes (160)	Slight	1.1
Cutaway-Sandwick-Greenwood (Mn279)	Corn Silage (9)	Slight	1.9
Greenwood-Rifle-Cathro (Mn473)	Oats (85)	Slight	0.9
Indus-Taylor-Dalbo (Mn277)	Oats (35)	Slight	0.2
Itasca-Goodland-Talmoon (Mn264)	Oats (70)	Slight	1.2
Itasca-Goodland-Warba (Mn030)	Oats (75)	Slight	10.8
Menahga-Graycalm-Mooselake (Mn026)	Corn Silage (6)	Slight	8.3
Nebish-Shooker-Beltrami (Mn045)	Corn (80)	Slight	15.9
Rifle-Tacoosh-Seelyeville (Mn066)	Reed Canarygrass (6)	Slight	2.4
Snellman-Talmoon-Sugarbush (Mn056)	Corn (80)	Slight	10.5
Spooner-Stuntz-Baudette (Mn029)	Oats (45)	Slight	1.5
Warba-Cutaway-Stuntz (Mn015)	Corn Silage (13)	Slight	35.8
Warba-Stuntz-Talmoon (Mn261)	Corn Silage (13)	Slight	3.8
Zimmerman-Cowhorn-Mooselake (Mn272)	Corn (50)	Slight	3.9

4.1.1.3 Groundwater

The evaluation of groundwater is a typical requirement of the macrocorridor analysis. There are two broad categories of aquifer underlying the Study Area: bedrock and surficial.

North Macrocorridor

A total of 442 water wells were identified within the area, utilizing data provided by the Minnesota Department of Health online County Well Index website (http://mdh-agua.health.state.mn.us/cwi/cwiViewer.htm). None of these wells were reported to have been completed in the Pre-Cambrian bedrock aquifer. Approximately 80 percent of the North Macrocorridor intersects material labeled as "non-aquifer", with groundwater yields described as less than 1 gallon per minute (gpm). These sediments correspond with the ground moraine and peat deposits described in the geology section. Wells in this material are typically screened across small, isolated sand lenses. This route intersects some areas of water-bearing glacial outwash sediments that coarsen to the west. Water yields range from 5 to 25 gpm in the sand west and northwest of Grand Rapids to 100 to 500 gpm in a sand and gravel unit southwest of Bemidji with an intermediate yield of 25 to 100 gpm in between the two (Kanivetsky, 1979).

Central Macrocorridor

A total of 498 water wells were identified within the area, utilizing data provided by the Minnesota Department of Health online County Well Index website (http://mdh-agua.health.state.mn.us/cwi/cwiViewer.htm). None of these wells were reported to have been completed in the Pre-Cambrian bedrock aquifer. Approximately 42 percent of the Central Macrocorridor is composed of material labeled as "non-aquifer," with groundwater yields described as less than 1 gallon per minute (gpm). These sediments correspond with the ground moraine and peat deposits described in Section 0. Wells in this material are typically screened across small, isolated sand lenses. The remaining area contains water-bearing glacial outwash sediments that coarsen to the west. Water yields range from 5 to 25 gpm in the sand west of Grand Rapids to 100 to 500 gpm in a sand and gravel unit southwest of Bemidji (Kanivetsky, 1979).

South Macrocorridor

A total of 445 water wells were identified within the area, utilizing data provided by the Minnesota Department of Health online County Well Index website (http://mdh-agua.health.state.mn.us/cwi/cwiViewer.htm). None of these wells were reported to have been completed in the Pre-Cambrian bedrock aquifer. Approximately 82 percent of the South Macrocorridor intersects material labeled as "non-aquifer", with groundwater yields described as less than 1 gallon per minute (gpm). These sediments correspond with the ground moraine and peat deposits described in the geology section. Wells in this material are typically screened across small, isolated sand lenses. This route intersects some areas of water-bearing glacial outwash sediments that coarsen to the west. Water yields range from 5 to 25 gpm in the sand west and northwest of Grand Rapids to 100 to 500 gpm in a sand and gravel unit southwest of Bemidji with an intermediate yield of 25 to 100 gpm in between the two (Kanivetsky, 1979).

Groundwater Summary

For this project, there are no impacts expected to groundwater resources.

4.1.2 Floodplains

Floodplains are low-lying areas that are subject to periodic inundation due to heavy rains or snow melt. Floodplain areas are generally adjacent to lakes, rivers, and streams. In their natural state, floodplains provide necessary temporary water storage during flooding events. The periodic flooding and drying in these areas creates a unique habitat that supports a wide variety of plant and animal species.

The National Flood Insurance Program (NFIP) identifies two primary components to a floodplain: the floodway and the flood fringe. The floodway is generally defined as the stream channel and over bank area necessary to convey a 100-year flood event (a level of flooding that has a 1 percent chance of being exceeded in any given year) without causing an increase of 1 foot in the flood elevation. No development is allowed in the floodway.

The flood fringe is the area within the 100-year floodplain, but outside of the floodway. Development is allowed within the flood fringe, but may be subject to review and approval by permitting authorities.

When available, Q3 flood data, which is derived from the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), were used to identify areas in the Study Area that fall within the 100-year floodplain. FEMA Q3 data, however, has not been fully developed for much of northern Minnesota, including areas within much of the Study Area. Thus, the absence of a floodplain from the Q3 flood data does not exclude the possibility of the presence of a 100-year floodplain along bodies of water without Q3 information.

North Macrocorridor

FEMA Q3 data has not been developed for the entire North Macrocorridor. Identified Q3 floodplains include:

- The Mississippi River at the eastern end of the Proposal (Jay Gould Lake area)
- White Oak Lake near the town of Deer River

Other floodplain areas are likely present within the North Macrocorridor, but have not been included in the Q3 GIS dataset. These areas include the Mississippi River and its tributaries, the Big Fork River and it tributaries, the areas surrounding Bow String Lake, Little Jesse Lake and Rice Lake.

Central Macrocorridor

FEMA Q3 data has not been developed for the entire Central Macrocorridor. Identified Q3 floodplains include:

- The Mississippi River at the eastern end of the Proposal (Jay Gould Lake area)
- White Oak Lake near the town of Deer River

Other floodplain areas are likely present within the Central Macrocorridor, but have not been included in the Q3 GIS dataset. These areas include the Mississippi River and its

tributaries, Ball Club Lake, Lake Winnibigoshish, Cass Lake, and other lakes in the Central Macrocorridor.

South Macrocorridor

FEMA Q3 data has not been developed for the entire South Macrocorridor. Identified Q3 floodplains include:

- The Mississippi River at the eastern end of the Proposal (Jay Gould Lake area)

Other floodplain areas are likely present within the South Macrocorridor, but have not been included in the Q3 GIS dataset. These areas include the Mississippi River and its tributaries, the Boy River and it tributaries and the areas surrounding Jack Lake.

Floodplain Summary

All three macrocorridors will require floodplain crossings, including crossings of the Mississippi River. To the extent practicable, the proposal will span floodplain areas to minimize potential impacts.

4.1.3 Surface Water

4.1.3.1 Streams & Rivers

North Macrocorridor

The Mississippi River flows through the western section of the North Macrocorridor, just to the southwest of the City of Bemidji, downstream from Lake Bemidji (Figure 2). The Mississippi River continues east through a series of lakes south of the North Macrocorridor, such as Cass Lake and Lake Winnibigoshish. The Mississippi also flows just southwest of the North Macrocorridor in Deer River and is located to the south of Boswell Substation, which is the eastern extent of the North Macrocorridor. Figure 7 shows surface waters in and near the North Macrocorridor.

The Big Fork River begins east of the North Macrocorridor as it parallels the eastern border of the Leech Lake Reservation. It flows west, across the macrocorridor towards Bow String Lake. The Big Fork continues northwest from Bow String Lake flowing through Sand and Rice Lakes, before crossing the North Macrocorridor again from the south. The Turtle River flows across the North Macrocorridor northeast of Bemidji in the Vicinity of Turtle Lake.

A review of the MNDNR public water inventory indicated that the proposed transmission line in the North Macrocorridor would likely involve crossing public waters approximately 21 times. A review of the USGS topographic maps indicates that the macrocorridor would likely cross 26 perennial streams; these streams would likely be classified as waters of the United States.

Central Macrocorridor

Numerous streams and rivers flow within and adjacent to the Central Macrocorridor. Most prominently, the Mississippi River flows through the northwest section of the Central Macrocorridor, just to the southwest of the City of Bemidji. The Mississippi River continues

through a series of lakes north of the Central Macrocorridor, then bends south and crosses the Central Macrocorridor west of the City of Deer River. Figure 6 shows surface waters in and near the Central Macrocorridor.

The southern portions of the macrocorridor cross the Bungashing Creek/Necktie River watershed, southwest of Cass Lake; these are Public Waters Inventory (PWI) streams. The Necktie River originates approximately 4.5 miles southeast of Bemidji and flows southeast towards Leech Lake. Bungashing Creek originates outside the Central Macrocorridor, northwest of Laporte and flows east/northeast towards the Necktie River.

The Schoolcraft River enters the macrocorridor approximately 2 miles south of Bemidji, flowing north, before its confluence with the Mississippi approximately 1 mile south of Bemidji. Smaller streams in and adjacent to the macrocorridor include, Portage Creek, Sucker Creek, Bear Brook and Fox Creek.

A review of the MNDNR public waters inventory indicated that the proposed transmission line in the Central Macrocorridor would likely involve crossing public waters approximately eight to 12 times. A review of the USGS topographic maps indicates that the macrocorridor would likely cross 12 perennial streams; these streams would likely be classified as waters of the United States.

South Macrocorridor

The Mississippi River flows through the northwest section of the South Macrocorridor, just to the southwest of the City of Bemidji (Figure 8). The river then flows north of the macrocorridor for most of its length, traveling through Lake Bemidji and Lake Winnibigoshish, before crossing the macrocorridor again along its eastern extent, near Highway 6, southwest of Grand Rapids.

The Kabekona River flows southeast across the South Macrocorridor approximately 2.5 miles west of Laporte and 16 miles south of Bemidji.

The South Macrocorridor crosses the Shingobee River approximately 4.5 miles northeast of Akeley. This river generally flows parallel to the South Macrocorridor as it travels between Highways 371 and 34.

The Boy River flows northward across the South Macrocorridor as it travels from Inguadona Lake to Boy Lake, approximately 9.5 miles west of Remer.

A review of the MNDNR public waters inventory indicated that the proposed transmission line in the South Macrocorridor would likely involve crossing public waters approximately 10 times. A review of the USGS topographic maps indicates that the macrocorridor would likely cross 15 perennial streams; these streams would likely be classified as waters of the United States.

Streams and Rivers Summary

All three macrocorridors will cross public waters; 21 crossings in the North Macrocorridor, eight to 12 in the Central Macrocorridor and 10 in the South Macrocorridor. To the extent practicable, the proposal will span public water crossings to minimize potential impacts.

4.1.3.2 Lakes

The following sections provide a general summary of the lakes within and near each macrocorridor. More detailed evaluation of and potential impacts will be determined during the scoping and environmental review process.

North Macrocorridor

Significant lakes within or adjacent to the North Macrocorridor include Blackduck Lake, Turtle River Lake, Lake Bemidji, Stump Lake, Carr Lake, Marquette Lake, Blackwater Lake, and Jesse Lake (Figure 7). Lake Bemidji is located just north of the northwest portion of the North Macrocorridor. Numerous smaller lakes are concentrated along the northeast and southwest sections of this macrocorridor. Lakes along the northeast section of the macrocorridor include (but not limited to) Rice Lakes (two Rice Lakes located in this vicinity), Little Turtle Lake, Little Too Much Lake, Big Too Much Lake, Hetch Lake, Big Rose Lake, Little Rose Lake, Fisher Lake, Elm Lake, Crooked Lake, Arrowhead Lake, Gunderson Lake Rock Lake, Whitefish Lake, Lake Helen and Squaw Lake. Lakes along the southwest portion of this macrocorridor include (but not limited to), Erickson Lake, Dutchman Lake, Carter Lake, Long Lake (not mentioned above), Gull Lake, and Meadow Lake. Most of these lakes are interconnected by a series of streams, rivers or wetland complexes flowing within the North Macrocorridor.

Central Macrocorridor

Significant lakes within or adjacent to the Central Macrocorridor include Cass Lake, Pike Bay, Leech Lake, Lake Winnibigoshish, and Ball Club Lake (Figure 6). Lake Bemidji is located just north of the northwest portion of the Central Macrocorridor. A chain of smaller lakes, including Lake Irving, Lake Marquette, Grace Lake, Midge Lake, Wolf Lake, Sucker Lake, Portage Lake, Sixmile Lake, and White Oak Lake, are also located within or adjacent to the Central Macrocorridor. Most of these lakes are interconnected by a series of streams and rivers flowing through the Central Macrocorridor.

South Macrocorridor

Significant lakes within or adjacent to the South Macrocorridor include Blackwater Lake, Long Lake, Leech Lake and Kabekona Lake (Figure 8). Lake Bemidji is located just north of the northwest portion of the South Macrocorridor. Numerous smaller lakes are concentrated along the eastern and northeast sections of this macrocorridor. Lakes along the northeast section of the macrocorridor include (but not limited to) Godbolt Lake, Portage Lake, Jack Lake, Conklin Lake, Rat Lake, Horseshoe Lake, Three Island Lake, Town Line Lake, Football Lake, Mabel Lake, Odidikosei Lake, Twin Lakes, Big Sand Lake, No-ta-she-bun Lake and Snells Lake. Several of these lakes are interconnected by a series of streams, rivers or wetland complexes but several appear to be isolated.

Lakes Summary

All three project macrocorridors include numerous lakes. To the extent practicable, the final proposal will avoid choosing a route that crosses lakes.

4.1.4 Wetlands

Wetlands are identified as shallow water systems that provide unique functions and values to the surrounding landscape, such as water quality protection, wildlife habitat, and flood

storage. Wetlands are protected under Sections 401 and 404 of the Clean Water Act and by Minnesota Rules Chapter 6115 (Public Waters Work Permit Program) and Chapter 8420 (Wetland Conservation Act). A number of agencies have permitting authority over activities that impact wetlands, including (but not limited to) the Army Corps of Engineers, DNR, Minnesota Pollution Control Agency and local government units.

Since National Wetland Inventory maps of this area are known to be less accurate than those for other parts of the state, an analysis of hydric soils (an indicator of potential wetland areas) was conducted to identify potential wetland areas missed by the National Wetlands Inventory (NWI) survey. Hydric soils identified by the Beltrami, Hubbard, Cass and Itasca county Soils Survey Geographic (SSURGO) database were used to determine the acres of hydric soils outside NWI areas in each macrocorridor. The results of this analysis are included in each macrocorridor's respective wetland resources table.

North Macrocorridor

Over one-third of the land surface in the North Macrocorridor is identified as lakes or wetlands (Figure 7). The largest wetland type, by proportion, is forested wetland. One forested wetland complex that is a part of the Bowstring State Forest, north of Highway 46 and southeast of Bowstring Lake, is especially prominent. This wetland area has over 8000 acres within the North Macrocorridor. The North Macrocorridor travels across this wetland complex from south to north, for approximately 8 miles.

Lakes and shrub swamps are also very prevalent. Construction activities that may impact wetlands must show evidence of avoidance, minimization, and for unavoidable impacts, replacement.

Areas with hydric soils not identified as NWI wetlands in this macrocorridor are distributed along its length, with concentrations to the east of Blackduck, as well as in the vicinity of Deer River.

Table 4-4 provides a summary of the wetland resources and hydric soils identified within the North Macrocorridor.

Table 4-4
Wetland Resources identified within the North Macrocorridor

Water Resource Type	Description	Area w/in Macrocorridor (AC)	Portion of Total Wetland Area (%)	Portion of Total Macrocorridor Area (%)	Estimated Acreage Impacts[1]
Lacustrine	Deep water wetland or lake	5,788	10.7	3.9	5.0
PAB	Aquatic Bed	1	0.0	0.0	0
PEM	Marsh with emergent vegetation	6,928	12.8	4.7	77.0
PFO	Forested wetland	26,175	48.3	17.8	210.0
PSS	Shrub swamp	13,698	25.2	9.3	118.7
PUB	Shallow open water	1,367	2.5	0.9	7.7
River	River	283	0.5	0.2	1.6
Total		**54,240***	**100.00**	**36.8**	**420.0**

Water Resource Type	Description	Area w/in Macrocorridor (AC)	Portion of Total Wetland Area (%)	Portion of Total Macrocorridor Area (%)	Estimated Acreage Impacts[1]
All Hydric Soils		56,939	100.00	38.6	559.4
Hydric Soils Within NWIs		39,417	69.2	26.7	335.0
Hydic Soils Outside NWIs		**17,522**	**30.8**	**11.88**	**224.4**

Source: National Wetland Inventory mapping, SSURGO Soils Data
**Note: The North Macrocorridor is 2 miles wide and 116 miles long.*
[1] Impact estimate based on ROW width as presented in Table 3-1.

Central Macrocorridor

Nearly one-third of the land surface in the Central Macrocorridor is identified as lakes or wetlands (Figure 6). The largest wetland type, by proportion, is forested wetland. Lakes and shrub swamps are also very prevalent. Construction activities that may impact wetlands must show evidence of avoidance, minimization, and for unavoidable impacts, replacement.

Areas with hydric soils not identified as NWI wetlands in this macrocorridor are concentrated in the vicinity of Deer River, as well as to the south of Bemidji

Table 4-5 provides a summary of the wetland resources and hydric soils identified within the Central Macrocorridor.

Table 4-5
Wetland Resources identified within the Central Macrocorridor

Water Resource Type	Description	Area w/in Macrocorridor (AC)	Portion of Total Resource Area (%)	Portion of Total Macrocorridor Area (%)	Estimated Acreage Impacts[1]
Lacustrine	Deep water wetland or lake	12,769	23.3	7.3	0.1
PEM	Marsh with emergent vegetation	9,008	16.5	5.1	94.5
PFO	Forested wetland	18,683	34.2	10.7	82.9
PSS	Shrub swamp	12,362	22.7	7.1	97.0
PUB	Shallow open water	1,621	3	0.9	2.3
River	River	154	0.3	0.1	1.1
Total NWI Area		**54,596**	**100.0**	**31.2**	**277.9**
All Hydric Soils		47,932	100	27.4	360.0
Hydric Soils Within NWIs		34,007	71	19.4	221.1
Hydic Soils Outside NWIs		**13,925**	**29.0**	**8**	**138.9**

Source: National Wetland Inventory mapping, SSURGO Soils Data.
**Note: The Central Macrocorridor ranges from 2 – 8 miles wide and 68 miles long.*
[1] Impact estimate based on ROW width as presented in Table 3-1.

South Macrocorridor

Nearly one quarter of the land surface in the South Macrocorridor is identified as lakes or wetlands (Figure 8). The largest wetland type, by proportion, is forested wetland. In general, most wetland areas are concentrated within the eastern half of the South Macrocorridor. Lakes and shrub swamps are also very prevalent. Construction activities

that may impact wetlands must show evidence of avoidance, minimization, and for unavoidable impacts, replacement.

Areas with hydric soils not identified as NWI wetlands in this macrocorridor are widely dispersed, but become more concentrated in the eastern portions of this macrocorridor.

Table 4-6 provides a summary of the wetland resources and hydric soils identified within the South Macrocorridor.

Table 4-6
Wetland Resources identified within the South Macrocorridor

Water Resource Type	Description	Area w/in Macrocorridor (AC)	Portion of Total Resource Area (%)	Portion of Total Macrocorridor Area (%)	Estimated Acreage Impacts[1]
Lacustrine	Deep water wetland or lake	7606.7	24.2	5.9	9.2
PAB	Aquatic Bed	29.6	0.1	0.0	9.3
PEM	Marsh with emergent vegetation	5863.6	18.7	5.0	60.9
PFO	Forested wetland	8838.2	28.1	6.9	36.7
PSS	Shrub swamp	7181.3	22.9	5.6	61.3
PUB	Shallow open water	1646.3	5.2	1.3	12.6
River	River	265.9	0.9	0.2	1.1
Total NWI Area		**31,431.6**	**100.0**	**24.9**	**181.8**
All Hydric Soils		24,494	100.0	19.0	193.6
Hydric Soils Within NWIs		16,716	68.2	13.0	103.3
Hydic Soils Outside NWIs		**7,778**	**31.8**	**6.0**	**90.3**

Source: National Wetland Inventory mapping.
**Note: The South Macrocorridor is 2 miles wide and 100 miles long.*
[1] Impact estimate based on ROW width as presented in Table 3-1.

Wetland Summary

Based on an evaluation of the wetland coverage (in percent), proposed right-of-way width, and right-of-way length, the North Macrocorridor is estimated to result in the largest impact to wetlands, followed by the Central Macrocorridor and South Macrocorridor, respectively.

4.1.5 Land Cover

Cover types were determined using USGS Gap Analysis Program (GAP) data available from the DNR. This data has been developed by the DNR in cooperation with the USGS to identify species and communities not adequately represented through existing conservation. Essentially, this data provides information about the type and extent of land/vegetative cover.

4.1.5.1 Developed Lands

Residential, commercial, and industrial land covers are present near urban areas within the North, Central, and South Macrocorridor Study Area. Generally, transmission line siting is most compatible with existing linear infrastructure, as opposed to cutting a new macrocorridor through undeveloped natural areas. However, existing linear macrocorridors

do not necessarily represent an opportunity for ROW sharing as each type of infrastructure has particular requirements for clearance, maintenance and safety.

North Macrocorridor

In the North Macrocorridor, residential, commercial, and industrial land covers are present near urban areas. The majority of developed lands within the North Macrocorridor are concentrated near the Cities of Bemidji, Deer River and Cohasset (Figure 10). Overall, 1.66 percent of the macrocorridor is identified as developed.

Central Macrocorridor

In the Central Macrocorridor, the majority of developed lands are concentrated near the Cities of Bemidji, Cass Lake, and Deer River (Figure 9). Overall, 2.19 percent of the macrocorridor is identified as developed.

South Macrocorridor

In the South Macrocorridor, the majority of developed lands within the South Macrocorridor are concentrated near the Cities of Bemidji, Walker, Remer, Akeley, and Cohasset (Figure 11). Overall, 1.41 percent of the macrocorridor is identified as developed.

Developed Lands Summary

Generally, the macrocorridors include minimal developed lands, ranging from 1.4 to 2.2 percent of the macrocorridor. Most of the developed areas are located in all three macrocorridors, i.e. developed areas near Bemidji and Cohasset.

4.1.5.2 Agriculture

Agricultural lands were identified using aerial photography and USGS GAP data available from the DNR.

North Macrocorridor

Agricultural land cover within the North Macrocorridor is concentrated primarily in its western half and especially between the City of Bemidji and the Mississippi River Crossing at Stump Lake. Agricultural uses also include pasture, row crops, and small grain. Overall, 16.9 percent of the macrocorridor is identified as cropland. Using GAP data, preliminary estimates suggest that approximately 415.9 acres of cropland and 13.2 acres of grasslands/pasture will be impacted by a route in this macrocorridor.

Central Macrocorridor

In the Central Macrocorridor, it is concentrated primarily between the Cities of Bemidji and Cass Lake, and near the City of Deer River. Agricultural uses include pasture, row crops, and small grain. Overall, 15.5 percent of the macrocorridor is identified as cropland. Based on GAP data, preliminary estimates suggest that approximately 132.9 acres of cropland and 3.9 acres of grasslands/pasture will be impacted by a route in this macrocorridor.

South Macrocorridor

In the South Macrocorridor, it is concentrated primarily between the City of Bemidji and State Highway 200, and in the vicinity between Cohasset and Schoolcraft State Park.

Another small concentration of agricultural land use is centered just west of the City of Remer. Agricultural uses include pasture, row crops, and small grain. Figures 9, 10 and 11 detail land cover classifications. Overall, 11.5 percent of the macrocorridor is identified as cropland. Based on GAP data, preliminary estimates indicate that approximately 278.7 acres of cropland and 65.4 acres of grasslands/pasture will be impacted by a route in this macrocorridor.

Agriculture Summary

Based on an evaluation of the cropland coverage, anticipated ROW width, and macrocorridor length, the North Macrocorridor would result in the largest impact to agricultural lands, followed by the South Macrocorridor and Central Macrocorridor, respectively.

4.1.5.3 Forest Lands

Forest lands were identified using aerial photography and USGS GAP data available from the DNR. It should be noted that forest lands include all woodlands, not just those identified or contained within the CNF boundary.

North Macrocorridor

The eastern section of the North Macrocorridor (between Jesse Lake and the City of Deer River) is represented by a nearly contiguous tract of lowland conifers and tamaracks. Forest types within the North Macrocorridor include deciduous forest, coniferous forest, mixed forest, and woody wetlands. Overall, 68.5 percent of the macrocorridor is identified as forested land. Preliminary estimates using GAP data suggest that approximately 823.3 acres of woodlands will be impacted by a route in this macrocorridor.

Central Macrocorridor

Fragmented tracts of forested land are present within the eastern and western extents of the Central Macrocorridor. The central section of the Central Macrocorridor (between Ball Club Lake and the City of Cass Lake) is represented by a nearly contiguous tract of forested land. Forest types within these areas include deciduous forest, coniferous forest, mixed forest, and woody wetlands. Overall, 39.2 percent of the macrocorridor is identified as forested land. Preliminary estimates using GAP data indicate that approximately 544.7 acres of woodlands will be impacted by a route in this macrocorridor.

South Macrocorridor

In the South Macrocorridor, fragmented tracts of forested land are present along most of its extents. The least fragmented areas are concentrated near the Paul Bunyan State Forest (south of the City of Bemidji) and the Remer State Forest (northeast of the City of Remer). Forest types within these areas include deciduous forest, coniferous forest, mixed forest, and woody wetlands. Overall, 64.4 percent of the macrocorridor is identified as forested land. Preliminary estimates using GAP data indicate that approximately 922.5 acres of woodlands will be impacted by a route in this macrocorridor.

Forested Land Summary

Based on an evaluation of the forested land coverage, anticipated ROW width, and macrocorridor length, the South Macrocorridor would result in the largest impact to forested lands, followed closely by the North Macrocorridor. Forest land cover impacts would be substantially smaller for the Central Macrocorridor.

4.1.6 Sensitive Natural Resources

Sensitive Natural Resources include those plant and animal species that have populations considered at risk. The Federal and State agencies and Tribes have each identified species of concern.

Records provided by the DNR Natural Heritage Database and the US Forest Service were reviewed for designated sensitive species within the study macrocorridors (note: tribal data is also included in the Natural Heritage and Forest Service Data). Since areas within the study macrocorridors may have been surveyed to varying degrees of completeness, the designated species represented by this data best serves as a snapshot of the potential presence of sensitive species, and does not necessarily represent a comprehensive list of all sensitive species located within the macrocorridors. Hence, when comparing species records between the North, Central, and South Macrocorridors, it also important to consider similarity of habitats when interpreting the available data (Figure 13, Figure 12, and Figure 14).

Table 4-7
Designated Sensitive Natural Resources identified within all Macrocorridors

Macrocorridor	Type	Total Different Types Identified	Agency Sensitive Species			
			Federal	State	USFS	Tribe
North	Bird	8	-	4	6	5
	Insect	-	-	-	-	-
	Mammal	1	-	1	-	1
	Mollusk	2	-	2	2	2
	Plant	10	-	6	8	6
	Reptile	-	-	-	-	-
	Total	**21**	**0**	**13**	**16**	**14**
Central	Bird	9	-	2	7	6
	Insect	1	-	1	-	-
	Mammal	1	-	1	-	-
	Mollusk	2	-	2	2	2
	Plant	16	-	12	16	16
	Reptile	-	-	-	-	-
	Total	**29**	**0**	**18**	**25**	**24**
South	Bird	13	-	3	7	9
	Fish	1	-	1	-	-
	Insect	1	-	1	-	-
	Mammal	2	-	2	-	1
	Mollusk	2	-	2	2	2
	Plant	11	-	9	9	10
	Reptile	1	-	1	1	-
	Total	**31**	**0**	**19**	**19**	**22**

Federal = Federally listed; State = MN State listed;
USFS = United States Forest Service listed; Tribe= Leech Lake Band listed

According to the Minnesota DNR's *Field Guide to the Native Plant Communities of Minnesota*, the North, Central, and South Macrocorridor Study Area is located entirely within the Northern Minnesota Drift and Lake Plains Ecological Section (MDL) and partly within the Chippewa Plains, Pine Moraines and Outwash Plains, and St. Louis Moraines Subsections. Patterns of vegetation within the MDL reflect the glacial deposits that occur within this area. This includes widespread areas composed of sugar maple, basswood, paper birch, aspen, and northern red oak. Occasional coniferous species are also present (MN DNR, 2003). In light of the similarities of habitats within the Study Area, it is expected that species that are documented within any one Macrocorridor may also have the potential to occur in macrocorridors that may not yet have documentation of those species (Table 4-7).

It should be noted that the data available for the Central Macrocorridor is more extensive because it has been studied for numerous other utility projects. Data for the North and South Macrocorridors are more limited as these macrocorridors have not undergone similar

extensive surveying. Additionally, the MCBS animal surveys have not been completed for Itasca, Beltrami, or Hubbard counties (MN DNR, 2006).

4.1.6.1 Federally-listed Threatened and Endangered Species

The Endangered Species Act (ESA) of 1973, as amended (Pub. L. 93-205), provides for the conservation of ecosystems upon which threatened and endangered species of fish, wildlife, and plants depend. Section 7 of the ESA requires Federal agencies to insure that any action authorized, funded, or carried out by them is not likely to jeopardize the continued existence of listed species or modify their critical habitat.

Verified, probable or unverified sightings of Canada lynx (*Lynx canadensis*) have occurred in all four project counties where the three macrocorridors are located, although specific sighting locations are unavailable. Cass and Itasca Counties have the most sightings but there is a lack of evidence to determine if these animals are currently present in these areas. The wide home ranges of this species further obscure whether members of this species regularly inhabit areas of this macrocorridor. The records suggest that Canada lynx potentially use the area surrounding the South Macrocorridor, at least on a sporadic basis.

North Macrocorridor

The Gray Wolf (*Canis lupus*) and the Bald Eagle (*Haliaeetus leucocephalus*) have been documented within the North Macrocorridor. The Gray Wolf has recently been delisted from the ESA within the macrocorridors. The Bald Eagle has also been recently delisted from the ESA. However, the Bald Eagle is still protected by other Federal Laws including: the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the Lacey Act. Figure 13 shows sensitive species records for areas in and surrounding the North Macrocorridor.

Central Macrocorridor

The Bald Eagle (*Haliaeetus leucocephalus*) has been documented within the Central Macrocorridor. The Bald Eagle has been recently delisted from the ESA. However, the Bald Eagle is still protected by other Federal Laws including: the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the Lacey Act. Figure 12 shows sensitive species records for areas in and surrounding the Central Macrocorridor.

South Macrocorridor

The Gray Wolf (*Canis lupus*) and the Bald Eagle (*Haliaeetus leucocephalus*) have been documented within the South Macrocorridor. The Gray Wolf has recently been delisted from the ESA within the macrocorridors. The Bald Eagle has also been recently delisted from the ESA. However, the Bald Eagle is still protected by other Federal Laws including: the Bald and Golden Eagle Protection Act, the Migratory Bird Treaty Act, and the Lacey Act. Figure 14 shows sensitive species records for areas in and surrounding the South Macrocorridor.

4.1.6.2 USFS Sensitive Species

USFS Sensitive Species include species that are candidates for Federal-listing, species delisted under the ESA in the last five years (with global, trinomial or national ranks of one to three), or are considered sensitive based on National Forest and Grassland Risk Evaluations.

Central Macrocorridor

The Central Macrocorridor includes eight sensitive bird species, two mollusk species, and fourteen plant species. There are also two plant species on the Watch List (See Appendix A).

North Macrocorridor

The North Macrocorridor includes six sensitive bird species, two mollusk species, and eight plant species (Appendix A).

South Macrocorridor

The South Macrocorridor includes seven sensitive bird species, two mollusk species, nine plant species, and one reptile species (Appendix A).

4.1.6.3 Tribal Sensitive Species

Tribal Sensitive Species include those species that have significance based on local customs, local gathering/harvest and ceremonial use. Please refer to Appendix A for a list of species the tribe considers sensitive.

4.1.6.4 State-listed Species and Rare Natural Features

Minnesota's endangered species law (Minn. Stat. § 84.0895) and associated rules govern the taking (including killing, capturing, collecting and/or possessing) of endangered or threatened species. Species identified as special concern are not legally protected. The DNR is responsible for overseeing the regulations and permitting for development projects.

North Macrocorridor

The North Macrocorridor includes three plants listed as Threatened, and two birds listed as Threatened. Special Concern listings include three plants, two birds, one mammal, and two mollusks.

There is also one animal community, a colonial Waterbird nesting area that has been recorded within the North Macrocorridor.

Central Macrocorridor

The Central Macrocorridor includes one plant listed as Endangered, three plants listed as Threatened, and one mammal listed as Threatened. Special Concern listings include eight plants, two birds, two mussels, and one insect.

There are also nine plant communities and one animal community that have been recorded within the Central Macrocorridor (Table 4-8).

Table 4-8
Plant and animal communities in the Central Macrocorridor

Type	Community
Bird	Colonial Waterbird Nesting Area
Plant	Alder - (Maple - Loosestrife) Swamp Type
Plant	Black Spruce Bog, Semi-Treed Subtype
Plant	Native Plant Community, Undetermined Class
Plant	Northern Poor Fen Class
Plant	Red Pine - White Pine Woodland, Mountain Maple Subtype
Plant	Rich Tamarack - (Alder) Swamp Type
Plant	Stream composite (Holocene)
Plant	Tamarack Swamp (Southern) Type
Plant	White Cedar Swamp (North central) Type

South Macrocorridor

The South Macrocorridor includes one plant listed as Endangered, two plants listed as Threatened, one bird listed as Threatened, one mammal listed as Threatened, and one reptile listed as Threatened. Special Concern listings include six plants, two birds, one fish, one insect, one mammal, and two mollusks.

There are also five plant communities and one animal community that have been recorded with the South Macrocorridor (Table 4-9).

Table 4-9
Plant and animal communities in the South Macrocorridor

Type	Community
Bird	Colonial Waterbird Nesting Site
Plant	Lowland White Cedar Forest (Northern)
Plant	Native Plant Community, Undetermined Class
Plant	Northern Poor Fen
Plant	Tamarack Swamp (Southern)
Plant	White Cedar Swamp (North central)

Sensitive Natural Features Summary

The North and South Macrocorridors appear to have lower concentrations of sensitive species than the Central Macrocorridor, but this may be a result of the Central Macrocorridor being a larger study area. The Central Macrocorridor (175,136 ac) represents the largest area, even though it is 32 miles shorter than the South Macrocorridor (128,876 ac) and 46 miles shorter than the North Macrocorridor (147,477 ac). The larger area is due to the fact that the central macrocorridor is intended to represent several route alternatives, where the North and South Macrocorridor have a more limited scope. Additionally, the Central Macrocorridor has been more intensely surveyed due to previous development in the macrocorridor. The quality and type of habitats are similar in all three macrocorridors, lending further support to the conclusion that the distribution of natural features within the macrocorridors is more even than MN DNR records would suggest.

4.1.7 Avoidance Areas

Avoidance Areas include those locations where transmission line development would be prohibited or restricted because of federal, state or local regulations or undesirable because of conflicts with existing land use or land features. The study addressed the following avoidance areas as outlined below.

4.1.7.1 Public Lands

This section describes federal- and state-owned resource lands within and in the vicinity of each macrocorridor. Section 4.1.7.3 discusses potential impacts to these resources in more detail.

North Macrocorridor

There are 666,612 acres in the CNF, of which approximately 31,594 acres are in the North Macrocorridor. The acreage of state forest land within the North Macrocorridor totals 20,909. The most significant block of state-owned forest land within the North Macrocorridor is in the Bowstring State Forest and totals 8,794 acres. One state wildlife management area (WMA), the Bemidji Slough WMA, is also located within the North Macrocorridor. Approximately 353 acres of Chippewa National Forest property and 154 acres of state forest land could be impacted depending on where the route for the Bemidji to Grand Rapids line is located in the macrocorridor.

Central Macrocorridor

Approximately 45,000 acres of CNF-managed land is in the Central Macrocorridor. The Central Macrocorridor also contains portions of the Bowstring State Forest, concentrated in the eastern sections of the macrocorridor with other state forest lands scattered throughout. Minnesota forest land within the macrocorridor totals 21,211 acres. Two state WMAs are within the Central Macrocorridor, Wolf Lake WMA and Bemidji Slough WMA, as well as approximately 291 acres of the Hole-In-Bog SNA. Approximately 318 acres of Chippewa National Forest property and 51 acres of state forest land could be impacted if the project was located in this macrocorridor.

South Macrocorridor

The CNF manages approximately 31,213 acres in the South Macrocorridor. Approximately 17,827 acres of the South Macrocorridor are state forest land. The most significant block of state forest land is the Paul Bunyan State Forest, which totals approximately 10,987 acres. Four WMAs are at least partially located within the South Macrocorridor. They are the Willow Lake Deer Yard WMA, Ah-gwah-ching WMA, Kabekona WMA, and Bemidji Slough WMA (Figure 20). Approximately 411 acres of Chippewa National Forest property and 180 acres of state forest land could be impacted if this macrocorridor was used for the proposed line.

Public Lands Summary

There are state and federal lands in all of the macrocorridors, such as CNF, state forests, lakes, and wildlife management areas. Based on an evaluation of the resources present, anticipated ROW width, and macrocorridor length, construction of the proposal in the South Macrocorridor could have the largest impact on public forest lands, followed by the

North Macrocorridor and lastly the Central Macrocorridor. It does not appear there would be impacts to other public lands (WMAs, SNAs etc).

4.1.7.2 Wilderness Areas

Federal Wilderness Areas are defined and identified in accord with the Wilderness Act of 1964 (Pub.L. 88-577). State-designated Wilderness Areas are defined and identified in accordance with Minnesota Rules Chapter 6140.

There are no Federal- or State-designated Wilderness Areas within the Study Area.

4.1.7.3 Parks and Natural Areas

Parks include all lands designated as State or National Parks. Natural Areas are identified in accordance with Minnesota Rules Chapter 6136, and are called Scientific and Natural Areas (SNA). There are no State or National Parks located within the macrocorridors.

Per Minn. Rule 4400.3350, subpart 2, no high voltage transmission line may be routed through State SNAs unless it would not materially damage the purpose for which the area was designated and no feasible and prudent alternative exists.

Figures 18-20 provide an illustration of the parks, trails and natural areas within the Study Area.

North Macrocorridor

There are no Minnesota SNAs within the North Macrocorridor. The closest SNA is Lost 40 SNA, located in Section 34, Township 150N, Range 27W (about 9 miles north of Squaw Lake) and five miles from the North Macrocorridor center line. Lost 40 SNA contains a stand of old-growth pine forest (Figure 19).

There are recreation areas, such as campgrounds, public water access points, snowmobile trails, and hiking trails, not specifically associated with State Parks, present within the North Macrocorridor.

Table 4-10
Publicly owned lands identified within the North Macrocorridor.

Feature Name	Responsible Agency	Total Size (acres)	General Public Use	Location
Bemidji Slough WMA (part of Bemidji State Game Refuge)	DNR	49	Wildlife Observation	CSAH 46 and SH 71
Big Fork State Forest	DNR	1,367	Outdoor Recreation	Multiple tracts w/in Study Area
Blackduck State Forest	DNR	2,720	Outdoor Recreation	Multiple tracts w/in Study Area
Bowstring State Forest	DNR	8,794	Outdoor Recreation	Multiple tracts w/in Study Area
Buena Vista State Forest	DNR	708	Outdoor Recreation	Multiple tracts w/in Study Area
Mississippi Headwaters State Forest	DNR	41	Outdoor Recreation	West of Bemidji
Chippewa National Forest	US Forest Service	31,594	Outdoor Recreation	Cass Lake to Deer River
Total Area		45,273		

Central Macrocorridor

Hole-in-Bog Peatland SNA is located on the southern edge of the Central Macrocorridor, between Leech Lake and Six Mile Lake at Township 144N, Range 28W, and Sections 3-5. Public access to this SNA is provided from County Highway 8. According to the DNR, this SNA is the state's best example of a basin-filled raised bog. Plants and animals inhabiting the area are characteristic of a relatively undisturbed patterned peatland. The SNA is 1,622 acres; with 1,482 acres are owned by the State of Minnesota. The proposal would not directly impact this SNA.

There are also recreation areas present within the Central Macrocorridor. These resources are most notable in the vicinity of Pike Bay. U.S. Highway 46 and County Road 10/39 are designated by the USFS as Minnesota State Scenic Byways (Figure 18).

Table 4-11
Publicly owned natural areas identified within the Central Corridor

Feature Name	Responsible Agency	Total Size (acres)	General Public Use	Location
Bemidji Slough WMA (part of Bemidji State Game Refuge)	DNR	49	Wildlife Observation	CSAH 46 and SH 71
Wolf Lake WMA	DNR	50	Hunting & Wildlife Observation	Township Road between US 2 and Wolf Lake
Hole-In-The-Bog Peatland SNA	DNR	291	Wildlife Observation	Between Leech Lake and Sixmile Lake
Bowstring State Forest	DNR	13,331	Outdoor Recreation	Multiple tracts w/in Study Area
Welsh Lake State Forest	DNR	158	Outdoor Recreation	Multiple tracts w/in Study Area
Chippewa National Forest	US Forest Service	44,972	Outdoor Recreation	Cass Lake to Deer River
Total Area		58,851		

South Macrocorridor

There are no Minnesota SNAs within the South Macrocorridor, but the Chisholm Point Island SNA is located five miles from the South Macrocorridor center line within Lake Pokegama (Southwest of the City of Grand Rapids). It is dominated by old-growth deciduous vegetation and is located in Section 24, Township 55N, and Range 26W. Schoolcraft State Park is located 1.5 miles to its west, near the eastern Mississippi River Crossing.

The South Macrocorridor also has recreation areas. In particular, the North Country Trail closely follows the east/west section of this macrocorridor; the trail is within the macrocorridor for nearly the entire section between MN State Highway 371 and 34 (Figure 20).

Table 4-112
Publicly owned lands identified within the South Macrocorridor.

Feature Name	Responsible Agency	Total Size (acres)	General Public Use	Location
Bemidji Slough WMA (part of Bemidji State Game Refuge)	DNR	49	Wildlife Observation	CSAH 46 and SH 71
KabeKona WMA	DNR	381	Hunting & Wildlife Observation	SH 64 2.5 Miles South of SH 200.
Ah-gwah-ching WMA	DNR	191	Hunting & Wildlife Observation	SH 200 2 miles east of Whipholt
Willow Lake Deer Yd WMA	DNR	0.4	Hunting & Wildlife Observation	USFS Road 2727
Paul Bunyan State Forest	DNR	10,987	Outdoor Recreation	Multiple Tracts within South Macrocorridor
Remer State Forest	DNR	1,119	Outdoor Recreation	5 Miles Northeast of Remer
Chippewa National Forest	US Forest Service	31,213	Outdoor Recreation	Cass Lake to Deer River
Total Area		43,940.4		

Parks and Natural Areas Summary

The total area of parks and publicly owned lands within the macrocorridors ranges from 44,940 acres in the South to 58,851 acres in the Central Macrocorridor. Potential impacts to the CNF owned property range from 318 acres for the Central Macrocorridor to 411 ac for the South Macrocorridor. Potential impacts to State Forest properties range from 51 acres for the Central Macrocorridor to 180 acres for the South Macrocorridor. An analysis of potential impacts will be included in the federal/state environmental review process.

4.1.7.4 Visual Resources

The value of a visual resource is dependent on the response of the viewer. A viewer's visual response to a landscape is based upon the relative sensitivity and the exposure of the viewer to a particular viewshed. High visibility areas that can be seen by a large number of viewers with a high concern for that scenery are often considered to be areas of higher scenic importance. The USFS chooses to define landscape visibility as being a "function of many interconnected considerations, including: context of viewers, duration of view, degree of discernible detail, seasonable variations, and number of viewers" (USFS Landscape Aesthetics Handbook, 2005).

USFS SIO Classification System

As part of the 2004 USFS CNF Revised Forest Plan, the USFS has mapped the planned visual management of forestry resources in CNF based upon three Scenic Integrity Objective (SIO) classifications: High, Moderate, and Low (Figures 21 to 23). Classifications within the CNF have been assigned according to the relative visual quality of USFS forest areas, typically as they relate to viewpoints from travel ways, recreations sites, and lakes with access. According to the USFS CNF Forest Plan, High and Moderate classified areas contain vegetation that: enhances views, creates vistas, and features natural openings; retains canopies over travel routes; encourages vegetative diversity and seasonal color contrast; and enhances big-tree appearance.

Vegetated areas in the CNF classified as having a High SIO typically occur within one-quarter mile from the location of viewing areas of relatively high importance, usually along major travel ways and lakeshore areas. Moderate SIO classifications are given to forested areas that display scenic value along secondary travel ways and recreational use areas. Low SIO classifications are given to less visible forest areas, and to clearings and open areas.

In section G-SC-9 of the CNF Forest Plan, the USFS offers their recommended guidance on the aesthetic treatment of overhead utilities in CNF areas. Specifically, the USFS prefers that, "in Moderate and High SIO areas in the CNF, the negative visible impacts of overhead utilities or electronic sites [should be minimized] if the utilities or electronic sites can be seen from travel ways, recreation sites, and bodies of water with access."

The CNF Forest Plan also offers guidelines on the creation of temporary forest openings according to the mapped SIO class. These CNF guidelines are summarized as follows:

- High SIO Areas - Temporary openings will be similar in size, shape, and edge characteristics to natural openings in the landscape being viewed. Or, temporary opening will mimic a natural disturbance.

- Moderate SIO Areas - Temporary openings may be more evident than in High SIO areas. Openings may be larger than those in the surrounding landscape, and after groundcover has become reestablished openings may have the appearance of a management activity.
- Low SIO Areas – Temporary openings may dominate the view.

Areas within the study macrocorridors that fall outside of the mapped CNF SIO model were evaluated in terms of scenic natural areas (which, for the purposes of this analysis are typically defined as non-urban landscapes that have not been highly modified or developed) that are visible from travel ways, recreation areas, and bodies of water with public access. High and Moderate scenic integrity values were generally applied to non-CNF natural areas located within one-quarter mile—the area typically considered by 1995 USFS Handbook to be the foreground in a flat landscape—of major travel ways, recreation areas, and bodies of water with access. Highly urban/developed areas and areas of low visibility were typically considered to be a Low SIO. SIO mapping trends for the CNF were considered when generalizing SIO values for non-CNF areas located beyond one-quarter mile of major viewing areas.

North Macrocorridor

About 52 percent of the North Macrocorridor has been mapped by CNF according to the SIO classification system (Table 4-12). Of this mapped area, the majority has been mapped as Moderate SIO (69 percent). The remaining relative percentages of the mapped areas are classified as 16 percent High SIO (primarily areas adjacent to US 71, MN 46, and the Bigfork River), and 15 percent Low SIO.

Table 4-12
North Macrocorridor CNF SIO Summary

SIO Classification	North Macrocorridor Mapped SIO (ac)	Relative Percentage of Mapped North Macrocorridor SIO	SIO Percentage of Entire North Macrocorridor
High	11,906	15.5%	8.1%
Moderate	53,401	69.3%	36.2%
Low	11,726	15.2%	8.0%
Total	77,033	100.0%	52.2%

In the remaining non-mapped SIO areas the majority of the Macrocorridor follows county roads. Natural areas within one-quarter mile of these roads are typically mapped as Moderate SIO within the CNF Forest Plan. Areas beyond one-quarter mile of CSAHs typically fall within the Moderate to Low category, depending on the areas visibility. Natural areas along segments of the North Macrocorridor within one-quarter mile of US 2 and MN 6 should be considered High SIO, as well as the two Mississippi River crossings near Bemidji.

Central Macrocorridor

About 44 percent of the Central Macrocorridor has been mapped by CNF according to the SIO classification system (Table 4-13). Of this area the majority has been mapped as Low SIO (49 percent), with the remaining landscape being classified as comparable areas of Moderate and High SIO (27 percent and 24 percent, respectively). The High SIO areas are concentrated along US 2, Pike Bay, Cass Lake, Lake Winnibigoshish, Leech Lake, Portage Lake, and the Mississippi River. Moderate mapped SIO classifications are scattered along natural resources throughout the mapped Central Macrocorridor.

Table 4-13
Central Macrocorridor CNF SIO Summary

SIO Classification	Central Macrocorridor Mapped SIO (ac)	Relative Percentage of Mapped Central Macrocorridor SIO	SIO Percentage of Entire Central Macrocorridor
High	18,231	24.0%	10.4%
Moderate	20,691	27.2%	11.8%
Low	37,197	48.9%	21.2%
Total	76,119	100.0%	43.5%

In the remaining non-mapped SIO areas, much of the Macrocorridor falls within semi- to highly-developed areas (including the cities of Bemidji, Cass Lake, and Deer River) that are crossed by several county roads. Depending on the quality of the remaining natural areas, and their degree of visibility, the majority of the non-mapped SIO areas generally fall within the Moderate and Low SIO classifications. High SIOs in non-mapped areas include areas within one-quarter mile of US 2, US 71, MN 371, MN 6, Grace Lake, Midge Lake, Lake Irving, Lake Marquette, and the Mississippi River.

South Macrocorridor

About 50 percent of the South Macrocorridor has been mapped by CNF according to the SIO classification system (Table 4-14). Of this area, the majority has been mapped as High and Moderate SIO (40 percent and 39 percent, respectively). The High SIO areas are concentrated along MN 200, MN 6, Leech Lake, and various small lakes and streams within the Macrocorridor. Mapped areas beyond one-quarter mile of MN 200 and MN 6 have typically been classified as Moderate SIO. The Low SIO areas within the mapped area (20 percent) are concentrated between Akeley and Walker, and near the city of Remer.

Table 4-14
South Macrocorridor CNF SIO Summary

SIO Classification	South Macrocorridor Mapped SIO (ac)	Relative Percentage of Mapped South Macrocorridor SIO	SIO Percentage of Entire South Macrocorridor
High	25,675	40.1%	19.9%
Moderate	25,098	39.2%	19.5%
Low	13,287	20.7%	10.3%
Total	64,060	100.0%	49.7%

In the remaining non-mapped SIO areas, much of the Macrocorridor traverses through natural areas that are visible from major viewing areas (primarily US 71, MN 64, and MN 6). These areas generally fall within the High and Moderate SIO classifications. The non-mapped macrocorridor between Laporte and Bemidji generally travels along road and transmission line macrocorridors in semi- to highly developed areas. With the exception of areas within one-quarter mile of Lake Irving, Lake Marquette, and the Mississippi River, this segment of the Macrocorridor falls within the Moderate and Low SIO classifications.

4.2 *Built Environment*

4.2.1 Avoidance Areas

The built environment, consisting of those macrocorridor features developed as a result of human activity, includes several resources that should be avoided to the extent practicable during the identification and development of transmission lines. In some cases, such as airports, there are specific regulations regarding the proximity of transmission lines.

4.2.1.1 Buildings/Setbacks

The location of buildings and their uses must be considered when siting a transmission line. Local, state, RUS, and National Electricity Safety Council (NESC) building setback requirements will be evaluated during the identification of potential routes and alternatives. In general, sensitive facilities such as residential areas, schools, hospitals, and community facilities will be avoided to the extent practicable.

North Macrocorridor

The highest concentration of buildings is associated with the cities and towns in the North Macrocorridor, including Bemidji, Tenstrike, Blackduck, Deer River, and Cohasset.

Central Macrocorridor

The highest concentration of buildings is associated with the cities and towns in the Central Macrocorridor, including Bemidji, Cass Lake, Bena, Deer River, Zemple, and Cohasset.

South Macrocorridor

The highest concentration of buildings is associated with the cities and towns in the South Macrocorridor, including Bemidji, Remer, and Cohasset, and the development between Walker and Akeley.

4.2.1.2 Airports

Federal Aviation Administration regulations govern the height of structures, including transmission lines and associated towers, within certain zones near the approaches to runways. The closer the structure is to the runway, the shorter the structure must be. These factors must be considered during the identification of transmission line routes.

North Macrocorridor

There are three publicly accessible airports and five privately accessible airports located within the North Macrocorridor or within 2 miles of the extent of the North Macrocorridor. Publicly accessible airports include: Bemidji Regional Airport (located approximately 1.5 miles north-northeast of the Wilton Substation), Moberg Airbase (located about 1 mile north of the Wilton Substation), and Bowstring Airport (located about 2 miles northwest of the City of Bowstring). Additionally, the Grand Rapids/Itasca County Airport-Gordon Newstrom Field is located approximately 7 miles east-southeast of the Boswell Substation.

Central Macrocorridor

There are two publicly accessible airports and three privately accessible airports located within the Central Macrocorridor or within 2 miles of the extent of the Central Macrocorridor. Publicly accessible airports include: Bemidji Regional Airport (located approximately 1.5 miles north-northeast of the Wilton Substation), and Moberg Airbase (located about 1 mile north of the Wilton Substation). Additionally, the Grand Rapids/Itasca County Airport-Gordon Newstrom Field is located approximately 7 miles east-southeast of the Boswell Substation.

South Macrocorridor

There are three publicly accessible airports and two privately accessible airports located within the South Macrocorridor or within 2 miles of the extent of the South Macrocorridor. Publicly accessible airports include: Bemidji Regional Airport (located approximately 1.5 miles north-northeast of the Wilton Substation), Moberg Airbase (located about 1 mile north of the Wilton Substation), and Remer Municipal Airport (located about 0.5 miles north of the city of Remer). Additionally, the Grand Rapids/Itasca County Airport-Gordon Newstrom Field is located approximately 7 miles east-southeast of the Boswell Substation.

Regardless of the chosen macrocorridor, the transmission line is required to be developed in compliance with Federal Aviation Administration Regulations. All three macrocorridors would be equally affected by existing airports.

4.2.1.3 Mining/Aggregate Resources

Transmission line routes generally avoid aggregate resources and mining areas. The construction of a transmission tower within an aggregate resource, potential quarry, or mining area can significantly reduce the development potential of such resources.

North Macrocorridor

This route intersects a peat deposit approximately 12 miles north-northwest of Grand Rapids (Hobbs and Goebel, 1982). This deposit covers approximately 8 miles of the route macrocorridor, but is not currently mined.

Central Macrocorridor

A review of county pit maps and the Aggregate Source Information interactive website at the Minnesota Department of Transportation identified several gravel pits in and near the Central Macrocorridor.

Economically valuable resources within the Study Area include iron ore, peat and sand and gravel deposits. Sand and gravel deposits are scattered throughout the area, though there are no active mining activities based on examination of aerial photographs.

South Macrocorridor

This route intersects the southern end of the Mesabi Iron Range approximately 8 miles southwest of Grand Rapids, where approximately 3 miles of iron formation exists within the route macrocorridor (Morey and Meints, 2000). However, no active mining exists at this time, nor has mining occurred in the past in this location.

These sites are summarized in Table 4-15.

Table 4-15
Gravel Resource Locations

County	Township	Range	Section	Status
Cass	144N	31W	8	Inactive (2 sites)
Cass	144N	31W	17	Active
Cass	144N	29W	2	Inactive (2 sites)
Cass	144N	29W	11	Active
Cass	144N	29W	29	Active
Cass	144N	25W	17	Active
Beltrami	146N	34W	13	Inactive
Beltrami	146N	34W	24	Active
Beltrami	146N	33W	20	Inactive
Beltrami	146N	33W	27	Active
Beltrami	146N	33W	29	Inactive
Hubbard	145N	33W	1	Active (2 sites)
Hubbard	145N	33W	7	Active (2 sites)
Hubbard	145N	33W	8	Active (2 sites) Inactive (1 site)
Hubbard	145N	33W	9	Active (3 sites)

County	Township	Range	Section	Status
				Inactive (1 site)
Hubbard	145N	33W	11	Active
Itasca	56N	26W	33	Active
Itasca	55N	26W	1	Active (2 sites)
Itasca	55N	26W	3	Active (2 sites)
Itasca	145N	25W	2	Inactive
Itasca	145N	25W	10	Inactive
Itasca	145N	25W	11	Active
Itasca	145N	25W	14	Inactive
Itasca	145N	25W	21	Active (2 sites) Inactive (1 site)

Source: MnDOT

Avoidance Area Summary

All three macrocorridors have varying amounts of built environment, including buildings, proximity to local airports and mining resources. The proposal will need to meet local state and federal regulations and will avoid features of the built environment to the extent practicable.

4.2.2 Linear Infrastructure Features

4.2.2.1 Existing Transmission Lines

North Macrocorridor

Several existing transmission lines are present within the North Macrocorridor (Figure 4). These include a 115 kV line operated by Otter Tail and Minnkota Power (Minnkota) that extends from the Wilton Substation, south to the Badoura Substation. Otter Tail and Minnkota also operate a 230 kV line that extends west from the Wilton Substation, outside the North Macrocorridor.

Great River Energy operates a 69 kV transmission line that enters the macrocorridor east of Deer River, travels north near TH 6, and then extends west to the Evenson Substation (located about 13 miles east of the city of Blackduck). A series of 69kV transmission lines operated by Minnkota are located within the macrocorridor from Blackduck southwest to Bemidji.

Central Macrocorridor

Several existing transmission lines are present within the Central Macrocorridor (Figure 3). These include a 115 kV line operated by Otter Tail and Minnkota that extends from the Wilton Substation, south to the Badoura Substation. Another 115 kV line, also operated by Otter Tail and Minnkota, extends from the City of Cass Lake south and west to the Wilton/Badoura line. Otter Tail and Minnkota also operate a 230 kV line that extends west

from the Wilton Substation, outside the Central Macrocorridor. In addition, Otter Tail operates a series of 69 kV lines between Cass Lake and Bemidji.

Great River Energy operates a 69 kV transmission line that extends from east from Bena, north and east around Deer River, then south to TH2. Minnesota Power operates a 115 kV line that extend from Deer River to the Boswell Substation, as well as three 230 kV lines and two 115 kV lines that run from the Boswell Substation east out of the Central Macrocorridor.

South Macrocorridor

Several existing transmission lines are present within the South Macrocorridor (Figure 5). These include a 115 kV line operated by Otter Tail and Minnkota that extends from the Wilton Substation, south to the Badoura Substation. Otter Tail and Minnkota also operate a 230 kV line that extends west from the Wilton Substation, outside the South Macrocorridor. Otter Tail operates a line that extends east and south from Cass Lake to the Wilton to Badoura 115 kV line that is cited above. Minnkota also operates a 115 kV line that taps off of the Wilton to Badoura 115 kV line just north of Kabekona Lake.

Minnesota Power operates a 115 kV line that extends from Deer River to the Boswell Substation, as well as three 230 kV lines and two 115 kV lines that run from the Boswell Substation east out of the South Macrocorridor.

A 69 kV line operated by Great River Energy also traverses the South Macrocorridor for a short distance near the city of Remer.

4.2.2.2 Pipelines

The pipelines described in this section include interstate pipelines only. Local distribution pipelines are beyond the scope of this document, and have not been identified. Generally, the proposed ROW for the transmission line would not overlap with the existing pipeline ROW due to the clearance and safety criteria for each utility. The applicants intend to work with pipeline owners to identify any ancillary facilities that may be required should the utilities be located on adjacent ROW. Collocation of utilities is, generally, beneficial in that it minimizes the need to:

- Develop new macrocorridors through natural areas
- Develop new macrocorridors through urban areas
- Provides opportunities to share access roads with existing macrocorridors.

North Macrocorridor

Seven pipelines extend through parts of the North Macrocorridor (Figure 4). Four are owned by Enbridge, and three pipelines within the TransCanada right-of-way. The pipelines follow the North Macrocorridor for approximately 8 miles along the southeast section of the macrocorridor, and for approximately 10 miles along the southwest section of the macrocorridor.

The pipelines enter the southeast section of the North Macrocorridor near Cohasset, travel northwest near the BNSF/TH 2 macrocorridor to Deer River, and exit the North Macrocorridor to the west of Deer River.

The pipelines also enter the southwest section of the North Macrocorridor at the Hubbard/Beltrami County line, about 6 miles south-southwest of Bemidji, and exit near the Wilton Substation.

Central Macrocorridor

Seven pipelines extend through the Central Macrocorridor (Figure 3). Four petroleum pipelines are owned by Enbridge, and three pipelines within the TransCanada right-of-way. Four of the Enbridge pipelines generally follow the BNSF rail macrocorridor and/or TH 2 Macrocorridor from Cohasset to Bemidji. The TransCanada pipelines generally follow the BNSF/TH 2 macrocorridor in the eastern and western portions of the Central Macrocorridor, but divert to a more southerly route within the Central Macrocorridor, approximately between the Cities of Bena and Cass Lake (Figure 2). The Central Macrocorridor includes approximately 29.5 miles of adjacent pipeline. In the near term, Enbridge is proposing to construct two additional pipelines in their corridor.

South Macrocorridor

Seven pipelines extend through parts of the South Macrocorridor for an approximately 6 mile stretch located near Bemidji (Figure 5). Four are owned by Enbridge, and three pipelines within the TransCanada right-of-way.

4.2.2.3 Surface Transportation

This section examines surface transportation infrastructure within each macrocorridor by identifying major roadways and railroads which may affect the configuration of the Proposal. It also identifies roadways classified as Scenic Byways. Although these byways receive no legal protection, their designation reflects the unique cultural, historic or environmental character of the surrounding landscape and grassroots support for maintaining and promoting these values. The applicants are consulting with the state and local roadway agencies to identify the potential issues and opportunities of co-location.

North Macrocorridor

Roadways

Minnesota Trunk Highways/US Highways and State or National Scenic Byways in the North Macrocorridor include (Figure 1):

- US 2 between Cohasset and Deer River and near Bemidji. These sections of Highway 2 have been designated as the Great River Road National Scenic Byway.
- US 71 south of Bemidji and between Tenstrike and Blackduck
- TH 46 northwest of Squaw Lake. This highway is known as the Avenue of the Pines and is designated as a National Scenic Byway.

- TH 6 enters the North Macrocorridor just west of Cohasset, joins US 2, and then extends north from Deer River
- TH 286 has a junction with TH 6 about 18 miles north of Deer River.
- TH 30 enters the macrocorridor from the south in Blackduck. This highway is known as the Ladyslipper Highway and is designated as a Minnesota Scenic Byway.

Future Transportation Plans

Preliminary discussions with transportation officials indicate that US 2 will be improved with turn lanes at various intersections between Bemidji and Grand Rapids over the next several years. Also MnDOT has plans to upgrade US 71 near Bemidji.

Several County State Aid Highways (CSAHs) provide connections between various state and US highways in the North Macrocorridor. Please refer to Figure 1 for the location of major roads within and adjacent to the North Macrocorridor.

Railways

The BNSF rail line follows the North Macrocorridor from Cohasset to Deer River, and crosses the macrocorridor south of Bemidji. Additional rail lines are present in the Bemidji area. Please refer to Figure 1 for rail lines.

Central Macrocorridor

Roadways

Minnesota Trunk Highways/ US Highways and State or National Scenic Byways in the Central Macrocorridor include (Figure 1):

- US 2 between Bemidji and Cohasset. This section of Highway 2 has been designated as the Great River Road National Scenic Byway.
- US 71 extending south from Bemidji
- TH 371 extending south from Cass Lake
- TH 6 enters the Central Macrocorridor just west of Cohasset, joins US 2, and then extends north from Deer River
- TH 46 extending northwest from Deer River. This highway is known as the Avenue of the Pines and is designated as a National Scenic Byway.
- TH 30/10 enters the macrocorridor from the north, to the east of Cass Lake. This highway is known as the Ladyslipper Byway and is designated as a Minnesota Scenic Byway.

Several CSAHs provide connections between various state and US highways in the Central Macrocorridor. Please refer to Figure 1 for the location of major roads within and adjacent to the Central Macrocorridor.

Future Transportation Plans

Preliminary discussions with transportation officials indicate that US 2 will be improved with turn lanes at various intersections between Bemidji and Grand Rapids over the next several years. Also, MnDOT has plans to upgrade US 71 near Bemidji.

Railways

One rail line, the BNSF, runs through the Central Macrocorridor, generally following the same alignment as US 2. Additional rail lines are present in the Bemidji area. Please refer to Figure 1 for rail lines.

South Macrocorridor

Roadways

Minnesota Trunk Highways/ US Highways and State or National Scenic Byways in the South Macrocorridor include (Figure 1):

- US 71 extending south from Bemidji
- US 2 extending east from Bemidji. This section of Highway 2 has been designated as the Great River Road National Scenic Byway.
- TH 6 from Remer northeast to TH 2 west of Cohasset
- TH 200 between Remer and Walker, and near Laporte
- TH 84 junction with TH 200 north of Longville
- TH 371 junction with TH 200 about 4 mile southeast of Walker
- TH 34 intersects the Macrocorridor about 5 miles southwest of Walker. This part of Highway 34 is designated as the Lake Country Minnesota Scenic Byway.
- TH 64 between Akeley and Laporte

Future Transportation Plans

Preliminary discussions with transportation officials indicate that US 2 will be improved with turn lanes at various intersections between Bemidji and Grand Rapids over the next several years. Also MnDOT has plans to upgrade US 71 near Bemidji.

Several CSAHs provide connections between various state and US highways in the South Macrocorridor. Please refer to Figure 1 for the location of major roads within and adjacent to the South Macrocorridor.

Railways

The BNSF rail line follows the South Macrocorridor for a short distance near the near Bemidji. Please refer to Figure 1 for rail lines.

4.2.2.4 Linear Infrastructure Summary

All three macrocorridors would be co-located next to existing linear infrastructure, to the extent practicable. The Applicants will coordinate with the facility owners to determine

safety and maintenance requirements as well as compatibility of the proposed transmission line with these facilities

4.2.3 Cultural/Historic Resources

The Applicants are currently working with the Army Corps of Engineers, Tribal Historic Preservation Office, Chippewa National Forest and Leech Lake Band of Ojibwe to identify potential cultural and historic resources within the macrocorridors. The Applicants will coordinate closely with the Band and pertinent agencies to complete the Section 106 consultation process.

North and South Macrocorridor

Both the North and South Macrocorridors have a potential to contain a large number of cultural and archaeological resources. Affected areas may include sections of the Leech Lake Reservation and the Chippewa National Forest. Archaeological sites relating to both prehistoric and historic habitation are common throughout area. The area is dense with lakes and wetlands, and abundant wild rice beds, which are still important in Native economies. There are considerable numbers of significant historic properties that exist within the proposed macrocorridor alternatives, including churches, schools, residences, state park structures and lumbering camps. An additional 170 reported, but unverified, archaeological sites may also exist within the proposed alternative macrocorridors. The terminal ends of both the North and South Macrocorridor alternatives overlap in area near the cities of Bemidji and Grand Rapids. Therefore, some recorded historic properties (listed later) are included in both macrocorridors.

Central Macrocorridor

Due to the number of pipelines, and therefore, number of cultural resource field surveys that have been conducted in the Central Macrocorridor, more existing data is available for this macrocorridor than the North and South Macrocorridors. In general, the Central Macrocorridor has the potential to contain many cultural and archaeological resources. Archaeological sites relating to native prehistoric and historic habitation and resource use are common in the area. As the area is dense with lakes and wetlands, there are abundant wild rice beds that still play an important role in the native economy, particularly near lake inlets and outlets. The Central Macrocorridor includes sections of the Leech Lake Reservation and the Chippewa National Forest. Historic Euro-American properties are found within the cities and towns within the Central Macrocorridor. Historic logging-related sites may be found within the national forest or along the railroad that enters the western half of the Central Macrocorridor.

This inventory does not include traditional cultural properties or traditional use areas whose locations are guarded from the general public by the Tribal Historic Preservation Office. Not all areas have been surveyed for archaeological or cultural properties, and there is a likelihood that more may yet be discovered. Archaeological sites are most common along the shores of major lakes and streams, although traditional use areas can be located anywhere within the macrocorridor depending on the resource of interest. Information was received on recorded historic and archaeological properties within the proposed macrocorridor alternatives from the Minnesota State Historic Preservation Office on October 12, 2007.

4.2.3.1 Listed Archaeological Sites

North Macrocorridor:

Within the North Macrocorridor there are 113 recorded archaeological sites, 79 recorded historical sites and 78 reported sites known only from historic documentation (Table 4-16), although none are listed on the National Register of Historic Places (NRHP) five sites are considered eligible by the SHPO.

Table 4-16
Archaeological Sites in the North Macrocorridor Considered Eligible for the NRHP

Site Number	County	Site Name	Site type
21BL0062	Beltrami	Hiltz	Artifact Scatter
21BL0223	Beltrami	North Marquette	Artifact Scatter
21HB0038	Hubbard	Necktie River	Artifact Scatter
21BL0060	Beltrami	Turtle	Artifact Scatter
21BL0058	Beltrami	Turtle River Swamp	Artifact Scatter Lithic Scatter

Central Macrocorridor

Within the Central Macrocorridor, there are 408 recorded archaeological properties, and while none are currently listed on National Register of Historic Places (NRHP), nine are certified as eligible for listing. Most inventoried properties are within Cass County, though they are found throughout the macrocorridor. Of the properties considered eligible for the NRHP, most are in Beltrami County. Table 4-17 lists sites certified as eligible for listing on the NRHP.

Table 4-17
Archaeological Sites in the Central Macrocorridor Considered as Eligible for Listing on the NRHP

County	Site Number	Site type
Beltrami	BL0022	Earthwork/Cemetery
Beltrami	BL0031	Earthwork/Cemetery
Beltrami	BL0037	Artifact Scatter
Beltrami	BL0062	Artifact Scatter/Habitation
Beltrami	BL0223	Artifact Scatter/Habitation
Beltrami	BL0172	Authenticated Burial
Cass	CA0169	Artifact Scatter/Habitation
Cass	CA0611	Cemetery/Authenticated Burial
Cass	CA0615	Cemetery/Authenticated Burial

South Macrocorridor

Within the South Macrocorridor there are 90 known archaeological sites, 90 known historic architectural properties, and 98 reported, but unverified historic properties. Although none are listed on the NRHP, eight sites are considered eligible by the SHPO (Table 4-18).

Table 4-18
Archaeological Sites in the South Macrocorridor Considered Eligible for Listing on the NRHP

Inventory Number	County	Township	Property type
21BL0062	Beltrami	Hiltz	Artifact Scatter
21BL0223	Beltrami	North Marquette	Artifact Scatter
21BL0022	Beltrami	Lake Irving	Artifact Scatter, Earthwork, Cemetery
21BL0037	Beltrami	Midway	Artifact Scatter
21BL0031	Beltrami	Lake Boulevard	Artifact Scatter, Earthwork, Cemetery
21BL0037	Beltrami	Midway	Artifact Scatter
21CA0267	Cass	Big Bass Lake Site	Artifact Scatter
21CA0197	Cass	Shingobee East	Lithic Scatter

4.2.3.2 Listed National Register of Historic Places Sites and Districts

North Macrocorridor

Seventy-nine known historic architectural properties are present through the North Macrocorridor. Five sites are currently on the NRHP and two are considered eligible for listing (Table 4-19 and Table 4-20).

Table 4-19
Historic Properties Listed on the NRHP within the North Macrocorridor

Inventory Number	County	Township	Property type
BL-NOR-004	Beltrami	Northern Twp.	shelter building
BL-NOR-007	Beltrami	Northern Twp.	Sanitation Building
BL-NOR-010	Beltrami	Northern Twp.	Beach House
BL-NOR-016	Beltrami	Northern Twp.	L. Bemidji State Park CCC/NYA/Rustic
IC-DRC-001	Itasca	Deer River	Itasca Lumber Company Superintendent

Table 4-20
Historic Properties Eligible for Listing on the NRHP within the North Macrocorridor

Inventory number	County	Township	Property name	Property type
IC-ALV-004	Itasca	Alvwood Twp.	Sereno White Log House	residence
IC-DRC-010	Itasca	Deer River	Deer River Water Tower	water tower

Central Macrocorridor

As stated in Section 4.2.3.1, there are no archaeological sites currently listed on the NRHP within the Central Macrocorridor. There are, however, 190 recorded historic structures, with 13 listed on NRHP, and three that are certified as eligible for listing. Nearly all these structures are located within the communities of Bemidji, Cass Lake, and Deer River. All structures within the Central Macrocorridor have not been inventoried and there may be additional historic properties not yet recorded. Table 4-21 lists NRHP-eligible structures within the Central Macrocorridor.

Table 4-21
NRHP Listed and Eligible Historic Structures within the Central Macrocorridor

County	Inventory No.	Property Type	On NRHP	Certified for NRHP
Beltrami	BJC-027	Post Office		X
Beltrami	BJC-039	Statue	X	
Beltrami	BJC-044	RR depot	X	
Beltrami	BJC-056	Courthouse	X	
Beltrami	BJC-057	Library	X	
Beltrami	BJC-058	Bridge	X	
Beltrami	NOR-004	Shelter	X	
Beltrami	NOR-007	Sanitation Bldg	X	
Beltrami	NOR-010	Beach house	X	
Beltrami	NOR-016	State Park Bldg	X	
Cass	BNC-006	Resort	X	
Cass	CLC-018	Residence	X	
Cass	CLC-019	Government Bldg		
Cass	UOG-006	Beach house		X
Itasca	DRC-001	Residence	X	
Itasca	DRC-010	Water tower		X

South Macrocorridor

Of the 90 known historic properties present throughout the South Macrocorridor, four are currently on the NRHP and one is considered eligible for listing (Table 4-22 and Table 4-23).

Table 4-22
Historic Architecture Properties Listed on the NRHP within the South Macrocorridor

Inventory Number	County	Township	Property type
BL-BJC-044	Beltrami	Bemidji	Great Northern Depot
BL-BJC-058	Beltrami	Bemidji	Nymore Bridge (Bridge No. 2366)
CA-REC-011	Cass	Remer	Soo Line Depot
CA-SGB-003	Cass	Shingobee	Minnesota State Sanitarium for Consumptives (Ah-Gwah-Ching Historic District)

Table 4-23
Historic Properties Certified as Eligible for Listing on the NRHP within the South Macrocorridor

Inventory Number	County	Township	Property type
CA-REC-012	Cass	Remer	Remer Ranger Station Complex Historic District

Cultural/Historic Resource Summary

All three macrocorridors have the potential to contain a large number of cultural, archaeological, and architectural resources. In particular, the macrocorridors are rich in lakes and wetlands with wild rice beds that offer common use areas. In addition, the Bemidji and Grand Rapids areas offer historic architectural properties relating to forestry and mining, which all three macrocorridors share as terminals. Due to previous linear development, i.e. pipelines, transmission lines, and US Highway 2, the Central Macrocorridor has been surveyed extensively and contains a larger number of known cultural resource sites than the other two macrocorridors. Based on an evaluation of macrocorridor width and macrocorridor length, the larger footprints of the North and South macrocorridors may have a similar number of resources, and the Central Macrocorridor may affect fewer resources because its overall footprint will be smaller.

4.2.4 Land Use and Zoning

North Macrocorridor

The North Macrocorridor extends through three counties (Beltrami, Hubbard, and Itasca), with the majority of the alignment being in Beltrami and Itasca Counties.

Development in Beltrami County is comprised primarily of low-density residential and commercial efforts, though it is classified medium-to-high- and high-density near and in the City of Bemidji. Outside of the Bemidji growth area, land use is generally rural (Beltrami County Comp Plan, 2000).

Land in the northern part of Hubbard County, through which the North Macrocorridor passes, consists primarily of three classifications: low-density area, rural growth area, and public ownership use. The alignment of the North Macrocorridor affects at least one county-designated commercial activity center. County land use policy favors preserving the rural character of the rural growth area by encouraging existing agricultural uses, maintaining open spaces, and encouraging the development of size-appropriate residential and related developments (in the range of 2.5 to 3 acres). Land use policy recognizes publicly-owned land for its recreational and economic potential. (Hubbard County Land Use Plan, 2005)

Land use in Itasca County is centered on a few key ideas: maintaining the character and commercial efficacy of rural areas, ensuring sustainable management of timber resources and timber industries, preserving the county's natural resources while encouraging the continuity of the prosperous tourism and recreation industry, and encouraging residential and commercial development at densities that respect the area in which the development occurs (Itasca County Comp Plan, 2000).

Central Macrocorridor

The Central Macrocorridor extends through the Leech Lake Reservation and four counties (Beltrami, Cass, Hubbard, and Itasca), with a large portion of it in northern Cass County.

Cass County zoning and land use policies favor preservation of critical habitat and agricultural land where traditional farm settlements exist. Regarding residential development, land use policy supports lakeshore development that minimally impacts the natural resources. Higher density residential housing is preferred in cities, close to sewer and water. Regarding commercial development, the land use plan supports the concentration of businesses at or near intersections of major transportation arteries (Cass County Comp Plan 2006). Please refer to the North Macrocorridor zoning text above for additional information regarding land use and zoning for Beltrami, Hubbard, and Itasca counties.

South Macrocorridor

The South Macrocorridor extends through four counties (Beltrami, Cass, Hubbard, and Itasca), with the majority of the alignment passing through Cass and Hubbard Counties. Please refer to the North Macrocorridor zoning text above for additional information regarding land use and zoning for Beltrami, Hubbard, and Itasca counties and refer to the Central Macrocorridor for information on land use and zoning in Cass County.

4.2.5 Socioeconomic Resources

North Macrocorridor

The North Macrocorridor crosses parts of Beltrami, Hubbard, and Itasca Counties. There are five incorporated cities located wholly or partially with the North Macrocorridor: Bemidji (pop. 13,291), Tenstrike (pop. 207), Blackduck (pop. 756), Deer River (pop. 934), and Cohasset (pop. 2,533).

Beltrami, Cass, and Hubbard Counties have experienced population growth rates between 1990 and 2000 that exceed the Minnesota state average. Itasca is growing at less than the state average.

Racial characteristics in the North Macrocorridor are primarily White. Notable Native American populations are also present in areas within Beltrami, Hubbard, and Itasca Counties (10 percent, 5 percent, and 9 percent, respectively). Areas within Beltrami and Hubbard Counties show poverty levels that are below the respective county average, while areas within Itasca County are above the respective county average (US Census 2000). Please refer to Appendix B for more detailed information.

According to the Quarterly Census of Employment and Wages (QCEW), the top-employing industries within the Central Macrocorridor counties include retail trade, health care and social assistance, educational services, accommodation and food services, public administration, construction, and manufacturing. Unemployment rates in the relevant counties are slightly above the Minnesota state average (Minnesota DEED). Please refer to Table 4-24 for information on the top 5 industries in the four counties.

Table 4-24
Top 5 Industries in Beltrami, Cass, Hubbard, and Itasca Counties

County	NAICS Title	Average Employment 2005
Beltrami		
	Retail Trade	3,020
	Health Care and Social Assistance	2,989
	Educational Services	2,263
	Accommodation and Food Services	1,654
	Public Administration	1,546
Cass		
	Accommodation and Food Services	1,497
	Public Administration	1,433
	Retail Trade	1,211
	Construction	571
	Manufacturing	406
Hubbard		
	Manufacturing	1,267
	Retail Trade	885
	Accommodation and Food Services	720
	Construction	450
	Public Administration	360
Itasca		
	Health Care and Social Assistance	2,636
	Retail Trade	2,287
	Accommodation and Food Services	1,392
	Manufacturing	1,380
	Public Administration	1,333

Source: *DEED, Labor Market Information Office. Quarterly Census of Employment and Wages (QCEW) www.deed.state.mn.us/lmi/tools/qcew/*

Central Macrocorridor

The Central Macrocorridor crosses parts of Beltrami, Cass, Hubbard, and Itasca Counties. Six incorporated cities are located wholly or partially within the Central Macrocorridor: Bemidji (pop. 13,291), Cass Lake (pop. 832), Bena (pop. 104), Deer River (pop. 934), Zemple (pop. 76), and Cohasset (pop. 2,508).

Racial characteristics in the Central Macrocorridor are primarily White, with the exception of Cass County, in which approximately 50 percent of the Central Macrocorridor population is Native American (with 46 percent is White). Areas within Beltrami, Hubbard, and Itasca Counties also have notable Native America populations (9 percent, 5 percent, and 13 percent respectively). Within the Central Macrocorridor, Beltrami, Cass, Hubbard and Itasca show poverty levels that are above the respective county average (US Census 2000). Please refer to Appendix B for more detailed information.

Please refer to the North Macrocorridor socioeconomic text for more details regarding county population growth rates and county employment industries.

South Macrocorridor

The South Macrocorridor crosses parts of Beltrami, Cass, Hubbard, and Itasca Counties. There are three incorporated cities located wholly or partially with the South Macrocorridor: Bemidji (pop. 13,291), Cohasset (pop. 2,508), and Remer (pop. 372). Walker (pop. 1,126) and Akeley (pop. 417) are also in close proximity to the South Macrocorridor.

Racial characteristics in the South Macrocorridor are primarily White. Notable Native American populations are also present in areas within Beltrami, Cass, Hubbard, and Itasca Counties (11 percent, 9 percent, 5 percent, and 9 percent, respectively). Areas within Beltrami and Hubbard Counties show poverty levels that are comparable to the respective county average, while areas within Cass County are above the respective county average and areas within Itasca County are below the respective county average (US Census 2000). Please refer to Appendix B for more detailed information.

Please refer to the North Macrocorridor socioeconomic text for more details regarding county population growth rates and county employment industries.

Social Economic Resources Summary

The detailed information for social economic resources is provided in Appendix B. This preliminary analysis of the county data indicates that portions of the macrocorridors contain higher than average concentrations of minorities and higher than average concentrations of low income populations. In particular, the Cass County segment of the Central Macrocorridor includes 49.7 percent minorities, as compared to the county-wide average of 11.5 percent. The potential for direct impacts to this minority population will depend on the actual routes chosen within the macrocorridor, and issues will be studied in detail during the environmental review process. However, the Applicants do not expect there to be any adverse economic or health and safety or disproportionate impacts as a result of the proposal.

4.2.6 Cumulative Effects

Generally, cumulative effects include an evaluation of all the proposed and planned activities that may occur, and their potential effects on the resources within the area. For this evaluation, the pertinent planned activities include changes to roadways, transmission lines and pipelines.

Based on discussions with the power utilities, there is no other transmission line project planed for the near future. The pipeline companies have plans to install additional lines adjacent to their existing lines. The highway departments have plans to make improvements to MN 371 south of Bemidji.

North Macrocorridor

The North Macrocorridor is located adjacent to approximately 91 miles of transmission line, 8 miles of pipeline and 15 miles or roadways. The proposed pipeline construction would coincide with this proposal at two locations: the west end near Bemidji and the east end near the Boswell Substation. Construction of the North Macrocorridor, in conjunction with the proposed pipeline installation near Bemidji and MN 371 improvements would result in a wider macrocorridor along approximately 8 miles, at the western and eastern ends of the Macrocorridor. This proposal would widen the existing macrocorridors by approximately 125 feet, depending on the final design of the proposal.

Central Macrocorridor

The Central Macrocorridor is located adjacent to approximately 32 miles of transmission line, 30 miles of pipeline, 5 miles of railroad and 3 miles of roadways. The proposed pipeline construction would coincide with this proposal for the 32-mile length, depending on the final design. Likewise, the MN 371 improvements would also coincide with this proposal. This proposal would widen the existing macrocorridors by approximately 125 feet, depending on the final design of the proposal.

South Macrocorridor

The South Macrocorridor is located adjacent to approximately 37 miles of transmission line and 52 miles or roadways. The proposed improvements to MN 371 would coincide with this proposal. This proposal would widen the existing macrocorridors by approximately 125 feet, depending on the final design of the proposal.

Cumulative Impact Summary

All three macrocorridors would have some relationship to on-going or planned linear projects. The degree of these cumulative impacts depends on the length of the coincident corridors. Generally, the Central Macrocorridor would have the longest coincident corridor since it is adjacent to an existing pipeline for most of its length. The overall impact of widening these corridors by an additional 125 feet will be studied in more detail during the environmental analysis completed for the NEPA process.

5.0 Avoidance Areas

Specific avoidance areas include areas where transmission line development is prohibited because of federal, state, or local regulations or undesirable because of conflicts with existing land use/development or land features. These areas are described in detail in Sections 4.1.7 and 4.2.1. The following resources will be avoided where possible in determining routing. Where these resources cannot be avoided, impact minimization and/or mitigation will be necessary:

- Recreational resource areas – trails, campgrounds, water accesses
- Hole-in-Bog Peatland Scientific and Natural Area
- Bemidji Slough and Wolf Lake WMAs
- Ecologically important areas
- Culturally important areas
- Wetlands and other water resources
- Deer River Airport and Bemidji Airport
- Active gravel mining operations

At this preliminary level of review, not all resources have been identified to the extent required for final route selection. Additional agency and stakeholder input, field surveys, and analysis will be conducted as part of the Federal and State environmental review processes, which will result in an informed decision regarding the final transmission line route.

6.0 Reduced Air Emissions and Mitigation of Climate Change Impacts Due to Improved Electrical Performance

The four options for meeting the electrical need were analyzed in terms of their ability to reduce air emissions. The level of emissions avoided is a function of the level of the reduction of energy losses due to transmission system improvements. Load flow modeling was used to determine the peak transmission system line loss and from this modeling the associated equivalent hourly loss reduction and annual energy savings was derived. This modeling takes into account winter peak electric power flow on the interconnected transmission system.

6.1 *Electric Options*

The options for meeting the electrical need considered in the Alternatives Evaluation Study included: 1) Rebuild of the existing 115 kV transmission line; 2) Construction of a second Winger-Wilton 230 kV Line; 3) Construction of the Badoura-Wilton 230 kV line; and, 4) Construction of the Bemidji to Grand Rapids 230 kV line. Loss reduction achieved with the Bemidji to Grand Rapids 230 kV line is 10 times greater than the rebuild option, 40 times greater than the Winger-Wilton option, and six times greater than the Badoura-Wilton option. The figures below show the relative CO_2 reduction associated with each of the electrical options expressed as Metric Tons of CO_2/Year, households served equivalents, and vehicle miles driven equivalents.

Table 6-1
Annual CO_2 Reduction Associated with Options for Meeting Electrical Need

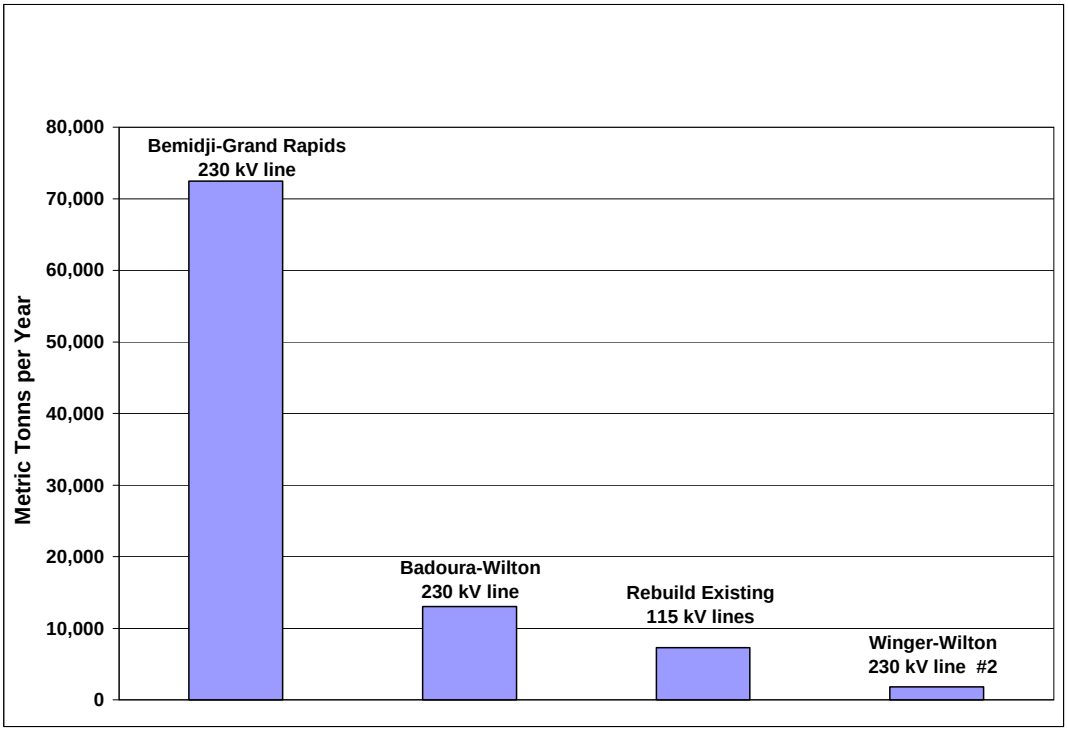


Table 6-2 CO_2 Reduction Associated with Electrical Need Options – Expressed in Households Served Equivalents

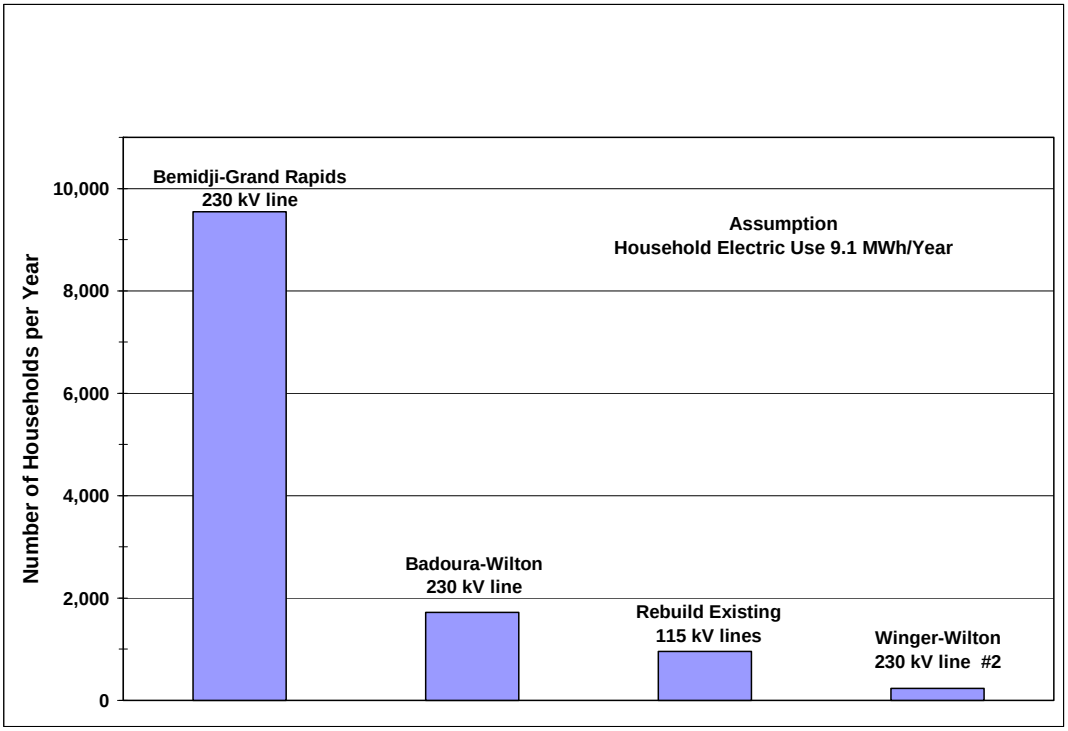
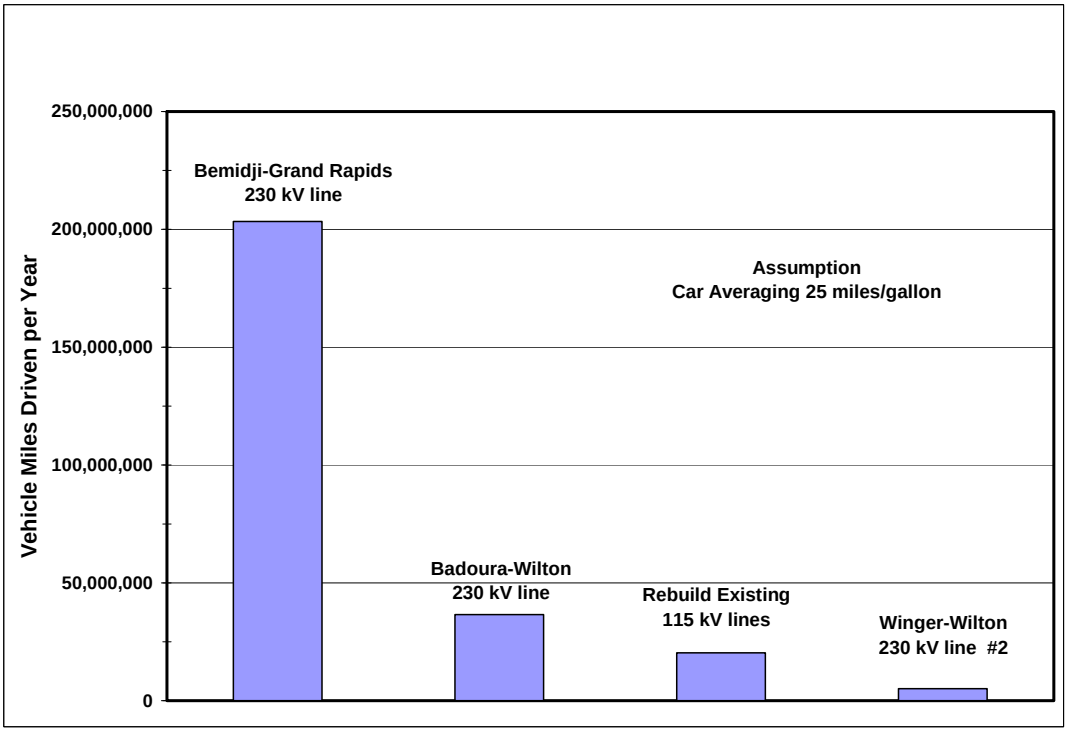


Table 6-3 CO_2 Reduction Associated with Electrical Need Options – Expressed as Vehicle Mile Equivalents



Improving voltage and meeting power supply needs through construction of the Bemidji to Grand Rapids 230 kV line achieves six to forty times the transmission line loss reduction of the other three options. The estimated annual 72,000 metric ton CO_2 reduction is equivalent to the annual household electricity usage of approximately 9,500 households and approximately 200 million vehicle miles driven per year.

6.2 *Macrocorridor Options*

Each of the Macrocorridor Options was evaluated for potential reductions in air emissions associated with system improvements. Table 6-4 shows the results of the annual loss reductions and energy savings for the Proposed Project in each of the four corridors. The greatest loss reduction is achieved with a Project location in the Central Corridor, followed by Project location in the South Corridor. The North and Non-CNF macrocorridors are associated with the least amount of loss reduction and energy savings.

Table 6-4 - Transmission Line Loss and Annual Energy Savings

Corridor	Peak Transmission Line Loss Reduction (MW)	Equivalent Hourly Loss Reduction (MWh)	Annual Energy Savings (MWh)
North	19.2	7.97	69,800
Central	23.9	9.92	86,886
South	20.6	8.55	74,889
Non-CNF	18.4	7.64	66,891

Each megawatt hour of avoided energy loss shown in the table above can be presumed to also reduce emissions of SO_2, NO_x, PM 10 (Particulates), CO_2, and Mercury below levels produced with the current transmission system. The average air emission rates per megawatt hour of energy generation has been estimated by the Mid-Continent Area Power Pool (MAPP), and approved by the Minnesota Pollution Control Agency. These emission rates are shown in Table 6-5.

Table 6-5 - MAPP Average Emission Rates

Emission Type	Emission Rate
SO_2	5.537 pounds per MWh
NO_x	3.982 pounds per MWh
Particulate PM10	0.3257 pounds per MWh
CO_2	0.834 metric tonnes per MWh
Mercury	0.0000432 pounds per MWh

Because the Central Macrocorridor option is associated with the highest loss reduction in relation to the other options, the emissions reductions of SO_2, NO_x, PM10, CO_2, and Mercury are greatest for this option. Emission reductions associated with a project located in the Central Macrocorridor is 16 percent greater than the South Macrocorridor, 24 percent greater than the North Macrocorridor and 30 percent greater than the Non-CNF Macrocorridor.

Table 6-6- Reduction in Air Emissions Associated with Macrocorridor Options

Macrocorridor Option	Line Loss Reduction MWh	SO_2 Reduction (Lbs./Year)	NO_x Reduction (Lbs./Year)	PM 10 Reduction (Lbs./Year)	CO_2 Reduction (Metric Tonnes/Year)	Mercury Reduction (Grams/Year)
Central	86,886	481,088	345,980	28,299	72,463	1,704
South	74,889	414,660	298,208	24,391	62,457	1,469
North	69,800	386,483	277,944	22,734	58,213	1,369
Non-CNF	66,891	370,375	266,360	21,786	55,787	1,312

CO_2 emissions reductions for the four Macrocorridor options were also analyzed and expressed in terms of tons of CO_2 reductions/year, annual households served equivalents, and annual vehicle miles driven equivalents.

Table 6-7
CO2 Reduction Associated with Macrocorridor Options

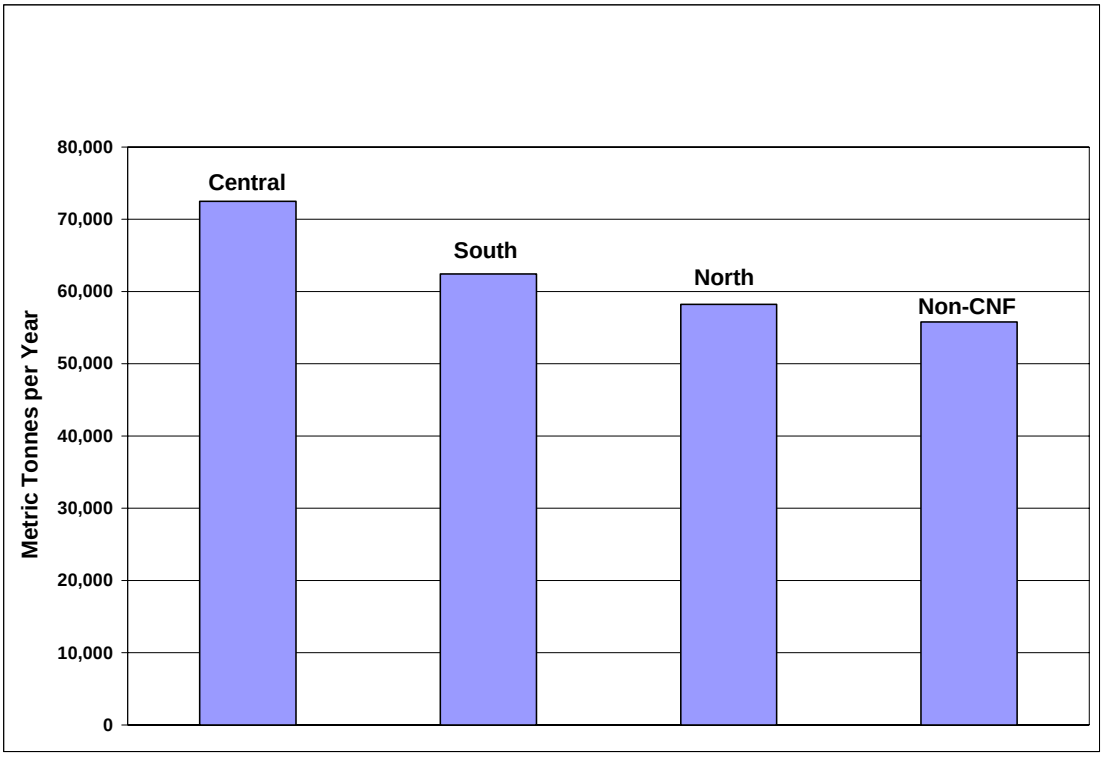


Table 6-8
CO2 Reduction Associated with Macrocorridor Options – Households Served Equivalents

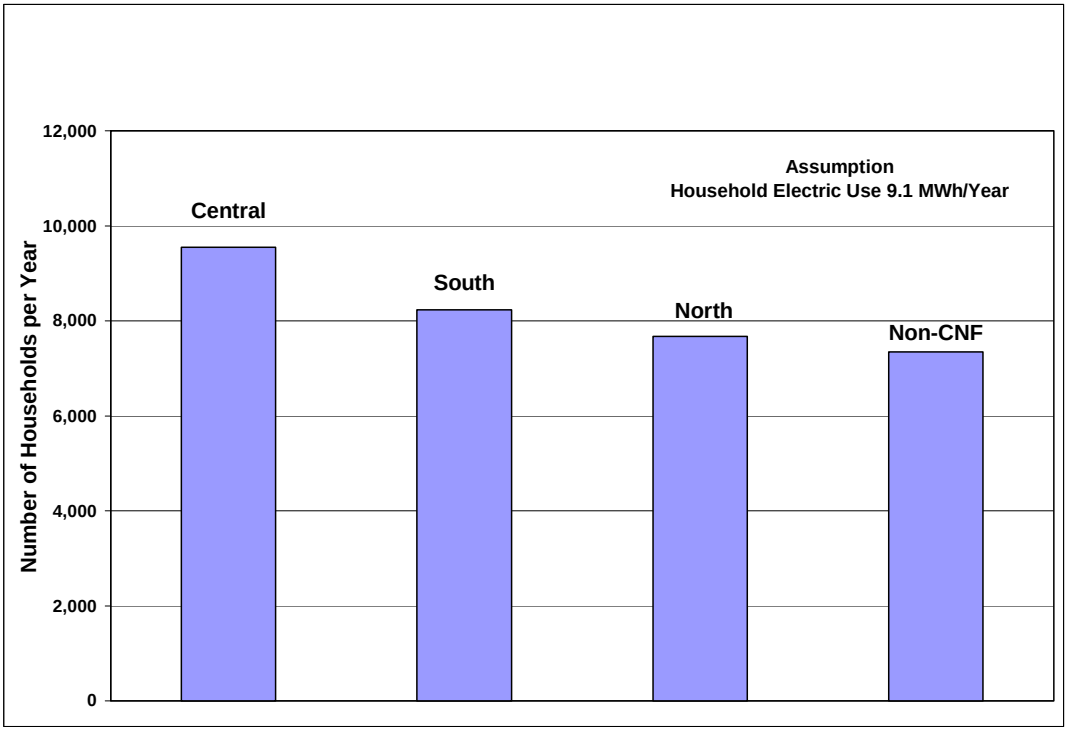
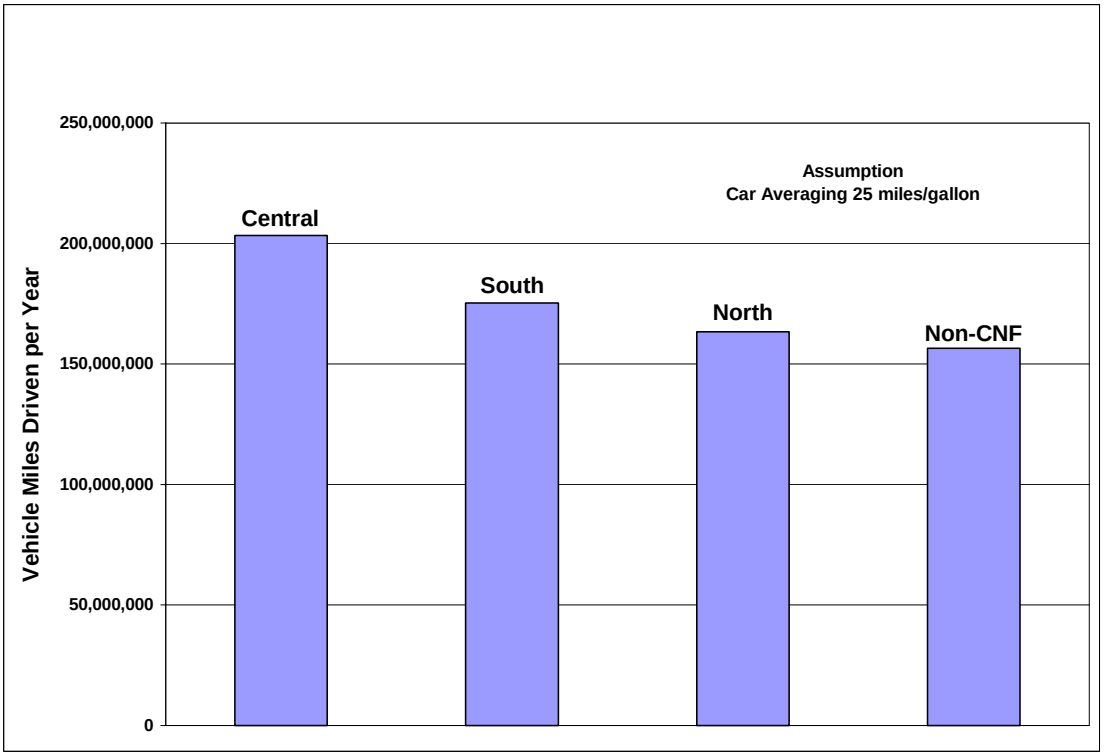


Table 6-9
CO2 Reduction Associated with Macrocorridor Options – Vehicle Miles Driven Equivalents



The approximately 70,000 metric ton CO_2 emissions reduction associated with the Central Macrocorridor is equivalent to the CO_2 emissions produced by roughly 9,500 households per year and 200 million vehicle miles driven per year. The 60,000 ton reduction in CO_2 associated with the Southern Macrocorridor is equivalent to that produced by 8,200 households and 175 million vehicle miles driven. The 58,000 ton reduction associated with the Northern Macrocorridor is equivalent to that of 7,700 households and 165 million vehicle miles driven. The 56,000 metric ton reduction in CO_2 emissions associated with the Non-CNF Macrocorridor option is equivalent to the emissions from 7,400 households and 155 million vehicle miles driven. The CO_2 emissions reduction associated with a project located in the Central macrocorridor is 16 percent greater than the South macrocorridor, 24 percent greater than the North macrocorridor and 30 percent greater than the Non-CNF macrocorridor.

7.0 Engineering Opportunities and Constraints

7.1 *Avoidance Areas*

Engineering factors also need to be considered when selecting a route. Such factors include topography (discussed below); span limitations, right-of-way limitations, and the presence of existing infrastructure or other development.

Span limitations need to be examined where there are large wetland complexes and lakes. Span limitations are driven by the type and height of the transmission pole structure, climate (wind speed, potential for ice loading, etc.) and the size/weight of the transmission line itself.

Transmission lines also require a certain amount of right-of-way to ensure safe and reliable operation. Key factors in determining right-of-way widths include structure span spacing, structure configuration, and conductor weight, sag, operating voltage, and elevation (RUS 1994). Areas where sufficient right-of-way is not available need to be identified and avoided during transmission line routing.

Dense development can also limit transmission line routing options. Where insufficient space is available to meet setback requirements, or where existing development is incompatible with the construction and operation of a transmission line, alternate routes may need to be identified.

One area that will need to be examined in further detail is Cass Lake. TH 2 and the BNSF rail line run between the main body of Cass Lake and Pike Bay to the south. The presence of these large water bodies and the existing infrastructure may limit the available right-of-way and ability to meet setback requirements. The analysis for route selection will include a more detailed look at opportunities to weave a route through this area, as well as consider other route opportunities by going to the south or north of these areas.

7.1.1 Use of Existing Linear Corridors

Existing corridors provide an opportunity for transmission line routing. These corridors have already disturbed the surrounding environment, and generally have preserved a right-of-way corridor that can be considered for a transmission line route. Existing linear corridors within the Central Macrocorridor are discussed in Section 4.2.2.

Constraints for the sharing of existing utility corridors depend on the type of utility present. As indicated previously, the opportunity for ROW sharing is limited to where safety, maintenance, and clearance requirements demand the utilities be kept separate.

7.1.2 Topographic Constraints

Major topographic features in a macrocorridor can limit options for transmission line routing and construction. Issues associated with extreme topography include accessibility for construction, soil/rock suitability, and span distance, among others.

7.1.3 Engineering Cost Analysis

Cost Analysis of Each Corridor

Three corridors were analyzed as to their total cost. The Non-CNF Macrocorridor was not included in the following analysis as it was developed after this analysis was completed. Table 7-1 below shows the present value revenue requirements to construct the Bemidji-Grand Rapids Line in each corridor.

Table 7-1 Cumulative Present Value of Revenue Requirements (PVRR) for Each Corridor

Macrocorridor	Installed Cost ($ millions)	Cumulative PVRR ($ million)		
		Capital Related PVRR	Loss Savings	Net PVRR
Northern Macrocorridor (116 miles)	$99.1	$200	-$26	$175
Central Macrocorridor (68 miles)	$60.6	$122	-$32	$90
Southern Macrocorridor (99 miles)	$84.6	$170	-$28	$143

The Central Macrocorridor has a PVRR of $90 million, with the PVRR for the Southern Corridor being 59 percent higher and the PVRR for the Northern Corridor being 94 percent higher.

The three corridors were also analyzed in terms of their environmental externality benefits: a megawatt hour of avoided energy losses can be presumed to avoid the emissions associated with the average emission rate for a MWh of energy production. The emission rates used by the Mid-Continent Area Power (MAPP), approved by the Minnesota Pollution Control Agency (MPCA) are provided in Table 7-2 below. Locating the route for the Project in the central corridor also results in greater environmental externality savings than if it is located in the other corridors.

Table 7-2 Environmental Externality Cost Savings for Each Corridor

Macrocorridor	Annual Loss Savings (MWh)	Annual Energy Reduction Savings ($ thousands)	Low Value Annual Externality Cost Savings ($ thousands)	High Value Annual Externality Cost Savings ($ thousands)
Northern Macrocorridor (116 miles)	69,800	$3,490	$242	$1,765
Central Macrocorridor (68 miles)	86,886	$4,344	$301	$2,194
Southern Macrocorridor (99 miles)	74,889	$3,744	$259	$1,892

7.2 *Selection of Alternative Routes*

The appliants will have submitted a Route Application Permit to the Minnesota Public Utilities Commission, identifying routes in the Central Corridor. The Application was accepted on June 26, 2008.

The route selection may include:

- Collection of more detailed information on existing linear utilities.
- Evaluation of opportunities and constraints.
- Evaluation of avoidance areas.
- Identification of feasible routes.
- Provide opportunity for public and agency comment.
- Refine routes and begin detailed environmental review.

Selection of a final route will be made by governing agencies at the appropriate time following the planning and environmental review process. This process will include additional opportunities for public and agency input as well as detailed analysis of environmental conditions.

8.0 Conclusion

This document was prepared in accordance with RUS Bulletin 1794A-603 and supplemented in response to agency and stakeholder requests. Specifically, this document has:

1) Defined endpoints for the Applicants' proposed 230 kV transmission line as the Wilton and Boswell Substations.

2) Identified four macrocorridor options.

3) Evaluated the natural and developed environments for three macrocorridor options.

4) Considered the use of existing rights-of-way for transmission routes for each of the three options.

A more detailed analysis of the four macrocorridor options and identification of other options will be considered during the scoping process under NEPA, with the RUS as the lead federal agency. The Minnesota's route permitting process, which includes a state-prepared Environmental Impact Statement, will consider the Central Corridor. However, other options may be identified during the NEPA scoping process. These processes will include additional opportunities for public and agency input as well as detailed analysis of environmental conditions. Selection of a final route will be made by governing agencies at the appropriate time following the planning and environmental review process.

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Figures

Note: Detailed Resource Maps are Included for the North, Central and South Macrocorridors

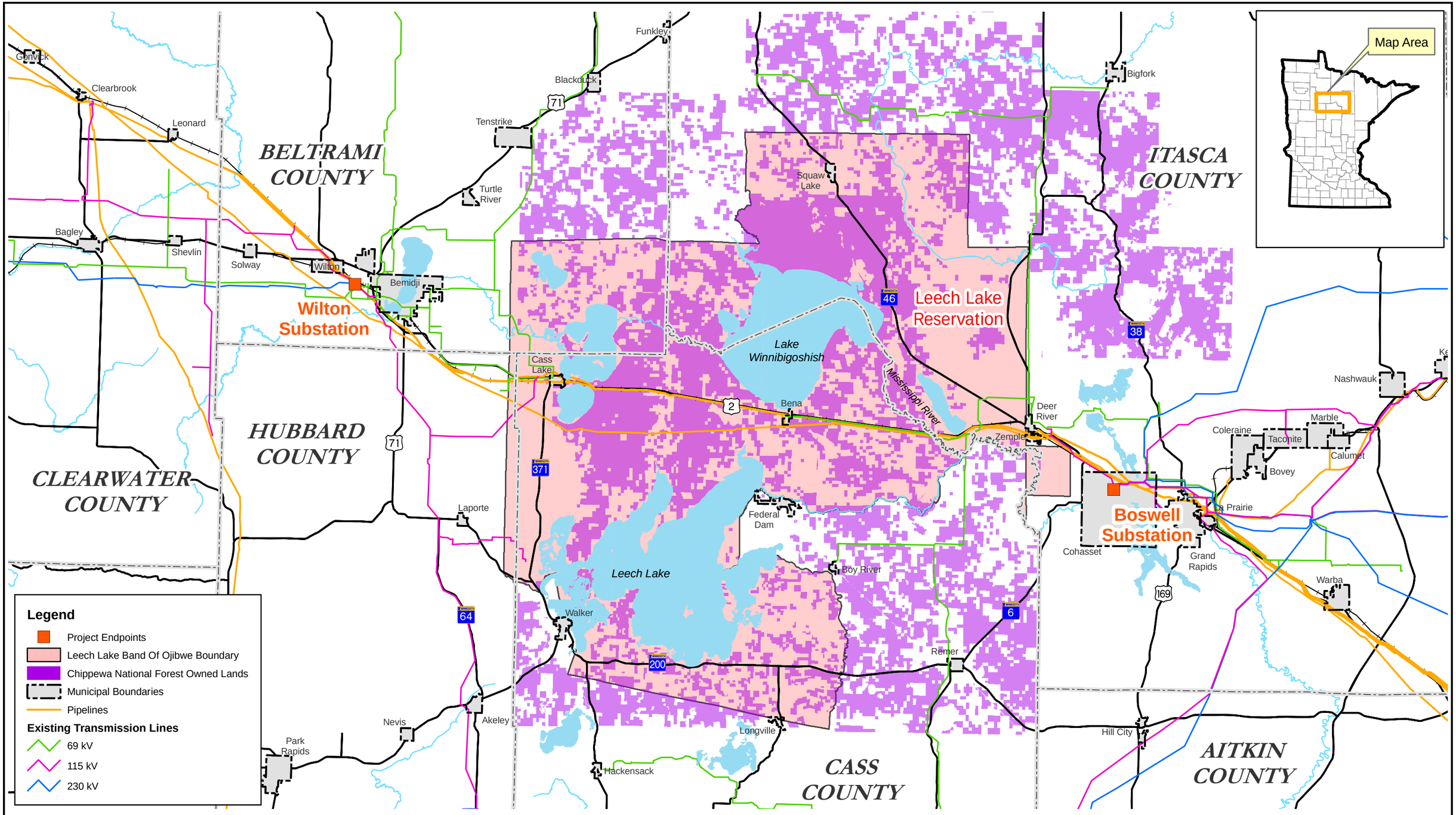

Figure 1 - Project Overview Map
230-kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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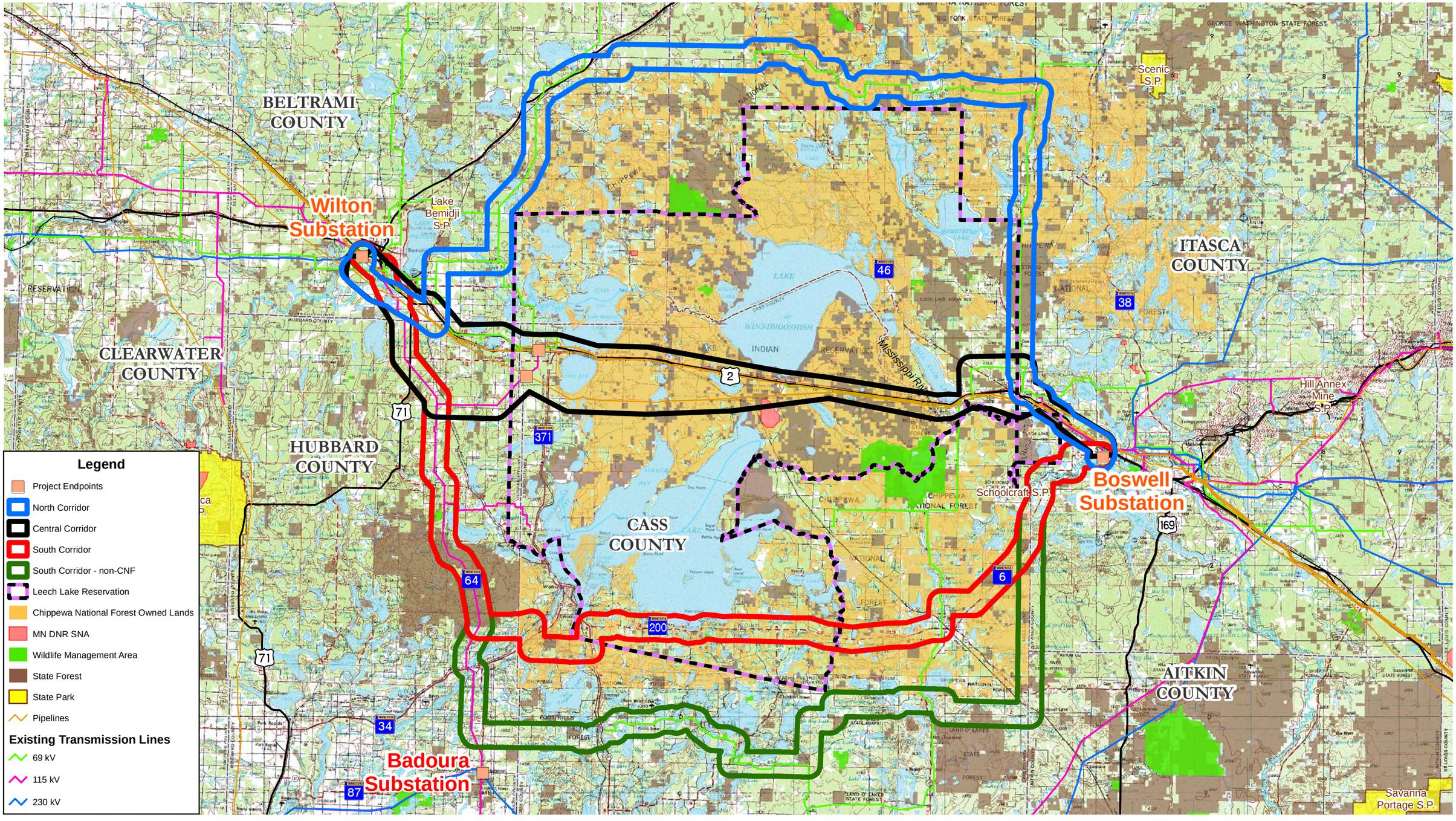

Legend

- Project Endpoints
- North Corridor
- Central Corridor
- South Corridor
- South Corridor - non-CNF
- Leech Lake Reservation
- Chippewa National Forest Owned Lands
- MN DNR SNA
- Wildlife Management Area
- State Forest
- State Park
- Pipelines

Existing Transmission Lines

- 69 kV
- 115 kV
- 230 kV

0 5 10 15
Miles

Figure 2 - Corridors Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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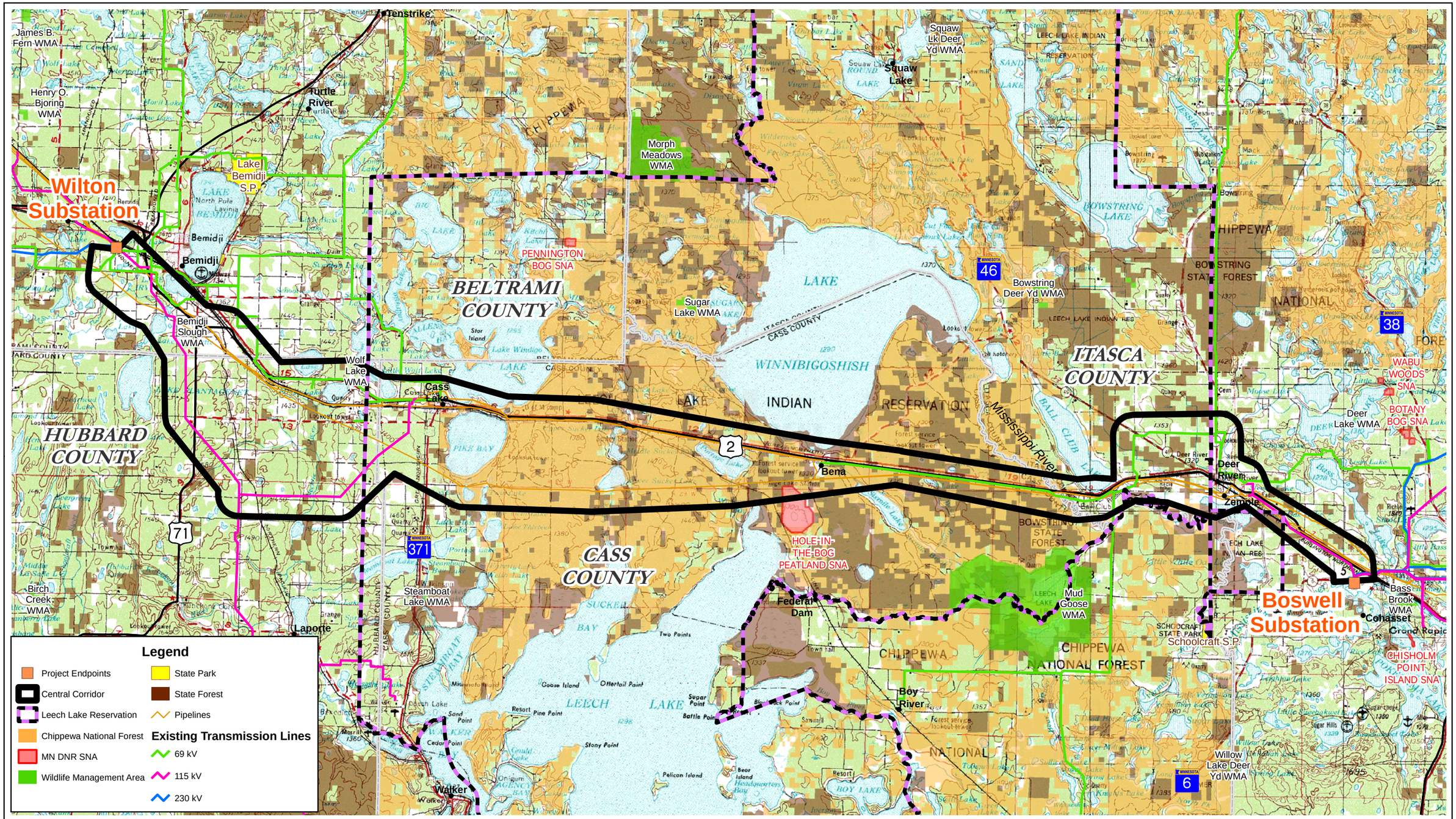

Figure 3 - Central Corridor Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
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Bemidji-Grand Rapids 230-kV line

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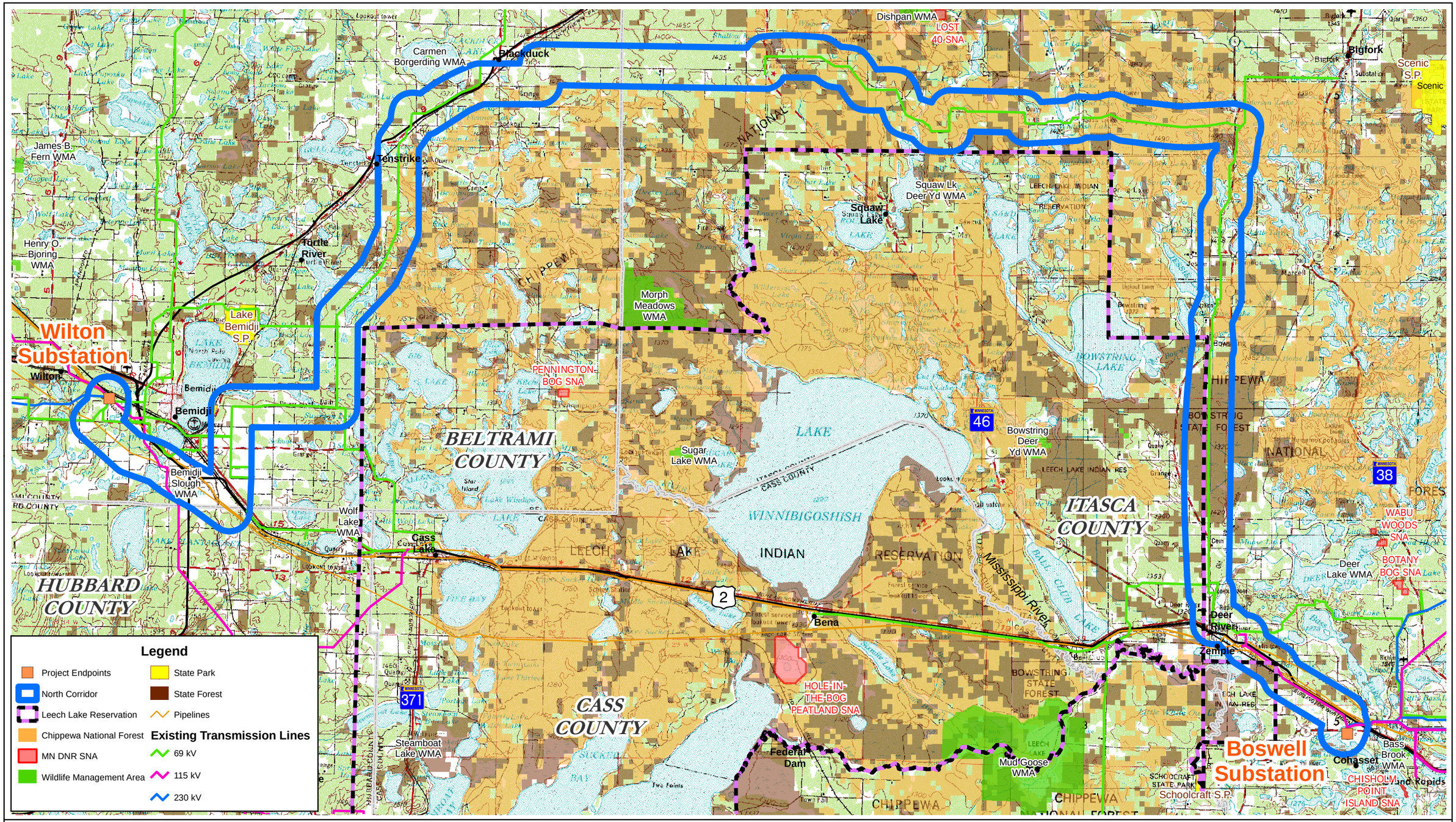

Figure 4 - North Corridor Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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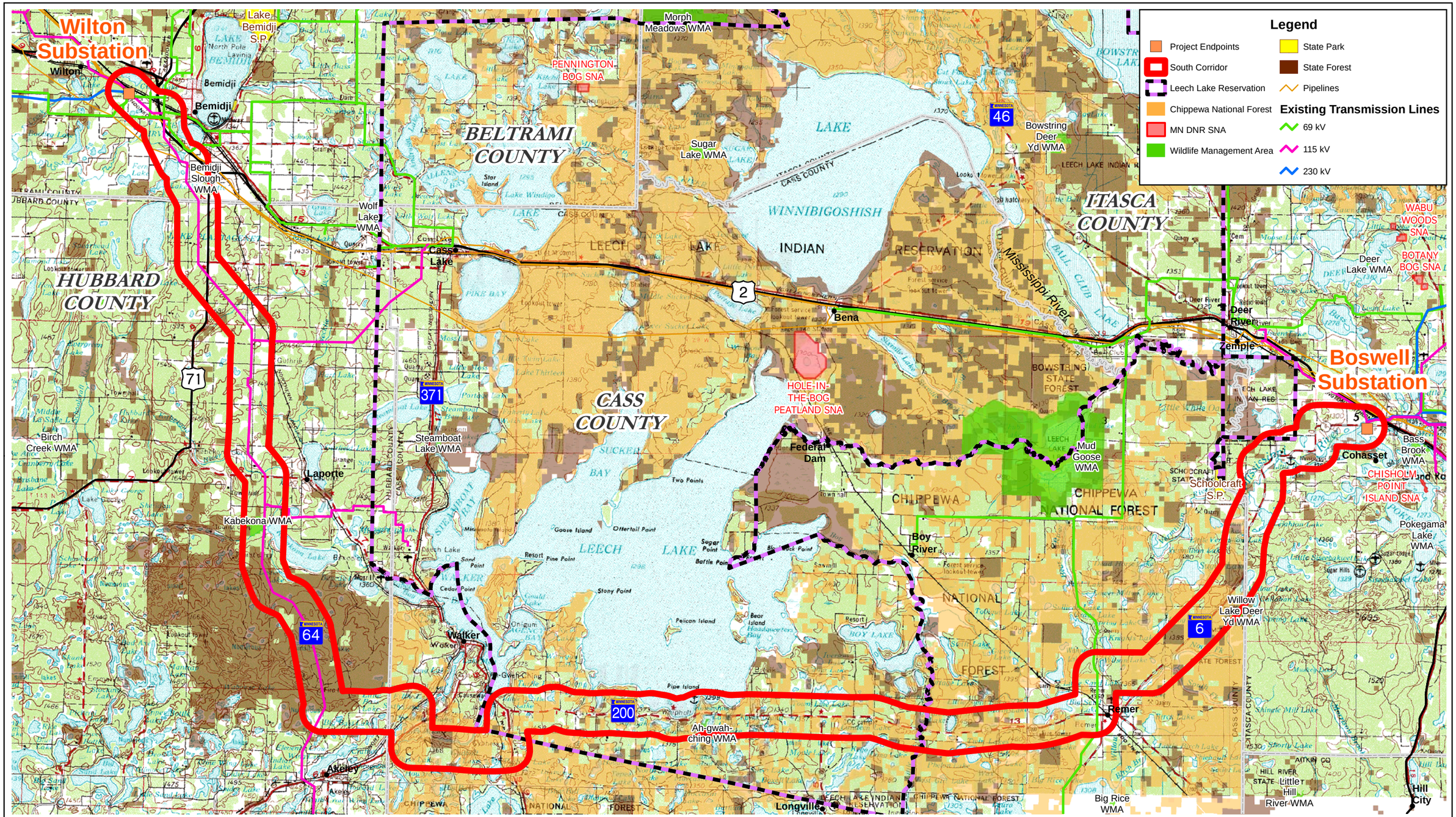

0 5 10
Miles

Figure 5 - South Corridor Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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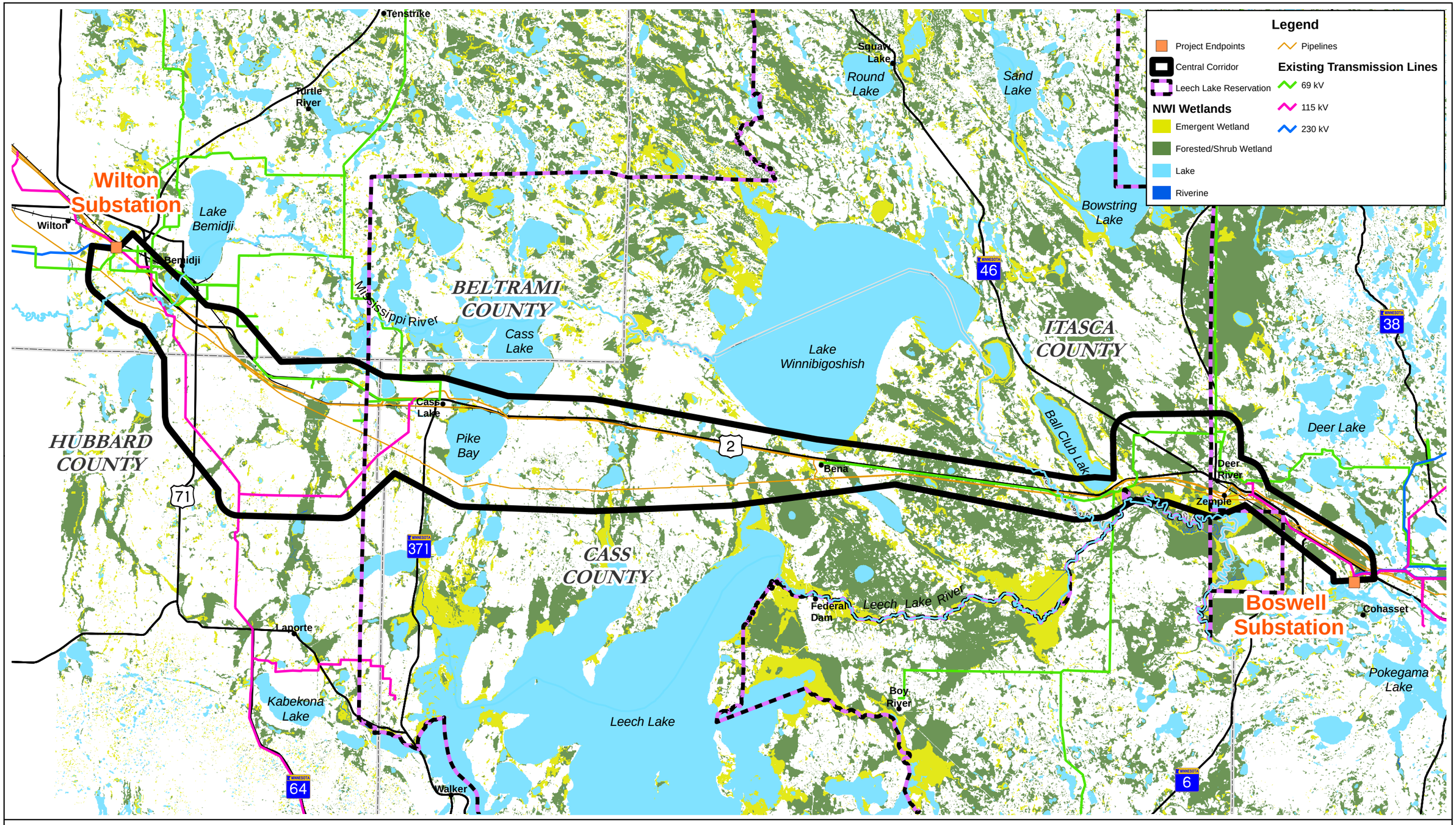

Figure 6 - Central Corridor Surface Waters Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020 Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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Blackduck Lake
Blackduck
Bigfork
Scenic
Gull Lake
Tenstrike
Squaw Lake
Round Lake
Sand Lake
Turtle River
Wilton Substation
Wilton
Lake Bemidji
Bemidji
Bowstring Lake
46
38
BELTRAMI COUNTY
Mississippi River
Cass Lake
Lake Winnibigoshish
ITASCA COUNTY
HUBBARD COUNTY
Cass Lake
Pike Bay
2
Bena
Ball Club Lake
Deer Lake
Deer River
Zemple
371
CASS COUNTY
Federal Dam
Leech Lake River
Boswell Substation
Cohasset

Legend

- Project Endpoints
- North Corridor
- Leech Lake Reservation

NWI Wetlands

- Emergent Wetland
- Forested/Shrub Wetland
- Lake
- Riverine
- Pipelines

Existing Transmission Lines

- 69 kV
- 115 kV
- 230 kV

0 5 10
Miles

Figure 7 - North Corridor Surface Waters Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

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Bemidji-Grand Rapids 230-kV line

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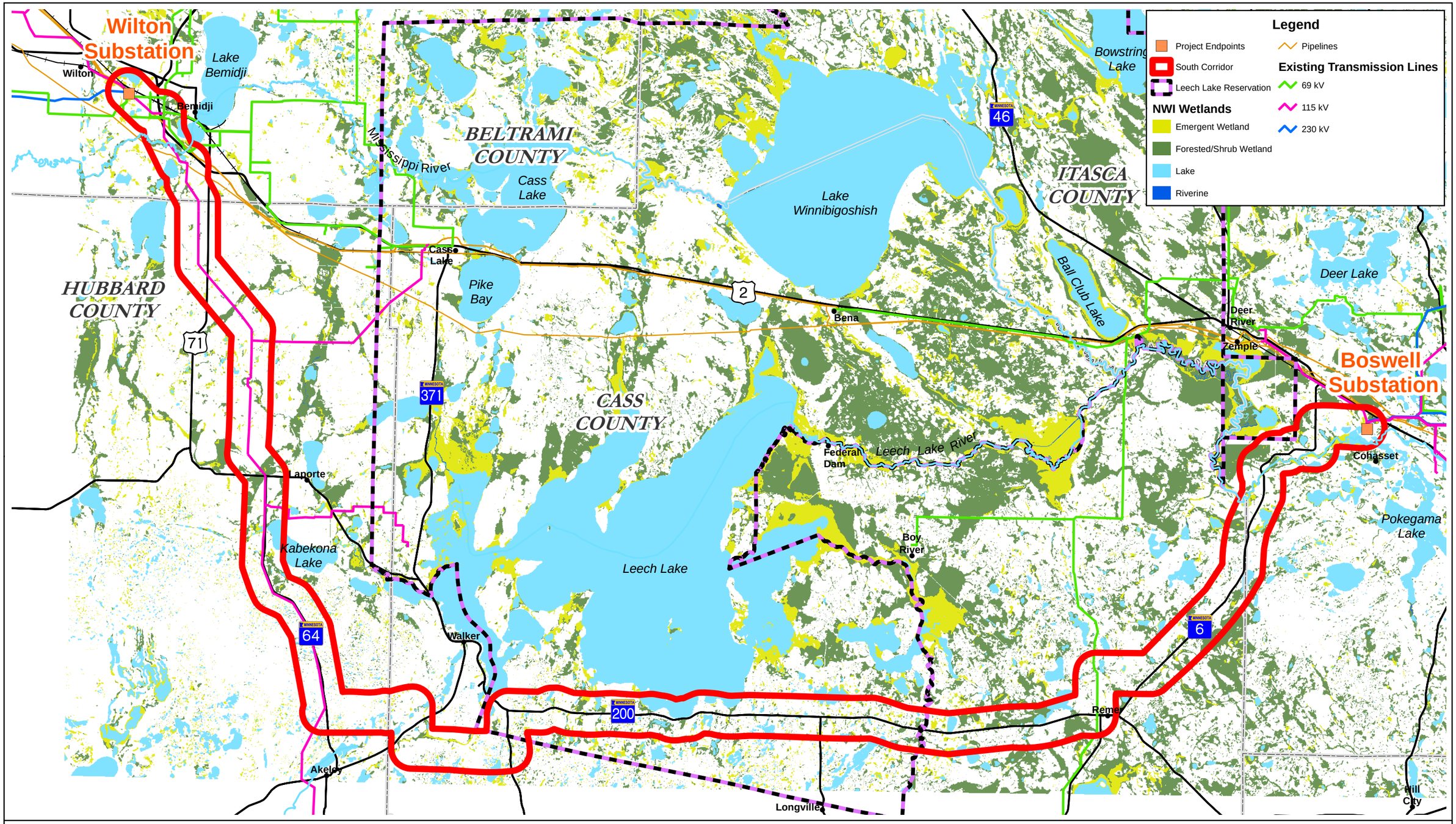

0 5 10
Miles

Figure 8 - South Corridor Surface Waters Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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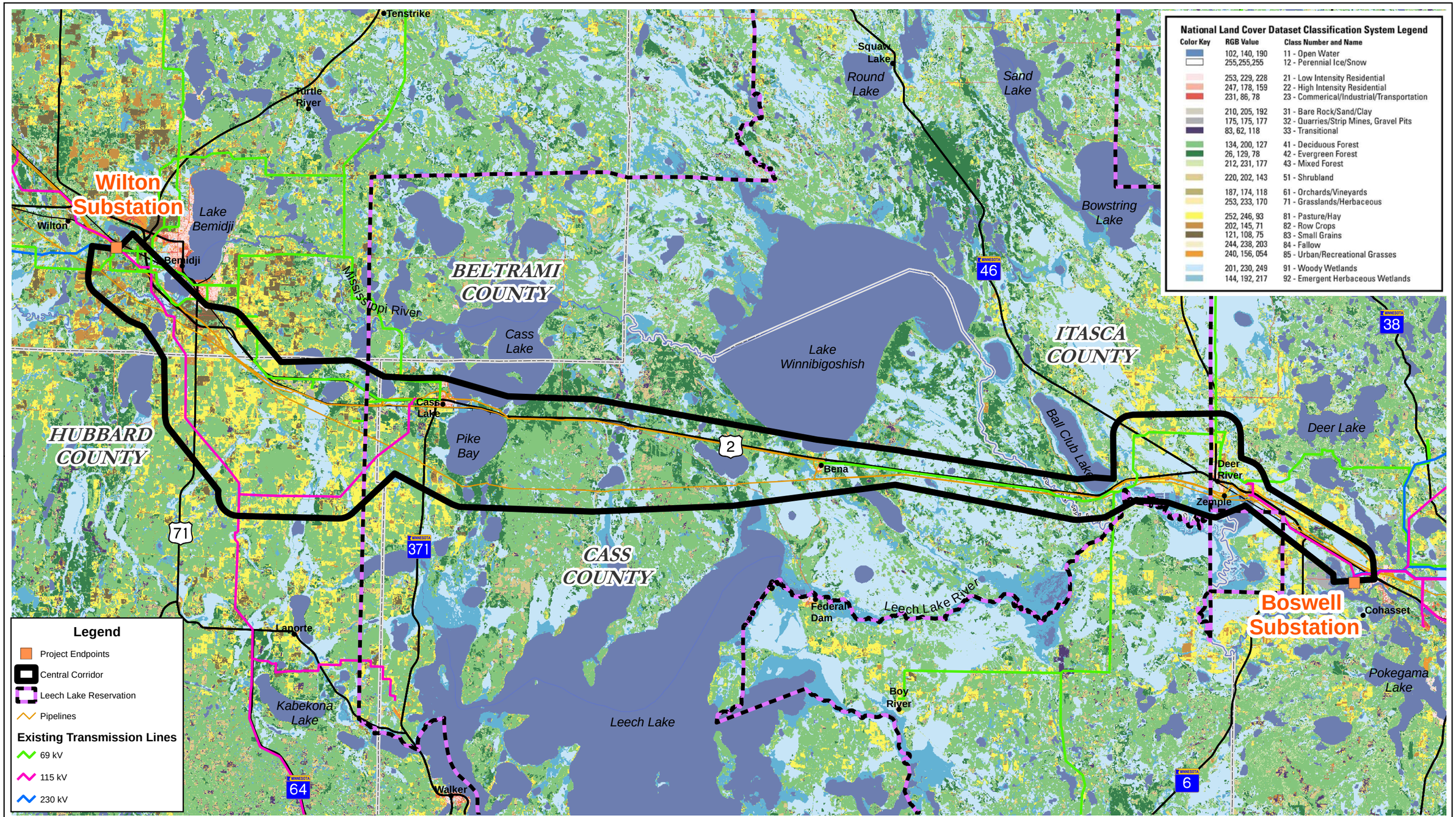

0 5 10
Miles

Figure 9 - Central Corridor Land Cover Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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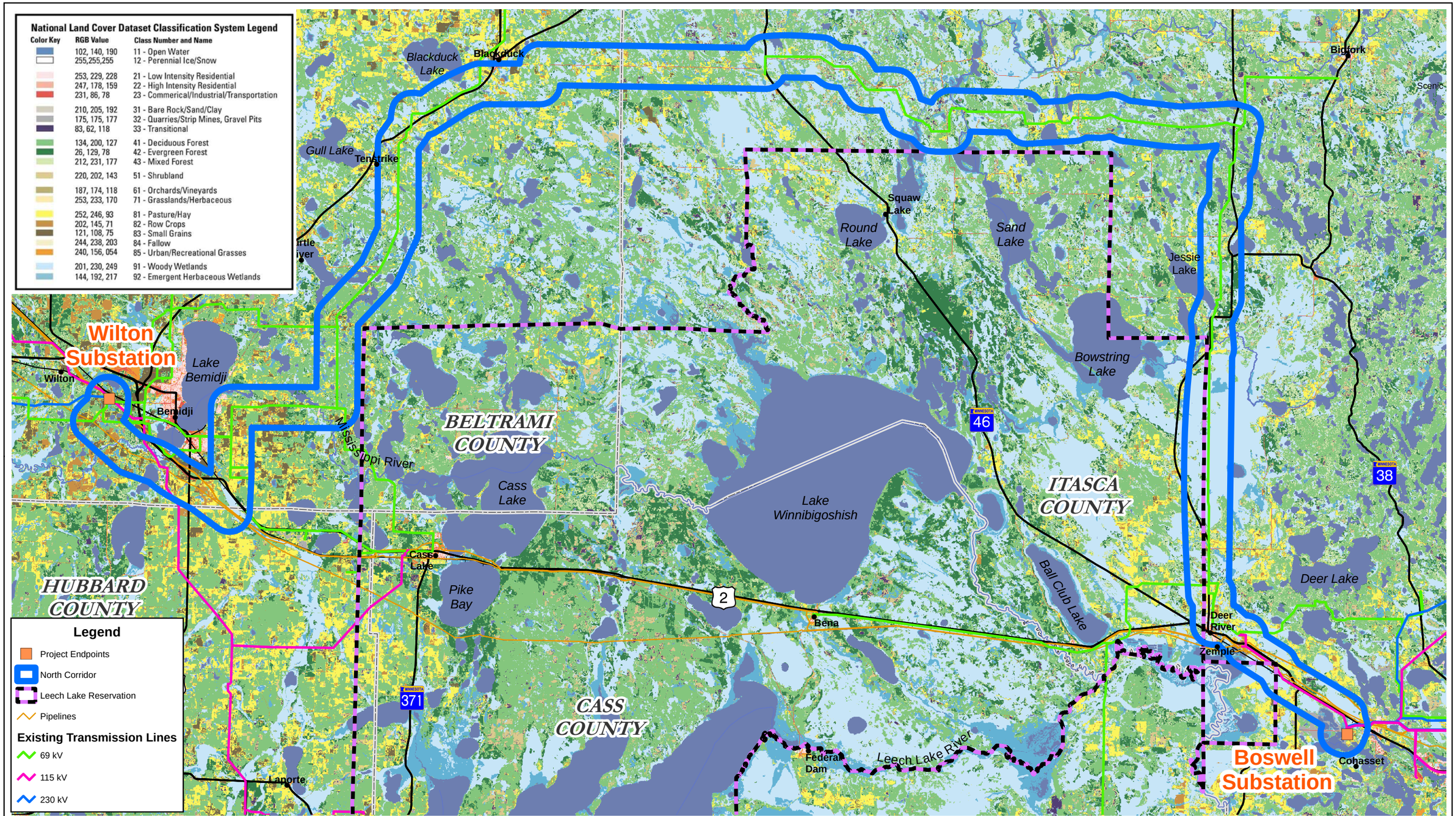

Figure 10 - North Corridor Land Cover Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020 Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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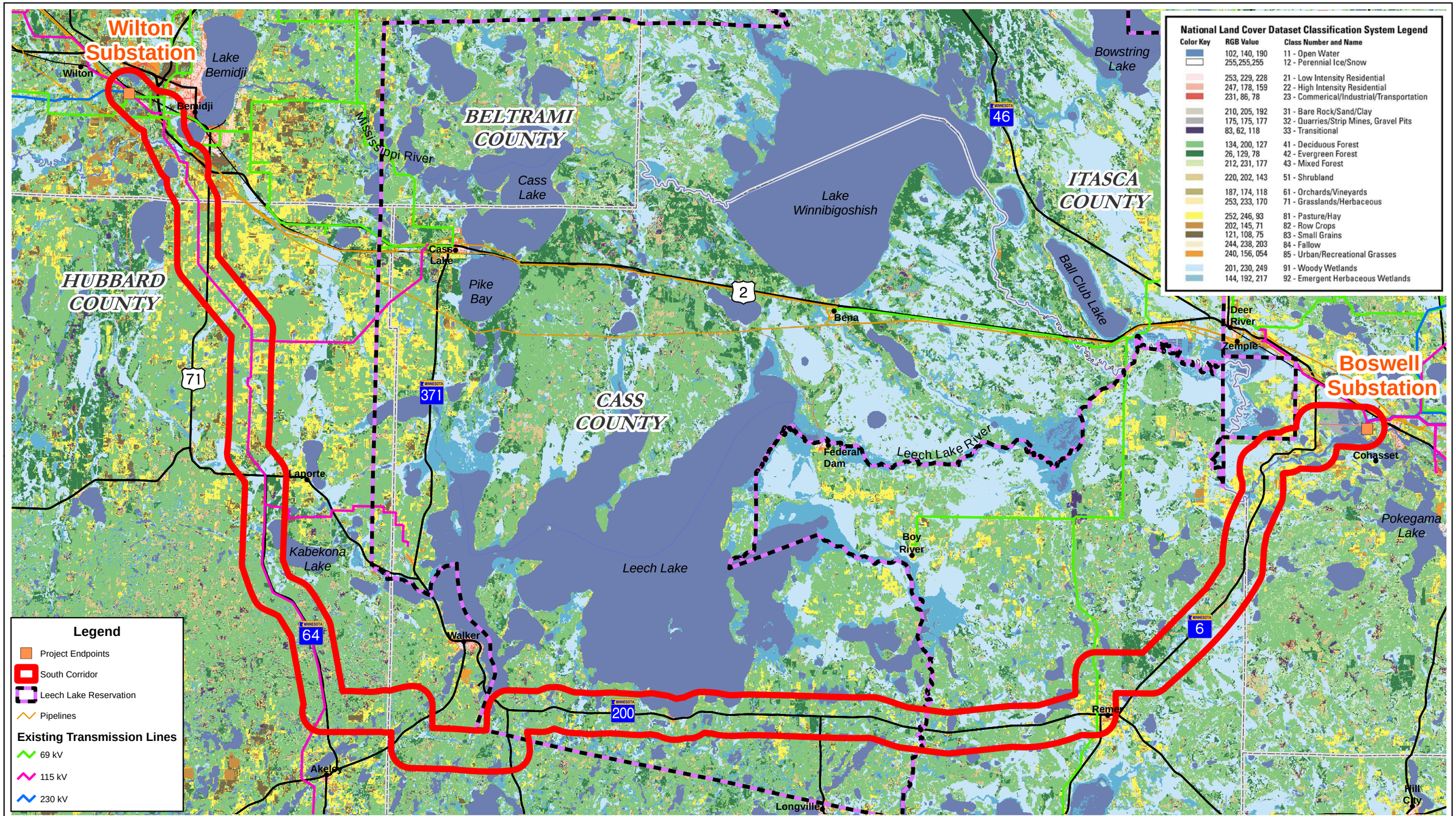

0 5 10
Miles

Figure 11 - South Corridor Land Cover Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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Wilton Substation

Boswell Substation

Legend

- Project Endpoints
- Central Corridor
- Leech Lake Reservation
- Pipelines
- Chippewa NF Species of Concern

Rare or Unique Resources

- Threatened or Endangered
- Special Concern
- Community

0 5 10 Miles

Figure 12 - Central Corridor Species of Concern Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020 Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

Map Document: (N:\GISProj\Ottertail\48496\map_docs\mxd\RUS_apps\macro_corridor\report\Special_edition\map_11x17L_species_concern_maps.mxd)
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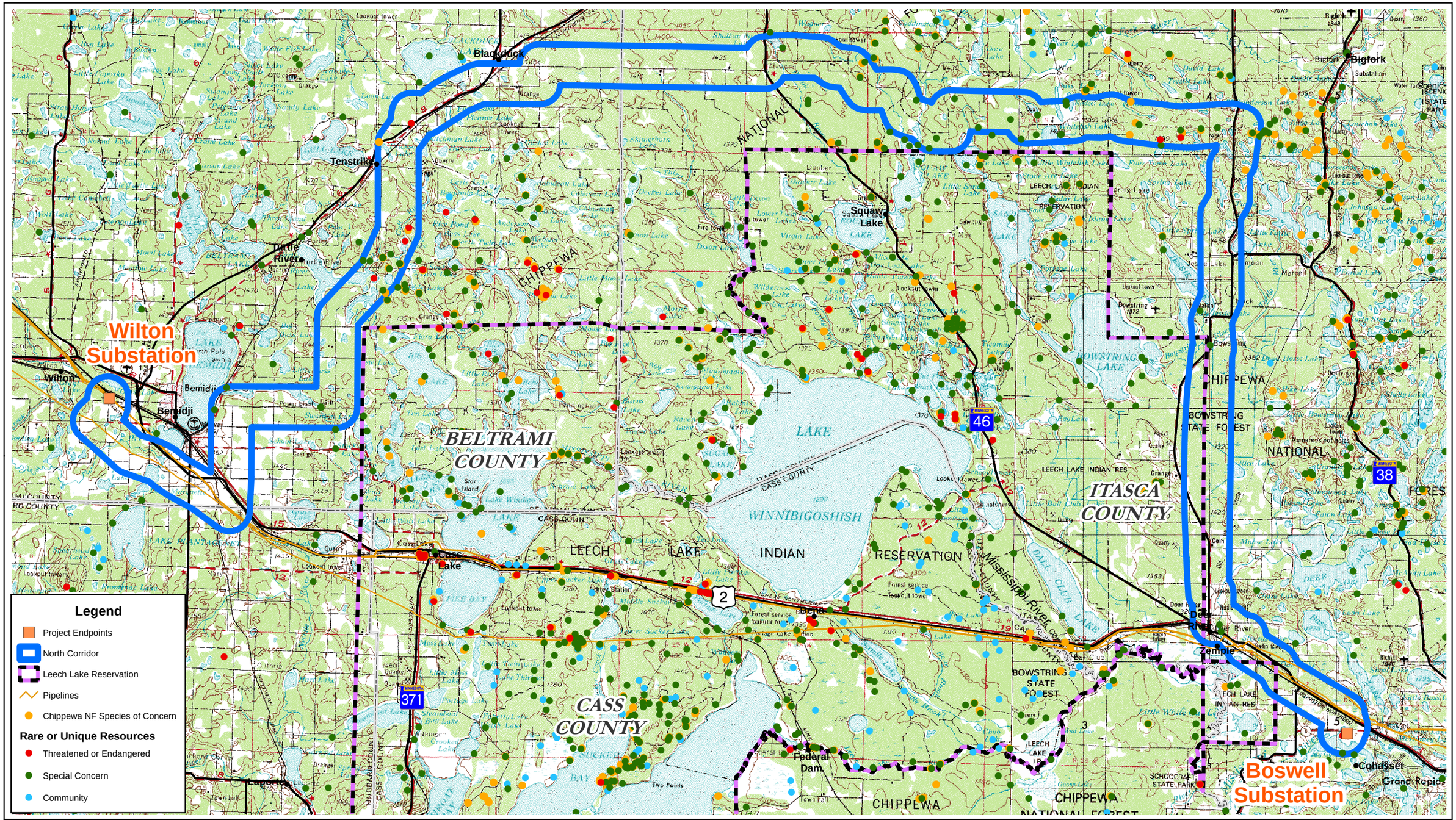

Figure 13 - North Corridor Species of Concern Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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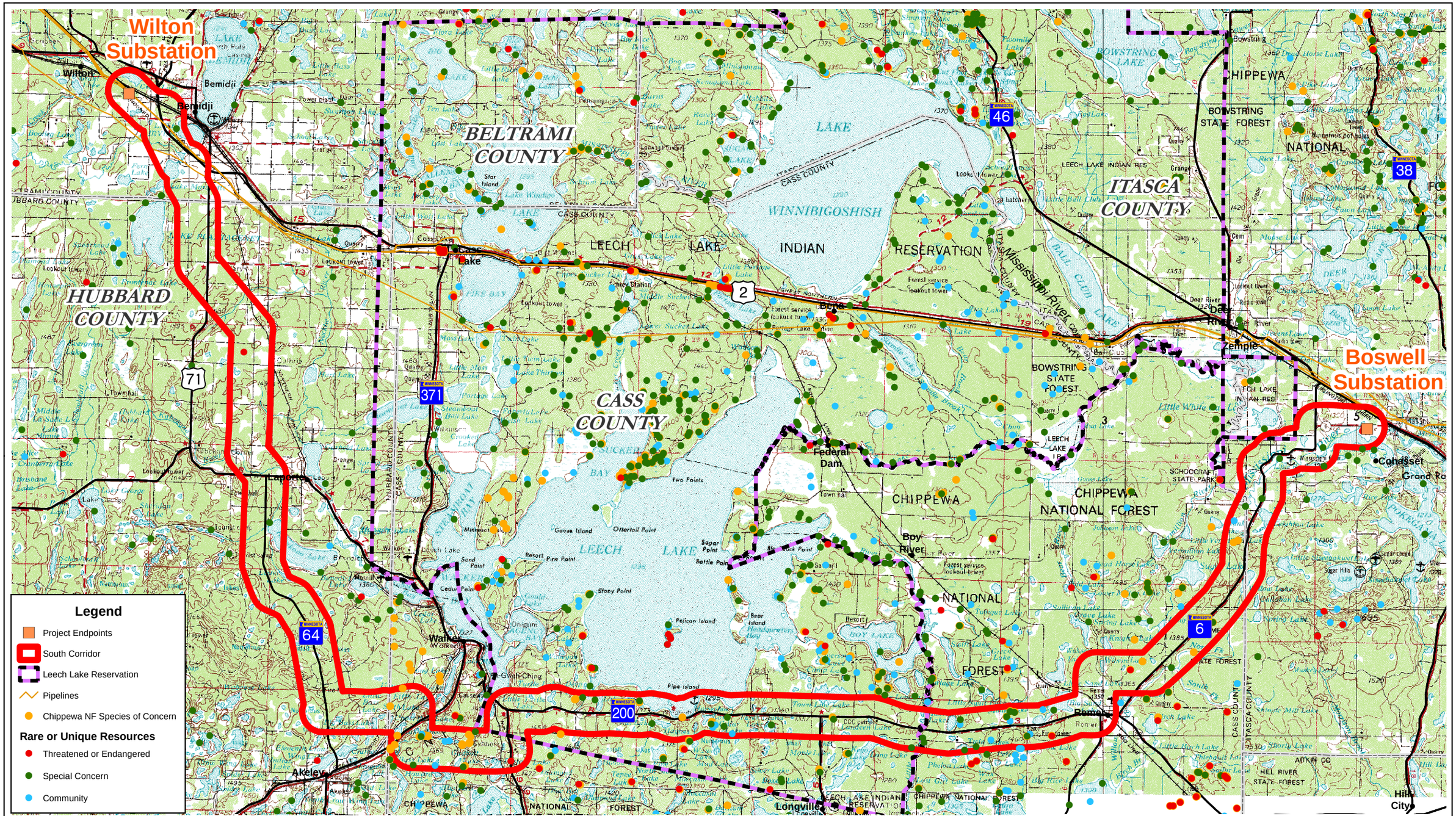

Figure 14 - South Corridor Species of Concern Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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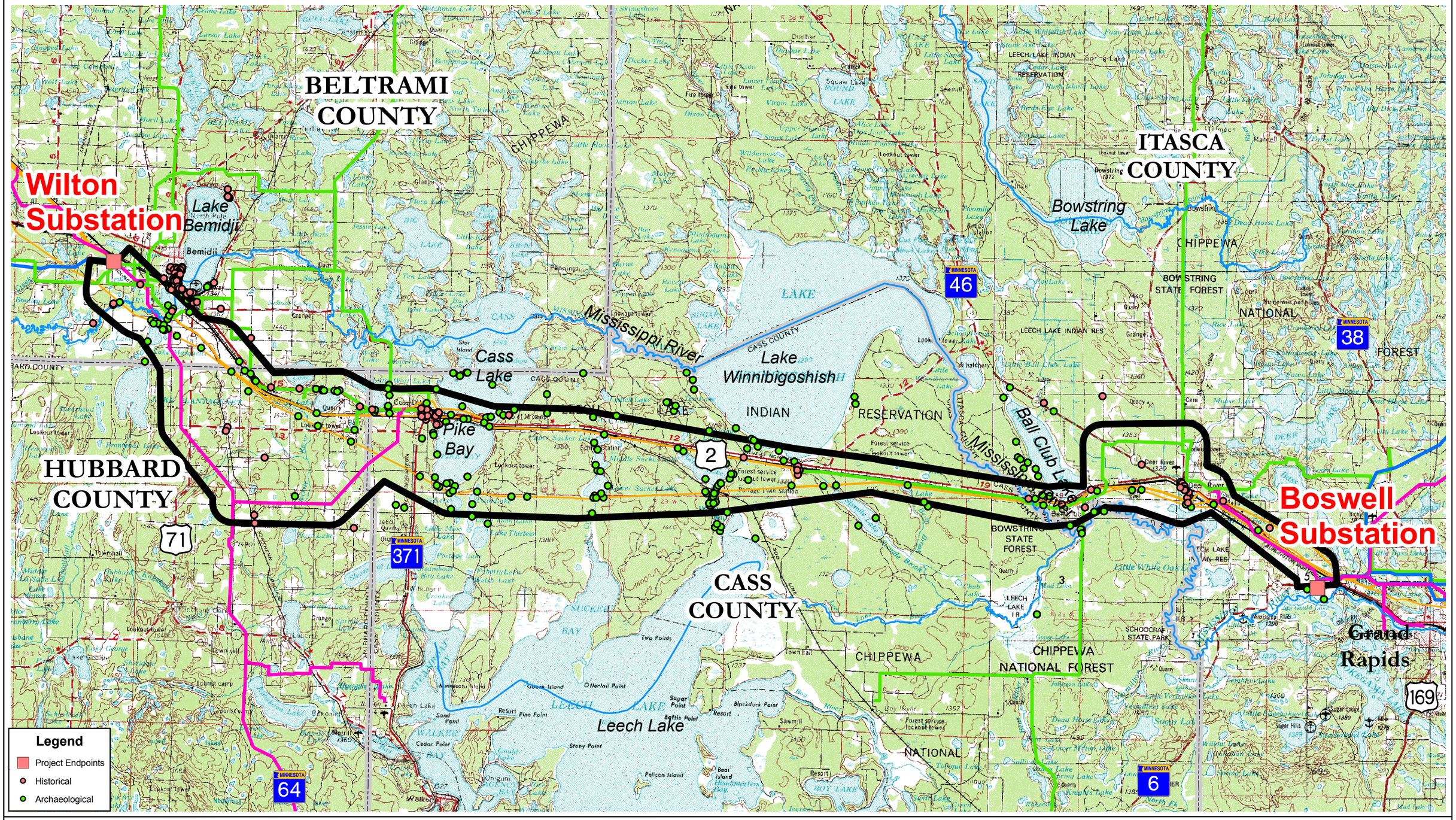

0 5
Miles

Figure 15 - Central Corridor Historic and Archeological Site Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company & Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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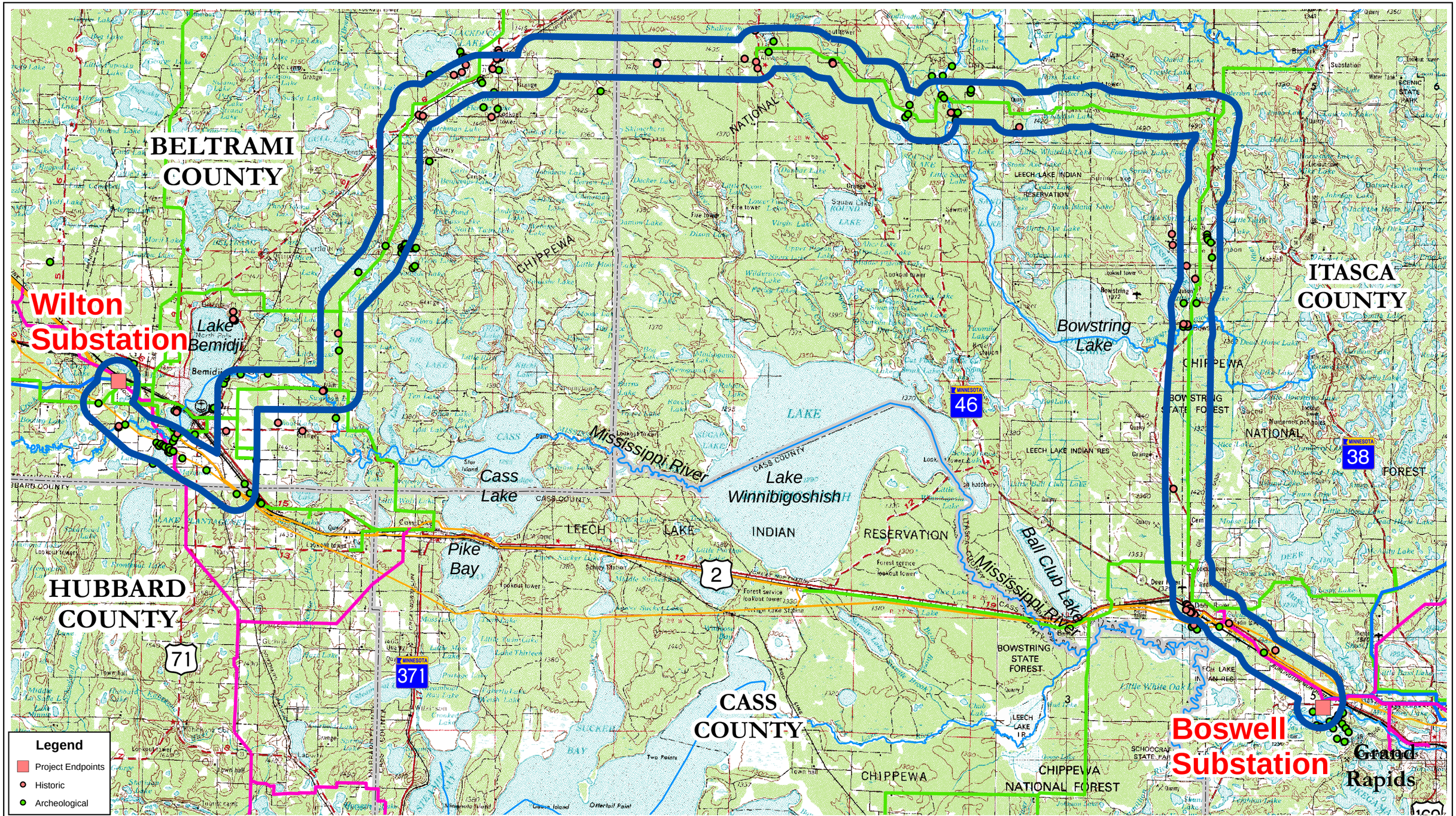

Figure 16 - North Corridor Historic and Archeological Site Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company & Minnesota Power

CapX2020 Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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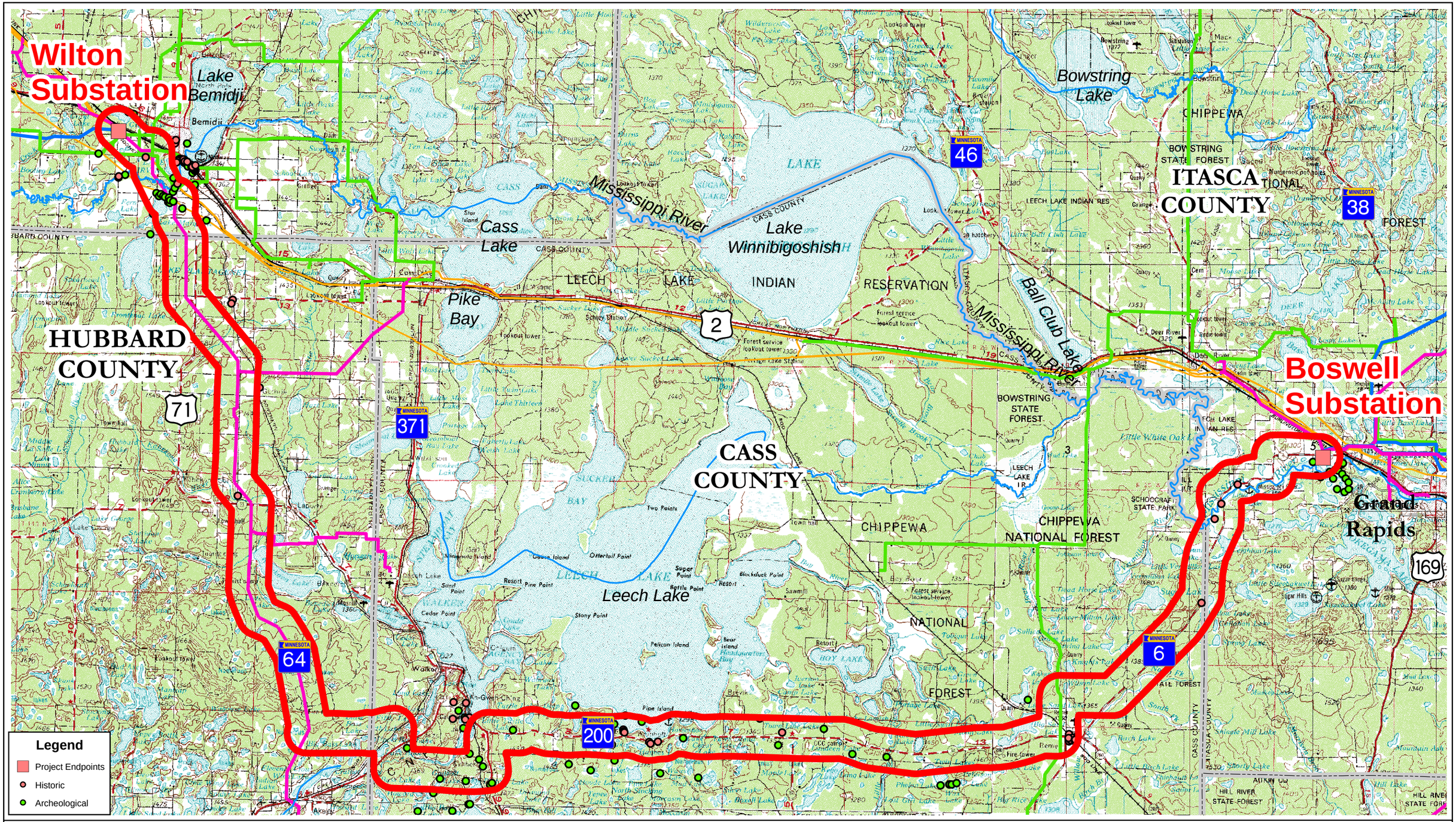

Figure 17 - South Corridor Historic and Archeological Site Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company & Minnesota Power

CapX2020 Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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Tenstrike
Turtle River
Wilton Substation
Wilton
Lake Bemidji S.P.
Lake Bemidji
Bemidji
Bemidji Slough WMA
Wolf Lake WMA
Cass Lake
Pike Bay
HUBBARD COUNTY
71
Birch Creek WMA
Laporte
Morph Meadows WMA
Big Lake
PENNINGTON BOG SNA
BELTRAMI COUNTY
Sugar Lake WMA
Lake Winnibigoshish
Nature's Lake WMA
Squaw Lake
Sand
Bowstring Lake
46
Bowstring Deer Yard WMA
ITASCA COUNTY
38
Mississippi River
Ball Club Lake
2
Bena
HOLE-IN-THE-BOG PEATLAND SNA
Deer River
Zemple
Deer Lake
Balsam-Deer Islands WMA
WABU WOODS SNA
BOTANY BOG SNA
371
Steamboat WMA
CASS COUNTY
Federal Dam
Mud Goose WMA
Schoolcraft S.P.
Boswell Substation
Bass Brook WMA
Cohasset
CHISHOLM POINT ISLAND SNA
Nesbitt Island WMA
Leech Lake
Boy River
Willow Lake Deer Yard WMA
6
Walker

Legend

- Project Endpoints
- Central Corridor
- Leech Lake Reservation
- CNF Administrative Boundary
- MN DNR SNA
- Wildlife Management Area
- State Park
- Snowmobile Trails

CNF Trails

- Bike Trail
- Walking, Hiking, and Interpretive Trails

State Trails

- Paul Bunyan
- Heartland

N

0 5 10

Miles

Figure 18 - Central Corridor Parks, Trails, and Natural Areas Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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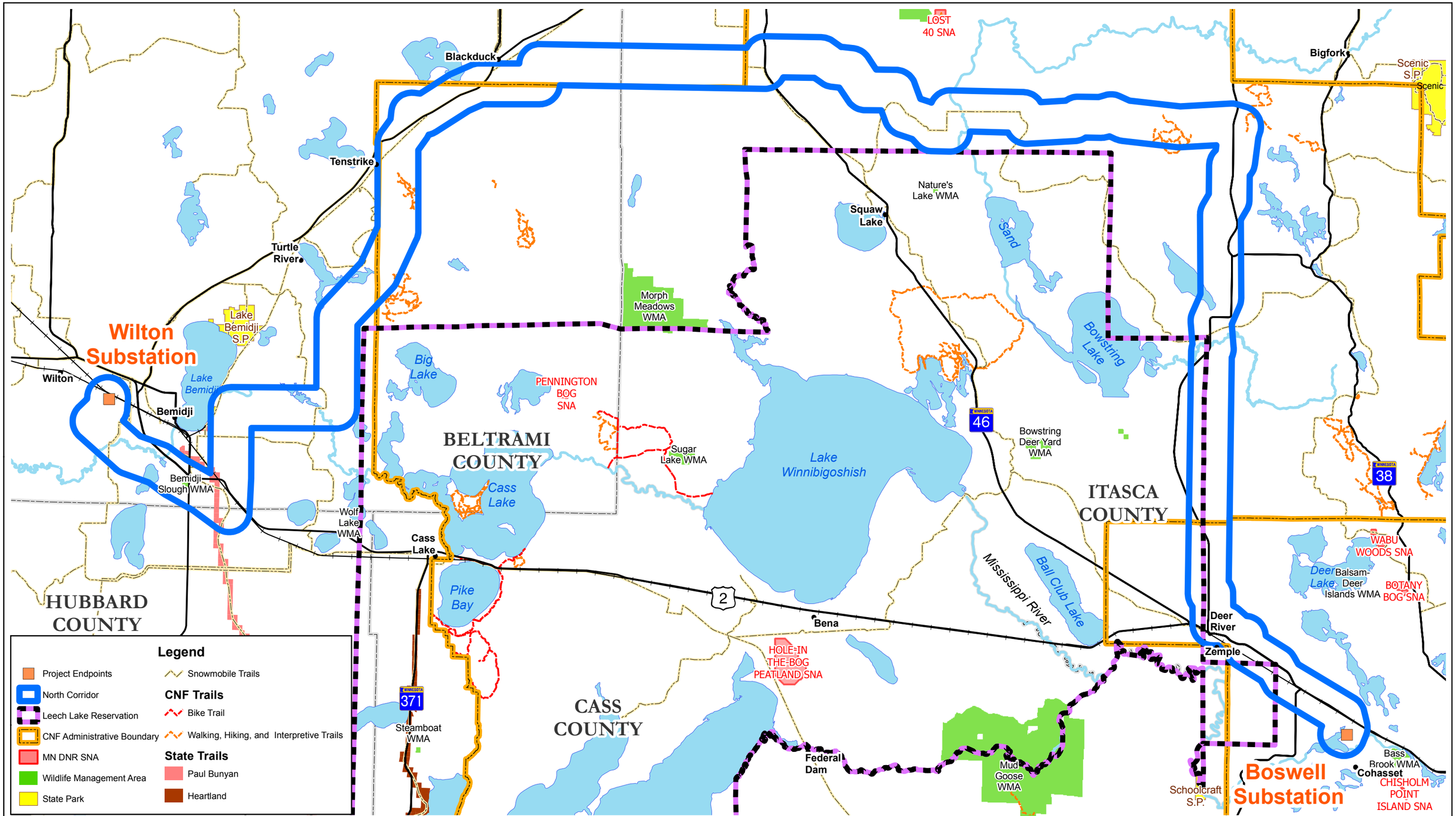

0 5 10
Miles

Figure 19 - North Corridor Parks, Trails, and Natural Areas Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

Map Document: (N:\GISProj\Ottertail\48496\map_docs\mxd\RUS_apps\macro_corridor\report\Special_edition\map_11x17L_parks&trails_maps.mxd)
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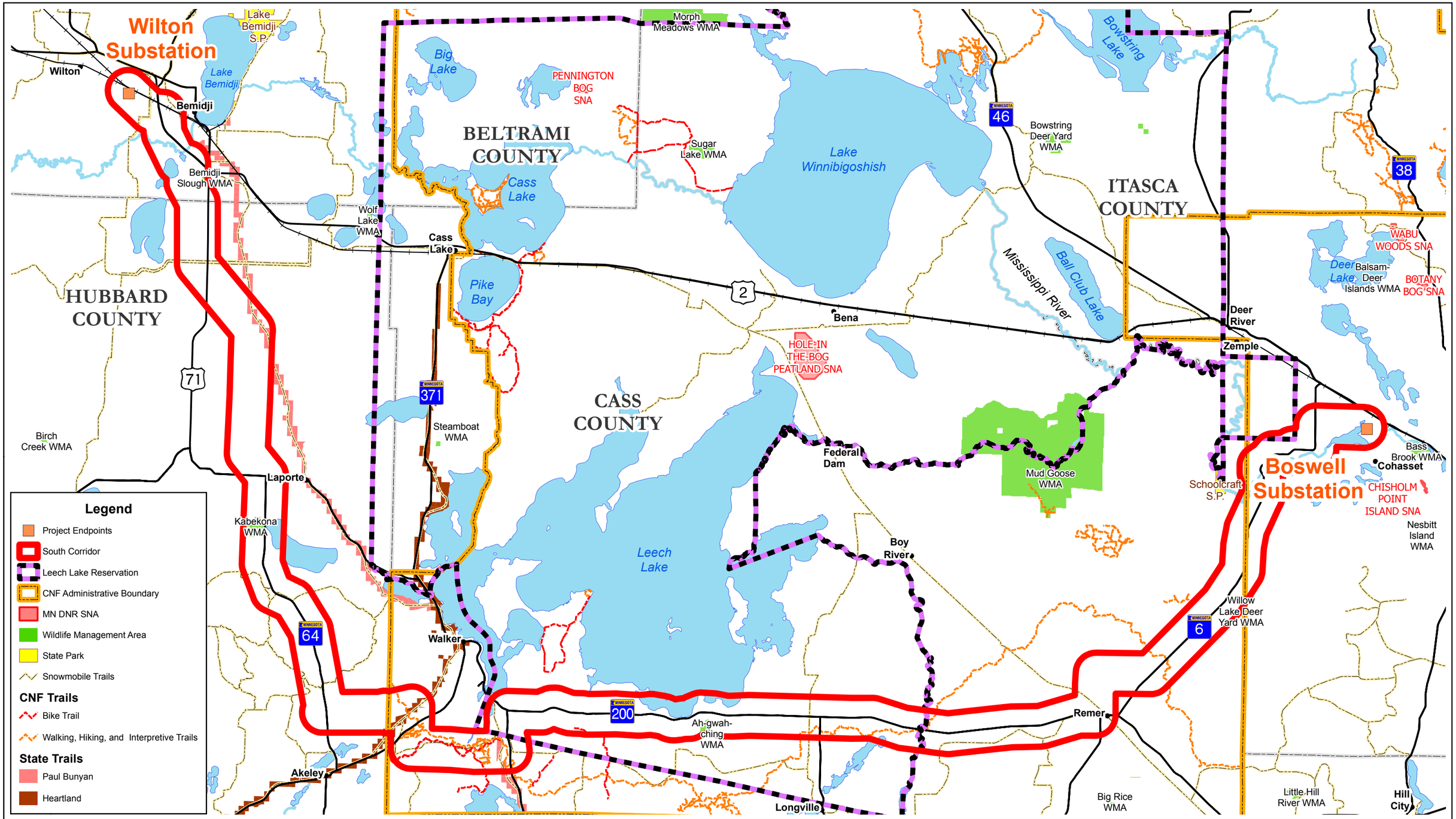

0 5 10
Miles

Figure 20 - South Corridor Parks, Trails, and Natural Areas Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

Map Document: (N:\GIS\Proj\Ottertail\48496\map_docs\mxd\RUS_apps\macro_corridor\report\Special_edition\map_11x17L_parks&trails_maps.mxd)
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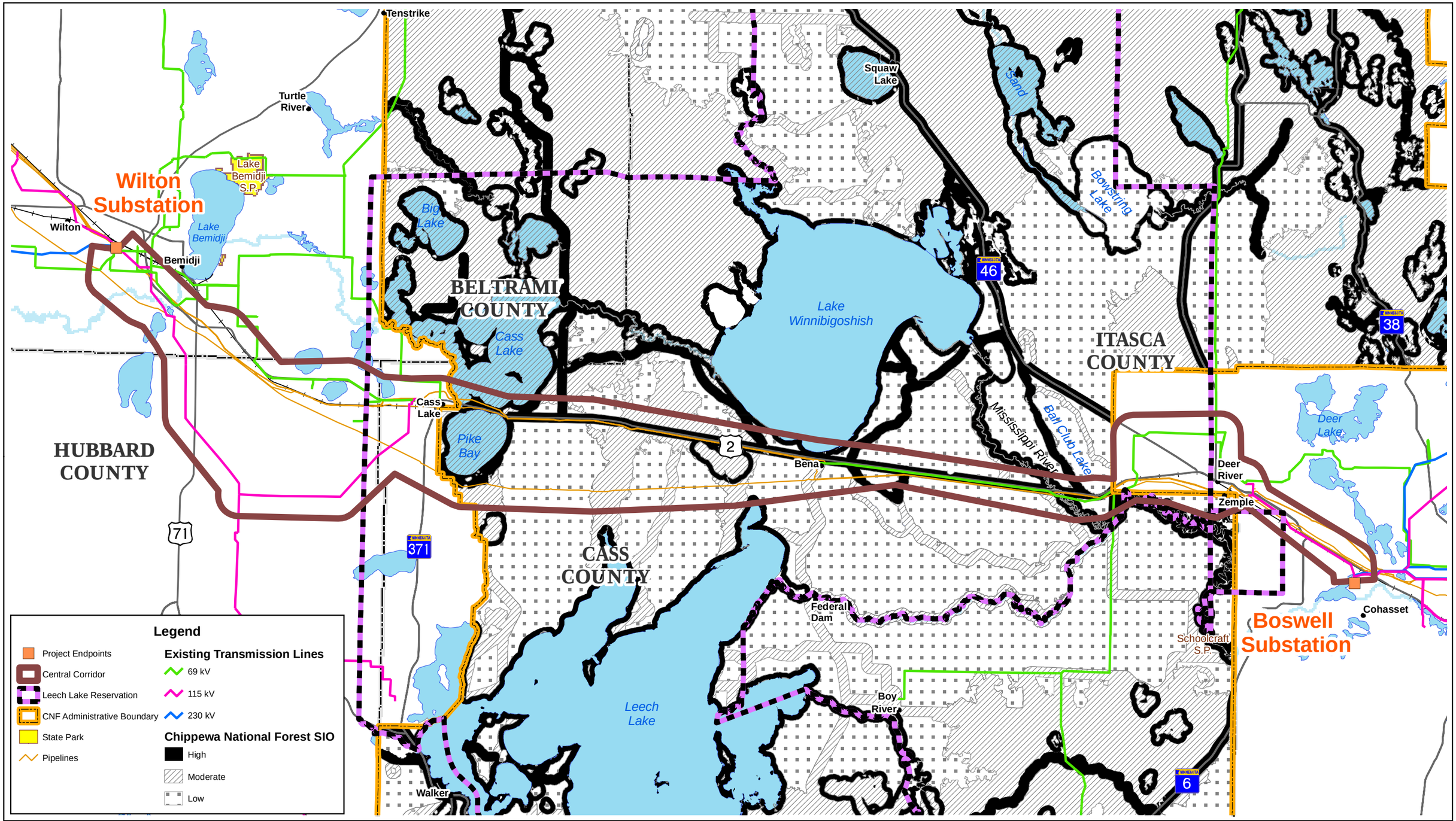

Figure 21 - Central Corridor Chippewa National Forest Scenic Integrity Objectives Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

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Blackduck
Tenstrike
Turtle River
Wilton Substation
Lake Bemidji S.P.
Wilton
Bemidji
Lake Bemidji
Big Lake
BELTRAMI COUNTY
Cass Lake
Cass Lake
Pike Bay
HUBBARD
CASS COUNTY
Squaw Lake
Sand
Bowstring Lake
Lake Winnibigoshish
46
ITASCA COUNTY
Bigfork
Scenic S.P.
Scenic
Deer Lake
Deer River
Zemple
Mississippi River
Bail Club Lake
2
Bena
371
Federal Dam
Schoolcraft S.P.
Cohasset
Boswell Substation
38

Legend

- Project Endpoints
- North Corridor
- Leech Lake Reservation
- CNF Administrative Boundary
- State Park
- Pipelines

Existing Transmission Lines

- 69 kV
- 115 kV
- 230 kV

Chippewa National Forest SIO

- High
- Moderate
- Low

0 5 10
Miles

Figure 22 - North Corridor Chippewa National Forest Scenic Integrity Objectives Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020
Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

Map Document: (N:\GISProj\Ottertail\48496\map_docs\mxd\RUS_apps\macro_corridor\report\Special_edition\map_11x17L_SIO_maps.mxd)
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Wilton Substation

Boswell Substation

HUBBARD COUNTY

BELTRAMI COUNTY

CASS COUNTY

ITASCA COUNTY

Lake Bemidji S.P.

Lake Bemidji

Big Lake

Cass Lake

Pike Bay

Lake Winnibigoshish

Bowstring Lake

Mississippi River

Bath Club Lake

Deer Lake

Leech Lake

Schoolcraft S.P.

Wilton

Bemidji

Cass Lake

Bena

Deer River

Zemple

Cohasset

Federal Dam

Laporte

Boy River

Walker

Remer

Akeley

Longville

Hill City

MINNESOTA 46

MINNESOTA 38

2

71

MINNESOTA 371

MINNESOTA 64

MINNESOTA 200

MINNESOTA 6

Legend

- Project Endpoints
- South Corridor
- Leech Lake Reservation
- CNF Administrative Boundary
- State Park
- Pipelines

Existing Transmission Lines

- 69 kV
- 115 kV
- 230 kV

Chippewa National Forest SIO

- High
- Moderate
- Low

0 5 10

Miles

Figure 23 - South Corridor Chippewa National Forest Scenic Integrity Objectives Map
230 kV Bemidji to Grand Rapids Transmission Line Project
Minnkota Power Cooperative, Otter Tail Power Company and Minnesota Power

CapX2020 Delivering electricity you can rely on

Bemidji-Grand Rapids 230-kV line

Map Document: (N:\GISProj\Ottertail\48496\map_docs\mxd\RUS_apps\macro_corridor\report\Special_edition\map_11x17L_SIO_maps.mxd)
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Appendix A

Sensitive natural resources identified within the Four-Macrocorridor Study Area

Sensitive natural resources identified within the North Macrocorridor

North Macrocorridor			Status			
Scientific Name	**Common Name**	**Category**	**Federal**	**State**	**USFS**	**Tribe**
Accipiter gentilis	Northern Goshawk	Bird			S	E
Buteo lineatus	Red-shouldered Hawk	Bird		SC	S	T
Contopus cooperi	Olive-sided Flycatcher	Bird			S	
Cygnus buccinator	Trumpeter Swan	Bird		T	S	E
Falco peregrinus	Peregrine Falcon	Bird		T		
Haliaeetus leucocephalus	Bald Eagle	Bird		SC		T
Oporornis agilis	Connecticut Warbler	Bird			S	
Picoides arcticus	Black-backed Woodpecker	Bird			S	T
Canis lupus	Gray Wolf	Mammal		SC		S
Lasmigona compressa	Creek Heelsplitter	Mollusk		SC	S	S
Ligumia recta	Black Sandshell	Mollusk		SC	S	S
Botrychium lanceolatum	Triangle Moonwort	Plant		T	S	
Botrychium mormo	Goblin Fern	Plant		SC	S	
Botrychium rugulosum	ternate grapefern	Plant		T	S	
Calypso bulbosa	fairy slipper	Plant			S	T
Cypripedium arietinum	Ram's-head Lady's-slipper	Plant		T	S	T
Malaxis brachypoda	white adder's-mouth orchid	Plant			S	
Ranunculus lapponicus	Lapland Buttercup	Plant		SC		T
Sparganium glomeratum	clustered bur-reed	Plant		SC	S	T
Taxus canadensis	Canada yew	Plant			S	S
Utricularia gibba	Humped Bladderwort	Plant				S

* MN = Minnesota DNR, USFS = US Forest Service, USFWS = US Fish & Wildlife Service, Tribe = Leech Lake Band Ojibwa.
** E = Endangered, N = None, S = Sensitive, SC = Special Concern, T = Threatened, U = Undetermined, W = Watch List

Sensitive natural resources identified within the Central Macrocorridor

Central Macrocorridor			Status			
Scientific	**Common**	**Category**	**Federal**	**State**	**USFS**	**Tribe**
Accipiter gentilis	Northern Goshawk	Bird			S	E
Ammodramus leconteii	Le Conte's Sparrow	Bird			S	S
Buteo lineatus	Red-shouldered Hawk	Bird		SC	S	T
Contopus cooperi	Olive-sided Flycatcher	Bird			S	
Dendroica castanea	Bay-breasted Warbler	Bird			S	
Haliaeetus leucocephalus	Bald Eagle	Bird		SC		T
Oporornis agilis	Connecticut Warbler	Bird			S	
Pandion haliaetus	Osprey	Bird				S
Picoides arcticus	Black-backed Woodpecker	Bird			S	T
Setodes guttatus	Caddisfly	Insect		SC		
Spilogale putorius	Eastern Spotted Skunk	Mammal		T		
Lasmigona compressa	Creek Heelsplitter	Mollusk		SC	S	S
Ligumia recta	Black Sandshell	Mollusk		SC	S	S
Botrychium dissectum	Cutleaf Grapefern	Plant			S	T
Botrychium lanceolatum	Triangle Moonwort	Plant		T	S	T
Botrychium minganense	Mingan Moonwort	Plant		SC	WL	T
Botrychium mormo	Goblin Fern	Plant		SC	S	E
Botrychium oneidense	Bluntlobe Grapefern	Plant			S	E
Botrychium pallidum	Pale Moonwort	Plant		E	S	T
Botrychium rugulosum	St. Lawrence Grapefern	Plant		T	S	T
Botrychium simplex	Least Moonwort	Plant		SC	S	T
Calypso bulbosa	Fairy Slipper	Plant			S	T
Cypripedium arietinum	Ram's-head Lady's-slipper	Plant		T	S	T
Eleocharis quinqueflora	Few-flowered Spike-rush	Plant		SC	S	S
Malaxis monophyllos var. brachypoda	White Adder's-mouth	Plant		SC	S	T
Orobanche uniflora	One-flowered Broomrape	Plant		SC	S	T
Sparganium glomeratum	Clustered Bur-reed	Plant		SC	S	T
Taxus canadensis	Canada Yew	Plant			S	S
Waldsteinia fragarioides	Appalachian Barren Strawberry	Plant		SC	WL	S

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Sensitive natural resources identified within the South Macrocorridor

South Macrocorridor			Status			
Scientific	**Common**	**Category**	**Federal**	**State**	**USFS**	**Tribe**
Accipiter gentilis	Northern Goshawk	Bird			S	E
Ammodramus leconteii	Le Conte's Sparrow	Bird			S	S
Ardea herodias	Great Blue Heron	Bird				S
Botaurus lentiginosus	American Bittern	Bird				S
Buteo lineatus	Red-shouldered Hawk	Bird		SC	S	T
Chlidonias niger	Black Tern	Bird				S
Contopus cooperi	Olive-sided Flycatcher	Bird			S	
Dendroica caerulescens	Black-throated Blue Warbler	Bird			S	
Falco peregrinus	Peregrine Falcon	Bird		T		
Haliaeetus leucocephalus	Bald Eagle	Bird		SC		T
Oporornis agilis	Connecticut Warbler	Bird			S	
Pandion haliaetus	Osprey	Bird				S
Picoides arcticus	Black-backed Woodpecker	Bird			S	T
Etheostoma microperca	Least Darter	Fish		SC		
Polycentropus milaca	Caddisfly	Insect		SC		
Canis lupus	Gray Wolf	Mammal		SC		S
Spilogale putorius	Eastern Spotted Skunk	Mammal		T		
Lasmigona compressa	Creek Heelsplitter	Mollusk		SC	S	S
Ligumia recta	Black Sandshell	Mollusk		SC	S	S
Botrychium lanceolatum	Triangle Moonwort	Plant		T	S	T
Botrychium mormo	Goblin Fern	Plant		SC	S	E
Botrychium oneidense	Bluntlobe grapefern	Plant		E	S	E
Botrychium simplex	Least Moonwort	Plant		SC	S	T
Calypso bulbosa	Fairy Slipper	Plant			S	T
Cypripedium arietinum	Ram's head Lady's slipper	Plant		T	S	T
Malaxis monophyllos var. brachypoda	White Adder's-mouth	Plant		SC	S	T
Najas gracillima	Slender Naiad	Plant		SC		S
Potamogeton vaseyi	Vasey's Pondweed	Plant		SC		
Sparganium glomeratum	Clustered Bur-reed	Plant		SC	S	T
Taxus canadensis	Canada yew	Plant			S	S
Emydoidea blandingii	Blanding's Turtle	Reptile		T	S	

* MN = Minnesota DNR, USFS = US Forest Service, USFWS = US Fish & Wildlife Service, Tribe = Leech Lake Band Ojibwa.
** E = Endangered, N = None, S = Sensitive, SC = Special Concern, T = Threatened, U = Undetermined, W = Watch List

Appendix B

Socioeconomic Data for the Counties in the Four-Macrocorridor Study Area

Socioeconomic Data for the Counties in the Four-Macrocorridor Study Area

Socioeconomic Data				
	Beltrami	**Cass**	**Hubbard**	**Itasca**
Population (Year 2000)				
County Population	39,650	27,150	18,376	43,992
1990-2000 County Population Change	15.3%	24.6%	23.0%	7.7%
North Macrocorridor Population	17,122	N/A	2,942	9,651
Central Macrocorridor Population	11,381	4,040	2,942	6,519
South Macrocorridor Population	8,817	7,417	4,850	5,602
Percent of County Population w/in N. Macrocorridor	43.2%	N/A	16.0%	21.9%
Percent of County Population w/in C. Macrocorridor	28.7%	14.9%	16.0%	14.8%
Percent of County Population w/in S. Macrocorridor	22.2%	27.3%	26.4%	12.7%
Households (Year 2000)				
County	14,337	10,893	7,435	17,789
North Macrocorridor	6,379	N/A	1,058	3,721
Central Macrocorridor	4,382	1,473	1,058	2,400
South Macrocorridor	3,482	3,132	1,811	2,074
Percent of county's households w/in N. Macrocorridor	44.5%	N/A	14.2%	20.9%
Percent of county's households w/in C. Macrocorridor	30.6%	13.5%	14.2%	13.5%
Percent of county's households w/in S. Macrocorridor	24.3%	28.8%	24.4%	11.7%
Age (Year 2000)				
Percent 18 years and older	71.3%	75.0%	75.4%	75.6%
Percent 65 years and older	11.7%	18.0%	18.0%	16.8%
Race (Year 2000)				
White				
County	76.7%	86.5%	96.3%	94.6%
North Macrocorridor	86.3%	N/A	92.5%	88.6%
Central Macrocorridor	86.8%	46.3%	92.5%	84.3%
South Macrocorridor	85.4%	88.3%	93.1%	88.9%
Black or African American				
County	0.4%	0.1%	0.2%	0.2%
North Macrocorridor	0.2%	N/A	0.1%	0.2%
Central Macrocorridor	1.0%	0.2%	0.003%	0.1%
South Macrocorridor	0.6%	0.2%	0.1%	0.1%
American Indian and Alaska Native				
County	20.4%	11.5%	2.1%	3.4%
North Macrocorridor	10.4%	N/A	5.4%	9.0%
Central Macrocorridor	8.9%	49.7%	4.6%	12.5%
South Macrocorridor	10.5%	9.0%	4.8%	9.2%
Asian				

Socioeconomic Data				
	Beltrami	**Cass**	**Hubbard**	**Itasca**
County	0.6%	0.3%	0.3%	0.3%
North Macrocorridor	0.4%	N/A	0.2%	0.1%
Central Macrocorridor	0.4%	0.2%	0.7%	0.2%
South Macrocorridor	0.4%	0.2%	0.2%	0.3%
Some other race				
County	0.2%	0.1%	0.2%	0.2%
North Macrocorridor	0.3%	N/A	0.1%	0.1%
Central Macrocorridor	0.3%	0.8%	0.1%	0.4%
South Macrocorridor	0.2%	0.2%	0.1%	0.1%
Two or more races				
County	1.8%	1.5%	0.9%	1.3%
North Macrocorridor	2.4%	N/A	1.6%	2.0%
Central Macrocorridor	2.6%	2.7%	1.7%	2.5%
South Macrocorridor	2.9%	2.1%	1.6%	1.4%
Education				
High school graduate or higher, age +25	83.4%	83.6%	86.1%	85.6%
Bachelor's degree or higher, age +25	23.5%	16.6%	20.2%	17.6%
Home Ownership				
Single-family owner-occupied homes	6,008	5,388	3,416	9,294
Income (1999)				
Median household income	$33,392	$34,332	$35,321	$36,234
Per capita income	$15,497	$17,189	$18,115	$17,717
Individuals below poverty level **(Year 2000)**				
County	17.6%	13.6%	9.7%	10.6%
North Macrocorridor	11.3%	N/A	8.9%	12.3%
Central Macrocorridor	14.1%	24.2%	8.9%	13.4%
South Macrocorridor	17.1%	15.2%	9.5%	8.3%
Employment (2006)				
Average Unemployment*	5.1%	6.2%	5.4%	5.9%

**Minnesota 2006 State Unemployment Average is 4.0%*

Note: *Study Area specific data is based upon Census blocks; some portions of the Census block may lie outside of the Study Area.*

Source: *U.S. Census Bureau and Minnesota Department of Employment and Economic Development.*

Appendix C

Community GAP Analysis Cover by Macrocorridor

Community GAP Analysis Cover by Corridor

Corridor	Macro Community	Micro Community	Total Acres	Percentage of Community	Percentage of Corridor	*Approx. Millage
North	Conifer Forest	Lowland Black Spruce	9403.81	44.01%	6.38%	7.40
		Lowland Northern White-Cedar	2659.10	12.45%	1.80%	2.09
		Pine	5073.65	23.75%	3.44%	3.99
		Spruce/Fir	1547.79	7.24%	1.05%	1.22
		Stagnant Conifer	5.56	0.03%	0.00%	0.00
		Tamarack	1163.12	5.44%	0.79%	0.91
		Upland Cedar	764.11	3.58%	0.52%	0.60
		Upland Conifer	748.30	3.50%	0.51%	0.59
	Conifer Forest Total		**21365.44**	**100.00%**	**14.49%**	**16.81**
	Conifer-Deciduous mix	Lowland Conifer-Deciduous mix	2548.23	82.74%	1.73%	2.00
		Pine-Deciduous mix	499.19	16.21%	0.34%	0.39
		Spruce/Fir-Deciduous mix	32.25	1.05%	0.02%	0.03
	Conifer-Deciduous mix Total		**3079.67**	**100.00%**	**2.09%**	**2.42**
	Deciduous Forest	Aspen/White Birch	40769.14	65.14%	27.64%	32.07
		Black Ash	1302.80	2.08%	0.88%	1.02
		Lowland Deciduous	5270.25	8.42%	3.57%	4.15
		Maple/Basswood	3480.72	5.56%	2.36%	2.74
		Oak	595.60	0.95%	0.40%	0.47
		Upland Deciduous	11172.36	17.85%	7.58%	8.79
	Deciduous Forest Total		**62590.87**	**100.00%**	**42.44%**	**49.23**
	Non-Forest	Aquatic	7309.04	12.09%	4.96%	5.75
		Barren	94.91	0.16%	0.06%	0.07
		Cropland	23458.12	38.81%	15.91%	18.45
		Developed	2445.59	4.05%	1.66%	1.92
		Grassland	680.58	1.13%	0.46%	0.54
		Lowland Shrub	16045.43	26.55%	10.88%	12.62
		Marsh	6339.62	10.49%	4.30%	4.99
		Upland Shrub	4069.23	6.73%	2.76%	3.20
	Non-Forest Total		**60442.52**	**100.00%**	**40.98%**	**47.54**
	North Corridor Total		**147478.49**	**--**	**100.00%**	**116.00**
Central	Conifer Forest	Lowland Black Spruce	4316.04	15.18%	2.46%	1.68
		Lowland Northern White-Cedar	2809.91	9.88%	1.60%	1.09
		Pine	15389.31	54.12%	8.79%	5.98
		Spruce/Fir	2174.88	7.65%	1.24%	0.84
		Tamarack	1283.03	4.51%	0.73%	0.50
		Upland Cedar	1273.07	4.48%	0.73%	0.49
		Upland Conifer	1190.02	4.18%	0.68%	0.46
	Conifer Forest Total		**28436.26**	**100.00%**	**16.24%**	**11.04**
	Conifer-Deciduous mix	Lowland Conifer-Deciduous mix	3173.52	79.63%	1.81%	1.23
		Pine-Deciduous mix	763.20	19.15%	0.44%	0.30
		Spruce/Fir-Deciduous mix	48.51	1.22%	0.03%	0.02
	Conifer-Deciduous mix Total		**3985.23**	**100.00%**	**2.28%**	**1.55**
	Deciduous Forest	Aspen/White Birch	40145.48	58.53%	22.92%	15.59
		Black Ash	927.96	1.35%	0.53%	0.36
		Lowland Deciduous	4353.60	6.35%	2.49%	1.69
		Maple/Basswood	4179.59	6.09%	2.39%	1.62
		Oak	1760.25	2.57%	1.01%	0.68
		Upland Deciduous	17221.17	25.11%	9.83%	6.69
	Deciduous Forest Total		**68588.05**	**100.00%**	**39.16%**	**26.63**
	Non-Forest	Aquatic	14243.51	19.21%	8.13%	5.53
		Cropland	27130.66	36.60%	15.49%	10.53
		Developed	3836.67	5.18%	2.19%	1.49
		Grassland	777.36	1.05%	0.44%	0.30
		Lowland Shrub	14473.71	19.53%	8.26%	5.62
		Marsh	8441.53	11.39%	4.82%	3.28
		Upland Shrub	5224.10	7.05%	2.98%	2.03
	Non-Forest Total		**74127.55**	**100.00%**	**42.33%**	**28.78**
	Grand Total		**175137.09**	**-**	**100.00%**	**68.00**
South	Conifer Forest	Lowland Black Spruce	1967.70	15.24%	1.53%	1.53
		Lowland Northern White-Cedar	1361.50	10.55%	1.06%	1.06
		Pine	6985.83	54.12%	5.43%	5.43
		Spruce/Fir	431.08	3.34%	0.33%	0.33
		Stagnant Conifer	52.07	0.40%	0.04%	0.04
		Tamarack	1787.17	13.85%	1.39%	1.39
		Upland Cedar	62.07	0.48%	0.05%	0.05
		Upland Conifer	259.90	2.01%	0.20%	0.20
	Conifer Forest Total		**12907.32**	**100.00%**	**10.03%**	**10.03**
	Conifer-Deciduous mix	Lowland Conifer-Deciduous mix	184.02	45.95%	0.14%	0.14
		Pine-Deciduous mix	209.37	52.28%	0.16%	0.16
		Spruce/Fir-Deciduous mix	7.12	1.78%	0.01%	0.01
	Conifer-Deciduous mix Total		**400.50**	**100.00%**	**0.31%**	**0.31**
	Deciduous Forest	Aspen/White Birch	53948.88	77.47%	41.91%	41.91
		Black Ash	1307.66	1.88%	1.02%	1.02
		Lowland Deciduous	894.04	1.28%	0.69%	0.69
		Maple/Basswood	3989.26	5.73%	3.10%	3.10
		Oak	5815.46	8.35%	4.52%	4.52
		Upland Deciduous	3686.67	5.29%	2.86%	2.86
	Deciduous Forest Total		**69641.96**	**100.00%**	**54.11%**	**54.11**
	Non-Forest	Aquatic	8994.42	19.65%	6.99%	6.99
		Cropland	14798.44	32.34%	11.50%	11.50
		Developed	1808.85	3.95%	1.41%	1.41
		Grassland	2695.59	5.89%	2.09%	2.09
		Lowland Shrub	6700.98	14.64%	5.21%	5.21
		Marsh	5128.09	11.21%	3.98%	3.98
		Upland Shrub	5638.78	12.32%	4.38%	4.38
	Non-Forest Total		**45765.13**	**100.00%**	**35.56%**	**35.56**
	Grand Total		**128714.92**		**100.00%**	**100.00**

*Approx. Millage equals length of transmission line multiplied by portion of total corridor acreage. It does not represent actual impacts expected and is intended only to be used for comparisons between corridors.