Bemidji-Grand Rapids

230-kV line

Application for a Route Permit for the Bemidji to Grand Rapids 230 kV Transmission Line Project

June 4, 2008

Docket No.
E017, E015, ET-6 TL-07-1327

Prepared by HDR Engineering, Inc.
for
Otter Tail Power Company
Minnesota Power
Minnkota Power Cooperative, Inc.

CapX2020
Delivering electricity you can rely on

Route Permit Application

Bemidji-Grand Rapids
230 kV Line

Otter Tail Power Company

Minnesota Power

Minnkota Power Cooperative, Inc

Docket No: E017, E015, ET-6 TL-07-1327

June 4, 2008

HDR

Table of Contents

1.0 Executive Summary 1-1
1.1 Route 1 (Applicants' Preferred Route) 1-2
1.2 Route 2 1-3
1.3 Transmission Line Structures 1-3
1.4 Associated Facilities 1-4
1.5 Costs 1-5
1.6 Potential Environmental Impacts 1-5
1.7 Conclusion 1-7
2.0 Introduction 2-1
2.1 Summary of Proposed Action 2-1
2.1.1 Project Location and Description 2-1
2.1.2 Associated Facilities 2-3
2.2 Proposed Project Ownership 2-5
2.2.1 Project Applicants 2-5
2.2.2 Other Project Owners 2-5
3.0 Purpose and Need for Project 3-1
3.1 Need Analysis for the Project 3-1
3.2 Need Analysis for an Upgraded or New Substation in the Cass Lake Area 3-2
3.3 Evaluation of Future Needs 3-4
4.0 Agency Actions and Regulatory Approvals 4-1
4.1 Federal Process 4-1
4.2 State Process 4-2
4.2.1 Minnesota Public Utilities Commission 4-2
4.2.2 Office of Energy Security – Energy Facility Permitting 4-3
4.3 Agency Decisions 4-4
4.3.1 Minnesota Public Utilities Commission Decisions 4-4
4.3.2 Federal Agency Decisions 4-4
4.4 Environmental Permits, Approvals, and Decisions 4-4
4.4.1 Federal Approvals 4-5
4.4.2 State Approvals 4-6
4.4.3 Local Actions 4-7
5.0 Development and Screening of Alternatives 5-1

5.1 Project Alternatives 5-1
5.1.1 Generation and Electrical System Alternatives 5-1
5.1.2 Macrocorridor Alternatives 5-1
5.2 Double-Circuiting Options 5-5
5.3 Alternatives Considered But Eliminated 5-5
5.3.1 No Build Alternative 5-6
5.3.2 Generation and Other Transmission Alternatives 5-6
5.3.3 Macrocorridor Alternatives 5-6
5.3.4 Transmission Technology Alternatives 5-9
6.0 Proposed Action and Alternatives 6-1
6.1 Route Selection Process 6-1
6.2 Route and Segment Descriptions 6-2
6.2.1 Route 1 6-3
6.2.2 Route 1A 6-5
6.2.3 Route 1B 6-5
6.2.4 Route 1C 6-6
6.2.5 Route 2 6-6
6.2.6 Route 2C 6-8
6.3 Crossover Segments 6-8
6.4 Double-Circuiting 6-8
6.5 Mississippi River Crossing Alternatives 6-10
6.5.1 Route Alternatives 6-10
6.5.2 69 kV Double-Circuit Crossing 6-10
6.6 Segment Alternatives Considered but Eliminated 6-10
6.6.1 Underground Alternative Crossing 6-14
6.7 Transmission Structure Design and Right-of-Way 6-16
6.8 Substation Design 6-21
6.8.1 Wilton Substation 6-21
6.8.2 Boswell Substation 6-21
6.8.3 New or Expanded Substation in the Cass Lake Area 6-21
6.8.4 Nary Breaker Station 6-22
6.9 Right-of-Way Acquisition 6-22
6.9.1 Transmission Line Right-of-Way 6-22

6.9.2 Substation Property 6-24
6.10 Preconstruction Activities 6-24
6.11 Construction Procedures 6-24
6.11.1 Transmission Line 6-24
6.11.2 Substations 6-27
6.12 Maintenance and Operation 6-27
6.12.1 Transmission Line 6-27
6.12.2 Substations 6-28
6.13 Environmental Protection Measures 6-28
6.14 Estimated Costs 6-29
6.15 Project Schedule 6-30
6.16 Summary of Impacts by Alternative 6-30
7.0 Environmental Review Methods and Regulations 7-1
7.1 Land Use 7-2
7.2 Human Settlement 7-2
7.3 Noise 7-3
7.4 Aesthetics 7-3
7.5 Socioeconomic Factors 7-5
7.6 Environmental Justice 7-5
7.7 Cultural Values 7-6
7.8 Public Services 7-6
7.9 Radio, Television, and Cellular Phone 7-7
7.10 Electric and Magnetic Fields 7-7
7.11 Archaeological and Historic Resources 7-7
7.12 Geomorphic and Physiographic Environment 7-7
7.13 Climate 7-7
7.14 Soils 7-7
7.15 Air Quality 7-7
7.16 Water Resources and Floodplains 7-8
7.17 Wetlands 7-8
7.18 Flora 7-9
7.19 Fauna 7-9
7.20 Noxious Weeds & Exotic Organisms 7-9

7.21 Rare and Unique Species and Communities 7-9
7.21.1 Federally-listed Threatened and Endangered Species 7-10
7.21.2 State-listed Species and Rare Natural Features 7-10
7.21.3 US Forest Service Sensitive Species 7-10
7.21.4 Tribal Sensitive Species 7-10
7.22 Recreation and Tourism 7-10
7.23 Agricultural Production 7-10
7.24 Transportation 7-11
7.25 Forestry 7-11
7.26 Mining 7-11
8.0 Affected Environment and Environmental Consequences……..8-1
8.1 Land Use 8.1-1
8.1.1 Existing Conditions 8.1-1
8.1.2 Direct/Indirect Effects 8.1-4
8.1.3 Direct/Indirect Effects within the Leech Lake Reservation 8.1-4
8.1.4 Direct/Indirect Effects within the Chippewa National Forest 8.1-5
8.1.5 Mitigation 8.1-6
8.2 Human Settlement 8.2-1
8.2.1 Existing Conditions 8.2-1
8.2.2 Direct/Indirect Effects 8.2-1
8.2.3 Direct/Indirect Effects within the Leech Lake Reservation 8.2-2
8.2.4 Direct/Indirect Effects within the Chippewa National Forest 8.2-2
8.2.5 Mitigation 8.2-3
8.3 Noise……...8.3-1
8.3.1 Existing Conditions 8.3-1
8.3.2 Direct/Indirect Effects 8.3-2
8.4 Aesthetics……8.4-1
8.4.1 Existing Conditions 8.4-1
8.4.2 Direct/Indirect Effects 8.4-1
8.4.3 Direct/Indirect Effects within the Leech Lake Reservation 8.4-3
8.4.4 Direct/Indirect Effects within the Chippewa National Forest 8.4-3
8.4.5 Mitigation 8.4-4
8.5 Socioeconomic Factors……...8.5-1

8.5.1 Existing Conditions 8.5-1
8.5.2 Direct/Indirect Effects 8.5-2
8.5.3 Direct/Indirect Effects within the Leech Lake Reservation 8.5-3
8.5.4 Direct/Indirect effects within Chippewa National Forest-managed Property 8.5-3
8.5.5 Mitigation 8.5-3
8.6 Environmental Justice 8.6-1
8.6.1 Existing Conditions 8.6-1
8.6.2 Direct/Indirect Effects 8.6-4
8.6.3 Comparison of Alternatives 8.6-7
8.6.4 Public Involvement and Mitigation 8.6-7
8.7 Cultural Values 8.7-1
8.7.1 Existing Conditions 8.7-1
8.7.2 Direct/Indirect Effects 8.7-2
8.7.3 Mitigation 8.7-3
8.8 Public Services 8.8-1
8.8.1 Existing Conditions 8.8-1
8.8.2 Direct/Indirect Effects 8.8-1
8.8.3 Mitigation 8.8-2
8.9 Radio, Television, and Cellular Phone 8.9-1
8.9.1 Existing Conditions 8.9-1
8.9.2 Direct/Indirect Effects 8.9-3
8.9.3 Mitigation 8.9-3
8.10 Electric and Magnetic Fields 8.10-1
8.10.1 Existing Conditions 8.10-1
8.10.2 Direct/Indirect Effects 8.10-2
8.10.3 Mitigation 8.10-3
8.11 Archaeological and Historic Resources 8.11-1
8.11.1 Existing Conditions 8.11-1
8.11.2 Direct/Indirect Effects 8.11-2
8.11.3 Direct/Indirect Effects within the Leech Lake Reservation 8.11-2
8.11.4 Direct/Indirect Effects within the Chippewa National Forest 8.11-3
8.11.5 Mitigation 8.11-3

8.12 Geomorphic and Physiographic Environment 8.12-1
8.12.1 Existing Conditions 8.12-1
8.12.2 Direct/Indirect Effects 8.12-1
8.12.3 Mitigation 8.12-2
8.13 Climate 8.13-1
8.13.1 Existing Conditions 8.13-1
8.13.2 Direct/Indirect Effects 8.13-1
8.13.3 Mitigation 8.13-1
8.14 Soils 8.14-1
8.14.1 Existing Conditions 8.14-1
8.14.2 Direct/Indirect Effects 8.14-4
8.14.3 Direct/Indirect Effects within the Leech Lake Reservation 8.14-4
8.14.4 Direct/Indirect Effects within the Chippewa National Forest 8.14-5
8.14.5 Mitigation 8.14-5
8.15 Air Quality 8.15-1
8.15.1 Existing Conditions 8.15-1
8.15.2 Direct/Indirect Effects 8.15-2
8.15.3 Mitigation 8.15-3
8.16 Water Resources 8.16-1
8.16.1 Existing Conditions 8.16-1
8.16.2 Direct/Indirect Effects 8.16-3
8.16.3 Direct/Indirect Effects within the Leech Lake Reservation 8.16-5
8.16.4 Direct/Indirect Effects within the Chippewa National Forest 8.16-5
8.16.5 Mitigation 8.16-5
8.17 Wetlands 8.17-1
8.17.1 Existing Conditions 8.17-1
8.17.2 Direct/Indirect Effects 8.17-3
8.17.3 Direct/Indirect Effects within the Leech Lake Reservation 8.17-4
8.17.4 Mitigation 8.17-5
8.18 Flora 8.18-1
8.18.1 Existing Conditions 8.18-1
8.18.2 Direct/Indirect Effects 8.18-1
8.18.3 Direct/Indirect Effects within Leech Lake Reservation 8.18-2

8.18.4 Forestry Direct/Indirect Effects within the Chippewa National Forest. 8.18-3
8.18.5 Mitigation 8.18-4
8.19 Fauna…….8.19-1
8.19.1 Existing Conditions 8.19-1
8.19.2 Direct/Indirect Effects 8.19-1
8.19.3 Mitigation 8.19-2
8.20 Noxious Weeds and Exotic Organisms……..8.20-1
8.20.1 Existing Conditions 8.20-1
8.20.2 Direct and Indirect Effects..... 8.20-2
8.20.3 Mitigation 8.20-3
8.21 Rare and Unique Species and Communities 8.21-1
8.21.1 Existing Conditions 8.21-1
8.21.2 Direct/Indirect Effects 8.21-8
8.21.3 LLBO Species..... 8.21-10
8.21.4 Mitigation 8.21-11
8.22 Recreation and Tourism..... 8.22-1
8.22.1 Existing Conditions 8.22-1
8.22.2 Direct/Indirect Effects 8.22-3
8.22.3 Mitigation 8.22-5
8.23 Agricultural Production..... 8.23-1
8.23.1 Existing Conditions 8.23-1
8.23.2 Direct/Indirect Effects – All Routes 8.23-2
8.23.3 Direct/Indirect Effects within the Leech Lake Reservation..... 8.23-3
8.23.4 Direct/Indirect Effects within the Chippewa National Forest..... 8.23-3
8.23.5 Mitigation 8.23-3
8.24 Transportation and Pipeline Facilities……..8.24-1
8.24.1 Existing Conditions 8.24-1
8.24.2 Direct/Indirect Effects 8.24-3
8.24.3 Mitigation 8.24-4
8.25 Forestry……...8.25-1
8.25.1 Existing Conditions 8.25-1
8.25.2 Direct/Indirect Effects 8.25-2
8.25.3 Direct/Indirect Effects within the Leech Lake Reservation..... 8.25-3

8.25.4 Direct/Indirect Effects to CNF-managed Property 8.25-3
8.25.5 Mitigation 8.25-5
8.26 Mining 8.26-1
8.26.1 Existing Conditions 8.26-1
8.26.2 Direct/Indirect Effects 8.26-1
8.26.3 Mitigation 8.26-1
8.27 Preferred Route (Route 1) 8.27-1
9.0 Cumulative Impacts 9-1
9.1 Regulatory Requirement 9-1
9.2 Analytical Approach 9-1
9.3 Valued Environmental Components 9-2
9.4 Temporal and Spatial Boundaries 9-4
9.5 Past, Present, and Reasonably Foreseeable Activities 9-4
9.5.1 Transmission Lines 9-4
9.5.2 Substations/Breaker Station 9-4
9.5.3 Roadway Infrastructure 9-5
9.5.4 Pipelines 9-5
9.5.5 Energy Corridors 9-5
9.6 Analysis Matrix 9-6
10.0 Other Required Considerations 10-1
10.1 Unavoidable Adverse Environmental Impacts 10-1
10.1.1 Land Use 10-1
10.1.2 Aesthetics 10-1
10.1.3 Environmental Justice 10-1
10.1.4 Soils 10-1
10.1.5 Wetlands 10-1
10.1.6 Flora 10-1
10.1.7 Fauna/Rare and Unique Species and Communities 10-2
10.1.8 Recreation and Tourism 10-2
10.1.9 Agricultural Production 10-2
10.1.10 Forestry 10-2
10.2 Short-term Uses of the Environment 10-2
10.3 Irreversible and Irretrievable Commitments of Resources 10-3

11.0 Public Participation and Agency Coordination 11-1

12.0 List of References 12-1

List of Tables

Table 4-1 List of Possible Permits and Decisions 4-4

Table 5-1 Summary of Potential Impacts in the North, Central, South, and Non-CNF Macrocorridors 5-4

Table 5-2 Summary of Identified Resources Located Within the North, Central, South, and Non-CNF Macrocorridors 5-5

Table 6-1 Route 1 Segments 6-3

Table 6-2 Route 1A Segments Varying from Route 1 6-5

Table 6-3 Route 1B Segments Varying from Route 1 6-5

Table 6-4 Route 1C Segments Varying from Route 1 6-6

Table 6-5 Route 2 Segments 6-6

Table 6-6 Potential Double-Circuiting Opportunities 6-9

Table 6-7 Eliminated Route Segments 6-11

Table 6-8 Transmission Line Construction Costs 6-29

Table 7-1 Route Characteristics 7-1

Table 7-2 Assumed Model Parameters for Single-Circuit 7-3

Table 7-3 Assumed Model Parameters for Double-Circuit 7-3

Table 8-1 Summary of Potential Impacts and Effects within the 125-foot ROW 8-1

Table 8-2 Proposed Mitigation Measures 8-6

Table 8.1-1 Route Acreage 8.1-1

Table 8.1-2 GAP Land Cover Types within the 1,000-foot Routes 8.1-3

Table 8.1-3 Acres of Land Affected within the 125-foot ROW Area 8.1-4

Table 8.1-4 Acres of LLR Affected within the 125-foot ROW 8.1-5

Table 8.1-5 Acres of CNF-managed Land Affected within the 125-foot ROW 8.1-5

Table 8.2-1 Residences within the 1,000-foot Routes 8.2-1

Table 8.2-2 Residences within the 1,000-foot Routes in the Leech Lake Reservation 8.2-2

Table 8.2-3 Residences within the 1,000-foot Routes on Chippewa National Forest-managed Lands 8.2-2

Table 8.3-1 Common Noise Sources and Levels 8.3-1

Table 8.3-2 MPCA Noise Limits by Noise Area Classification (dBA) 8.3-2

Table 8.4-1 Scenic Integrity Objective Areas within 1,000-foot Routes 8.4-1

Table 8.4-2 Scenic Integrity Objective Rating of Scenic Resources within Routes 8.4-2
Table 8.4-3 Scenic Integrity Objective Areas within LLR Boundaries within Routes..... 8.4-3
Table 8.4-4 Scenic Integrity Objective Areas within CNF-managed Land within Routes… 8.4-4
Table 8.5-1 Leading County Industries..... 8.5-1
Table 8.6-1 Racial Composition..... 8.6-1
Table 8.6-2 Poverty Level and Income in 2000..... 8.6-2
Table 8.6-3 Racial and Poverty Status by Block Group in the Study Area..... 8.6-3
Table 8.6-4 Limited English Proficiency 8.6-4
Table 8.6-5 Routes 1, 1A, 1B, and 1C - Minority Persons by Census Block Group 8.6-4
Table 8.6-6 Routes 1, 1A, 1B, and 1C - Poverty Level by Census Block Group 8.6-5
Table 8.6-7 Routes 2 and 2C - Minority Persons by Census Block Group..... 8.6-5
Table 8.6-8 Routes 2 and 2C - Poverty Level by Census Block Group..... 8.6-6
Table 8.6-9 Summary of Affected Environmental Justice Communities 8.6-7
Table 8.8-1 Public Services Located in Proximity to the Study Area..... 8.8-1
Table 8.11-1 Cultural Resources Identified within the Study Area..... 8.11-1
Table 8.11-2 Cultural Resources Identified within the LLR Portion of the Study Area….. ..... 8.11-3
Table 8.11-3 Cultural Resources Identified within the CNF-managed Portion of the Study Area 8.11-3
Table 8.14-1 Soil Associations within the Study Area 8.14-2
Table 8.14-2 Effects upon Soils within the Right-of-way..... 8.14-4
Table 8.14-3 Effects upon Soils within the LLR Portion of the Right-of-way..... 8.14-5
Table 8.14-4 Effects upon Soils within Chippewa National Forest-managed Right-of-way 8.14-5
Table 8.15-1 National and Minnesota Ambient Air Quality Standards 8.15-2
Table 8.16-1 PWI Waterbodies within the Study Area 8.16-1
Table 8.16-2 Water Resources with Designated Impairments in the Study Area..... 8.16-2
Table 8.16-3 PWI Basins Identified within the 125-foot Right-of-way 8.16-3
Table 8.16-4 PWI Watercourses Crossed by the 125-foot Right-of-way 8.16-4
Table 8.17-1 NWI Wetlands Identified within the 1,000-foot Routes..... 8.17-2
Table 8.17-2 PWI Wetlands Identified within the 1,000-foot Routes..... 8.17-3
Table 8.17-3 Estimated Wetland Impacts within the 125-foot Right-of-way..... 8.17-4
Table 8.17-4 NWI Wetland Complexes that Cannot be Spanned..... 8.17-4

Table 8.17-5 Estimated Wetland Impacts within the LLR Portion of the Right-of-way . 8.17-4
Table 8.17-6 NWI Wetland Complexes that cannot be Spanned within the LLR 8.17-5
Table 8.18-1 Landcover Types within the Study Area (acres) 8.18-1
Table 8.18-2 Landcover Types within the 125-foot Right-of-way (acres) 8.18-2
Table 8.18-3 Landcover Types within LLR Right-of-way (acres) 8.18-2
Table 8.18-4 CNF-managed Forest Stands within the Right-of-way (acres) 8.18-3
Table 8.18-5 CNF Landscape Ecosystems within in the Right-of-way (acres) 8.18-4
Table 8.19-1 Length of Cross-country Segments Included in Each Route 8.19-2
Table 8.20-1 MN Primary and County-Selected Secondary Noxious Weeds 8.20-1
Table 8.20-2 Noxious Weeds Tracked within Chippewa National Forest 8.20-2
Table 8.21-1 Number of Occurrences of Rare and Unique Species within each 1,000-foot Route 8.21-2
Table 8.21-2 Number of State Listed Species Recorded within each Route 8.21-4
Table 8.21-3 Number of LLBO Listed Species Recorded within each Route 8.21-4
Table 8.21-4 Number of USFS RFSS Listed Species Recorded within each Route 8.21-4
Table 8.21-5 USFS List of Major Threats to *Botrychium* Species and Habitat Features 8.21-7
Table 8.21-6 Records of State Listed Species within the 125-foot Right-of-Way 8.21-9
Table 8.21-7 Records of LLBO Listed Species within the 125-foot Right-of-Way 8.21-10
Table 8.21-8 Records of USFS RFSS Listed Species within the 125-foot Right-of-Way 8.21-11
Table 8.22-1 Recreational Resources within the Study Area 8.22-2
Table 8.22-2 Potential Direct Effects to Recreation 8.22-4
Table 8.23-1 1997 and 2002 Agricultural Census Data 8.23-1
Table 8.23-2 Agricultural Production Effects for the Right-of-way 8.23-2
Table 8.23-3 Agricultural Production Effects within the LLR 8.23-3
Table 8.23-4 Agricultural Production Effects for CNF-managed Lands 8.23-3
Table 8.25-1 Forested Landcover within each Route 8.25-2
Table 8.25-2 Forest Impacts with the 125-foot Right-of-way 8.25-2
Table 8.25-3 Forest Impacts within the Leech Lake Reservation 8.25-3
Table 8.25-4 Forest Impacts within CNF-managed Property 8.25-4
Table 8.25-5 CNF Management Areas within the 125-foot Right-of-way 8.25-4
Table 9-1 Interaction Matrix 9-6
Table 9-2 Cumulative Interaction Criteria 9-8
Table 11-1 Public and agency meetings held for the Project 11-1

List of Graphics

Graphic 4-1 Project Timeline 4-9
Graphic 6-1 Typical 230 kV H-Frame 6-18
Graphic 6-2 Typical 230 kV Single-Pole Structure 6-19
Graphic 6-3 Typical 230/115 kV Single-Pole Double-Circuit Structure 6-20

List of Maps

Map 2-1 Project Overview 2-2
Map 5-1 North, Central, South, and Non-CNF Macrocorridors 5-2

List of Figures

Figure 1 ..... Overview

Figure 2 ..... Land Cover

Figure 3 ..... Scenic Integrity Objectives

Figure 4 ..... Minority Population

Figure 5 ..... Population Below Poverty Level

Figure 6 ..... Surface Waters/Wetlands

Figure 7 ..... Sensitive Resources

Figure 8 ..... Project Infrastructure

Figure 9 ..... Recreational Areas

Figure 10 ..... Soils

Figure 11 ..... CNF Management Areas

List of Appendices

Appendix A ..... Detailed Route Maps

Appendix B ..... Structure Graphics

Appendix C ..... Project Development Agreement and Certificate of Need Outlines

Appendix D ..... Agency Letters

Appendix E ..... Environmental Analysis Tables

Appendix F ..... Noise Analysis

Appendix G ..... Zoning Maps

Appendix H ..... Photos and Photosimulations

Appendix I ..... Electric and Magnetic Fields

Appendix J ..... Property Owners

Appendix K ..... Cultural Resources Draft Plan of Action

Appendix L ..... Flora, Fauna, Rare Species, and Noxious Weeds

List of Acronyms

ACSR	Aluminum conductor, steel reinforced
AES	Alternatives Evaluation Study
AC	Alternating Current
BA	Biological Assessment
BMP	Best Management Practice
BNSF	Burlington Northern Santa Fe
CapX	Capacity Expansion
CSAH	County State Aid Highway
CNF	Chippewa National Forest
DC	Direct Current
DNR	Minnesota Department of Natural Resources
DOC	Minnesota Department of Commerce
DRM	Department of Resource Management
DSM	Demand Side Management
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Maps
GAP	Geographical Analysis Program
GIS	Geographic Information System
gpm	gallons per minute
kV	Kilovolt
LEP	Limited English Proficiency
LGU	Local Government Unit
LLBO	Leech Lake Band of Ojibwe
LLR	Leech Lake Reservation
MCS	Macrocorridor Study
MV	Megavolts

MW	Megawatts
MDL	Minnesota Drift and Lake Plains Ecological Section
MHB	Mississippi Headwaters Board
MN/DOT	Minnesota Department of Transportation
MPCA	Minnesota Pollution Control Agency
MVA	Megavolt Amperes
MVAR	Megavolt Amperes Reactive
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electricity Safety Code
NPDES	National Pollutant Discharge Elimination System Permit
NFIP	National Flood Insurance Program
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
OES	Office of Energy Security
PUC	Minnesota Public Utilities Commission
PVRR	present value of the revenue requirements
PWI	Public Waters Inventory
QCEW	Quarterly Census of Employment and Wages
ROD	Record of Decision
RMCS	Revised Macrocorridor Study
ROC	Region of Concern
ROD	Record of Decision
ROW	Right-of-Way
RPA	Route Permit Application
RUS	Rural Utilities Service
SGR	State Game Refuge
SNA	Scientific and Natural Areas
STATSGO	State Soil Geographic Database
SFRMP	Subsection Forest Resource Management Plan
SGR	State Game Refuge

SSURGO	Soil Survey Geographic Database
THPO	Tribal Heritage Preservation Office
TH	Trunk Highway
TIPS	Transmission Improvement Planning Study
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFSSS	US Forest Service Sensitive Species
USGS	United States Geological Survey
USFWS	United States Fish and Wildlife Service
WIPM	Weed Integrated Pest Management Project
WMA	Wildlife Management Areas

The contents required for an application with the Minnesota Public Utilities Commission (PUC) under the Full Permitting Process are outlined in Minn. Rules 7849.5220. The PUC submittal requirements are listed in the Completeness Checklist table below with cross-references identifying where the information can be found in this application.

Completeness Checklist

Authority	Required Information	Where
7849.5220, Subp. 2	**Route Permit for HVTL.** An application for a route permit for a high voltage transmission line shall contain the following information:	
A.	a statement of proposed ownership of the facility at the time of filing the application and after commercial operation	2.2
B.	the precise name of any person or organization to be initially named as permittee or permittees and the name of any other person to whom the permit may be transferred if transfer of the permit is contemplated	2.2
C.	at least two proposed routes for the proposed high voltage transmission line and identification of the applicant's preferred route and the reasons for the preference	6.2
D.	a description of the proposed high voltage transmission line and all associated facilities including the size and type of the high voltage transmission line	2.1
E.	the environmental information required under 7849.5220, Subp. 3	8.0
F.	identification of land uses and environmental conditions along the proposed routes	8.1
G.	the names of each owner whose property is within any of the proposed routes for the high voltage transmission line	Appendix J
H.	United States Geological Survey topographical maps or other maps acceptable to the chair showing the entire length of the high voltage transmission line on all proposed routes	Appendix A, Figures 1-11
I.	identification of existing utility and public rights-of-way along or parallel to the proposed routes that have the potential to share the riight-of-way with the proposed line	Table 6.1-6.5
J.	the engineering and operational design concepts for the proposed high voltage transmission line, including information on the electric and magnetic fields of the transmission line	Appendix B and I
K.	cost analysis of each route, including the costs of constructing, operating, and maintaining the high voltage transmission line that are dependent on design and route	6.14
L.	a description of possible design options to accommodate expansion of the high voltage transmission line in the future	5.2.2
M.	the procedures and practices proposed for the acquisition and restoration of the right-of-way, construction, and maintenance of the high voltage transmission line	8.0
N.	a listing and brief description of federal, state, and local permits that may be required for the proposed high voltage transmission line	4.0
O.	a copy of the Certificate of Need or the certified HVTL list containing the proposed high voltage transmission line or documentation that an application for a Certificate of Need has been submitted or is not required	Appendix C
7849.5220, Subp. 3	**Environmental information.** An applicant for a site permit or a route permit shall include in the application the following environmental information for each proposed site or route to aid in the preparation of an environmental impcat statement:	
A.	a description of the environmental setting for each site or route	8.12
B.	a description of the effects of construction and operation of the facility on human settlement, including, but not limited to, public health and safety, displacement, noise, aesthetics, socioeconomic impacts, cultural values, recreation, and public services	8.2, 8.3, 8.4, 8.5, 8.7, 8.22, 8.8
C.	a description of the effects of the facility on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining	8.23, 8.25, 8.22, 8.26

Authority	Required Information	Where
D.	a description of the effects of the facility on archaeological and historic resources	8.11
E.	a description of the effects of the facility on the natural environment, including effects on air and water quality resources and flora and fauna	8.13, 8.14, 8.15, 8.16, 8.17, 8.18, 8.19
F.	a description of the effects of the facility on rare and unique natural resources	8.21
G.	identification of human and natural environmental effects that cannot be avoided if the facility is approved at a specific site or route	10.0
H.	a description of measures that might be implemented to mitigate the potential human and environmental impacts identified in items A to G and the estimated costs of such mitigative measures	8.0
7849.5240	Project Notice.	
Subp. 2	Notification to persons on general list, to local officials, and to property owners	Appendix J
7849.5910	Factors Considered. In determining whether to issue a permit for a large electric power generating plant or a high voltage transmission line, the comission shall consider the following:	
A.	effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation, and public services	8.3, 8.4, 8.7, 8.22, 8.8
B.	effects on public health and safety	8.8, 8.10,
C.	effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining	8.5, 8.23, 8.25, 8.22, 8.26
D.	effects on archaeological and historic resources	8.11
E.	effects on the natural environment, including effects on air and water quality resources and flora and fauna	8.13, 8.14, 8.15, 8.16, 8.17, 8.18, 8.19
F.	effects on rare and unique natural resources	8.21
G.	application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity	5.1, 5.2, 5.3
H.	use or paralleling of existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries	Table 5-1, 6.0
I.	use of existing large electric power generating plant sites	N/A
J.	use of existing transportation, pipeline, and electrical transmission systems or rights-of-way	Table 5-1, 6.0
K.	electrical system reliability	5.1
L.	costs of constructing, operating, and maintaining the facility which are dependent on design and route	6.14
M.	adverse human and natural environmental effects which cannot be avoided	10.0
N.	irreversible and irretrievable commitments of resources	10.0
7849.5930	Prohibited Routes	
Subp. 1	Wilderness Areas. No high voltage transmission line may be routed through state or national wilderness areas	8.22

Authority	Required Information	Where
Subp. 2	Parks and Natural Areas. No high voltage transmission line may be routed through state or national parks or state scientific and natural areas unless the transmission line would not materially damage or impair the purpose for which the area was designated and no feasible and prudent alternative exists. Economic considerations alone do not justify use of these areas for a high voltage transmission line	8.21, 8.22
Minn. Stat. §216E.03, subd. 7	Designating sites and routes.	
(1)	evaluation of research and investigations relating to the effects on land, water and air resources of large electric power generating plants and high voltage transmission lines and the effects of water and air discharges and electric and magnetic fields resulting from such facilities on public health and welfare, vegetation, animals, materials and aesthetic values, including base line studies, predictive modeling, and evaluation of new or improved methods for minimizing adverse impacts of water and air discharges and other matters pertaining to the effects of power plants on the water and air environment	8.0
(2)	environmental evaluation of sites and routes proposed for future development and expansion and their relationship to the land, water, air and human resources of the state	Chapter 8
(3)	evaluation of the effects of new electric power generation and transmission technologies and systems related to power plants designed to minimize adverse environmental effects	N/A
(4)	evaluation of the potential for beneficial uses of waste energy from proposed large electric power generating plants	N/A
(5)	analysis of the direct and indirect economic impact of proposed sites and routes including, but not limited to, productive agricultural land lost or impaired	8.5
(6)	evaluation of adverse direct and indirect environmental effects that cannot be avoided should the proposed site and route be accepted	10.0
(7)	evaluation of alternatives to the applicant's proposed site or route proposed pursuant to subdivisions 1 and 2	5.3, 6.2
(8)	evaluation of potential routes that would use or parallel existing railroad and highway rights-of way	Table 5-1, 6.0
(9)	evaluation of governmental survey lines and other natural division lines of agricultural land so as to minimize interference with agricultural operations	6.1
(10)	evaluation of the future needs for additional high voltage transmission lines in the same general area as any proposed route, and the advisability of ordering the construction of structures capable of expansion in transmission capacity through multiple circuiting or design modifications	3.3
(11)	evaluation of irreversible and irretrievable commitments of resources should the proposed site or route be approved	10.0
(12)	when appropriate, consideration of problems raised by other state and federal agencies and local entities	5.1.2

1.0 Executive Summary

Otter Tail Power Company (Otter Tail Power), Minnesota Power, and Minnkota Power Cooperative, Inc. (Minnkota Power), collectively referred to as "the Applicants", on behalf of themselves and Northern States Power Company, a Minnesota corporation (Xcel Energy) and Great River Energy, a Minnesota cooperative association (collectively, the Utilities), are applying for a Route Permit to construct a 230 kV transmission line between Bemidji, Minnesota, and Grand Rapids, Minnesota, (Bemidji-Grand Rapids Line or "the Project"). The Utilities propose locating the Project primarily along existing rights-of-way within a corridor that runs from Bemidji east to Grand Rapids. The line would be approximately 68 miles long. Construction would begin by 2009, and be completed by the end of 2011 to meet the anticipated 2011/2012 winter peak demand in the Bemidji area.

As required by Minnesota law, the Applicants have identified several distinct route alternatives for the proposed Bemidji-Grand Rapids Line. Two primary routes (1,000-feet-wide) have been identified, as well as a number of alternative segments and cross-over opportunities. Route 1 generally follows the Great Lakes Gas Transmission Company (Great Lakes) pipeline right-of-way from the Wilton Substation to just east of Deer River, where it then follows a Minnesota Power 115 kV transmission line to the Boswell Substation. Route 2 generally follows US Highway 2 (US 2) and the pipeline rights-of-way of Enbridge Pipelines LLC (Enbridge). Routes 1A, 1B, 1C, and 2C include alternative segments that would avoid impacts to sensitive resources. In addition to transmission line construction, the Project would include improvements to the Wilton Substation owned by Minnkota Power and Otter Tail Power, located just west of Bemidji, and the Minnesota Power-owned Boswell Substation located in Cohasset just northwest of Grand Rapids. The Project also includes constructing a 230 kV expansion of Otter Tail Power's existing Cass Lake 115 kV Substation or constructing a 230 kV Substation at a new site in the Cass Lake area. In addition, if Route 1A is selected, a 115 kV Breaker Station would also be constructed at Nary Junction, which is located south of Bemidji.

The primary purpose of the Project is to improve long-term reliability of the local and regional transmission system. The Project is needed to effectively meet projected future customer demand in the Bemidji area in north central Minnesota. The Bemidji area includes communities from Bagley, Minnesota, in the west; Walker, Minnesota, in the south; and Blackduck, Minnesota, in the northeast; as well as a large portion of the Leech Lake Reservation in the east. Although the Project is necessary to assure reliable service to the Bemidji area, it is also required to improve the regional transmission reliability of the larger northwestern Minnesota and eastern North Dakota region.

This line would also provide an ancillary benefit: facilitating the addition of new generation sources in the region. Specifically, portions of the Red River Valley and eastern North Dakota have been identified as areas for the potential development of wind-energy generation sources, and the added transmission capacity from the Bemidji-Grand Rapids Line would assist in the development of such resources.

The Applicants filed a Certificate of Need application for the Project with the Minnesota Public Utilities Commission (PUC) on March 17, 2008. That application is available online at: www.capx2020.com. It is also available at the eDockets link on the PUC website,

www.puc.state.mn.us, under Docket No. E017, E015, ET-6/CN-07-1222. The Certificate of Need establishes the size, type, and required end points of the Project. The Applicants have also filed a Macrocorridor Study (MCS) and an Alternative Evaluation Study (AES) with the Rural Utility Service (RUS) of the US Department of Agriculture. These studies will be available on the RUS and CapX2020 web sites after they have been accepted by RUS for publication. The Applicants are requesting that the Certificate of Need and Route Permit proceedings be combined for this Project because it is feasible, more efficient, and in the public interest. Detail on the state process is described in Section 4.2.1.

This document is the Route Permit Application for authorization to construct a new transmission line and associated facilities in Minnesota. The possible routes for the transmission line are described more specifically as follows.

While the Certificate of Need proceedings for a proposed facility may be handled separately from the facility's Route Permit proceedings, the Legislature has directed that they be handled together where appropriate. "Unless the commission determines that a joint hearing on [routing] and need under [the Certificate of Need statute] and the [Route Permit statute] is not feasible or more efficient, or otherwise not in the public interest, a joint hearing under those [statutes] shall be held." Minn. Stat. 216B.243, subd. 4. The Applicants are requesting that the Certificate of Need and Route Permit proceedings will be combined for the Project because it is feasible, more efficient, and in the public interest.

1.1 *Route 1 (Applicants' Preferred Route)*

The deciding factors in selecting Route 1 as the preferred route are as follows:

- Route 1 would impact less area of High Scenic Integrity than Route 2. About 33 percent of Route 1 is classified as needing management for High Scenic Integrity, contrasted with about 88 percent of Route 2. The primary negative visual impacts within Route 2 are associated with the US 2 corridor. US 2 is considered the "gateway" into the Chippewa National Forest (CNF), and the Project would be another visual impact along US 2 if that route were selected.
- Route 1 avoids going through the towns of Cass Lake and Bena. In contrast, Route 2 would directly affect the cities of Cass Lake and Bena. The US 2 corridor in the Cass Lake area is considered a "pinch-point," located on an isthmus between Cass Lake and Pike Bay (approximately 2.5 miles in length and approximately 1,200-feet wide). Along with US 2, there are four existing pipelines, two proposed pipelines, a railroad, a recreational trail, and commercial buildings located on this narrow strip of land.
- Route 1 would affect fewer residences than Route 2.
- Route 1 would affect fewer commercial and industrial operations than Route 2.
- Route 1 uses existing transmission line corridors and creates more opportunities for double-circuiting with existing lines than Route 2.
- Route 1 has options to avoid the Pike Bay Experimental Forest.

- The Applicants recognize that Route 1 would convert more forested wetlands to non-forested wetlands as compared to Route 2. However, the Applicants believe that the benefits of following existing transmission and pipeline rights-of-way outweigh the additional impacts. Best management practices and mitigation would be used to compensate for wetland impacts.
- The Applicants believe that Route 1 also best addresses concerns raised at public meetings by utilizing existing transmission and pipeline rights-of-way to minimize impacts to landowners, businesses, and population concentrations.
- Route 2 could conflict with the construction schedule of Enbridge's proposed pipeline project.

Table 8.1-1 summarizes the potential impacts and effects of all of the route options.

The Applicants' preferred route for the Bemidji-Grand Rapids Line generally follows the Great Lakes Gas Transmission Company (Great Lakes) pipeline right-of-way from the Wilton Substation to just east of Deer River, where it then follows a Minnesota Power 115 kV transmission line to the Boswell Substation. The utilities intend to construct the new line adjacent to the pipeline. Three route alternatives are also under consideration. Route 1A would be the same as Route 1 except that it would follow an existing 115 kV transmission line from Bemidji to Cass Lake instead of following the Great Lakes pipeline. Route 1B would be the same as Route 1 except that it would avoid the Ten Section Area and Pike Bay Experimental Forest of the CNF by going cross-country on new right-of-way. Route 1C would be the same as Route 1 except that it would replace the existing Great River Energy 69 kV line crossing the Mississippi River (Bena Substation–to-Bena Tap at CSAH 18) with the proposed 230 kV transmission line. Great River Energy's 69 kV line would be re-routed to the south along a new right-of-way. Figure 1 illustrates Route 1 and its alternatives. Detailed route figures are provided in Appendix A.

1.2 *Route 2*

Route 2 generally follows US 2 and the Enbridge pipeline rights-of-way, with shorter segments co-located with existing transmission line and railroad rights-of-way. The route alternative that has been identified, Route 2C, would be the same as Route 2 except that it would replace the existing Great River Energy 69 kV line crossing the Mississippi River (Bena Substation-to-Bena Tap at CSAH 18) with the proposed 230 kV transmission line. Great River Energy's 69 kV line would be re-routed to the south along a new right-of-way. Figure 1 illustrates Route 2 and its alternative. Detailed route figures are provided in Appendix A.

1.3 *Transmission Line Structures*

The Applicants have identified possible routes that are up to 1,000 feet in width. While the actual right-of-way would be 125 feet upon completion of construction, this wider route width is being proposed to allow for flexibility in determining the actual right-of-way at the time of construction. This allows the Applicants to work with landowners on actual structure placement.

H-frame structures are proposed for single-circuit construction of the Project in rugged terrain and for areas requiring longer spans to avoid or minimize the placement of structures in wetlands or waterways. Each H-frame would range in height from approximately 70 to 90 feet, and be placed approximately 600 to 1,000 feet apart. Corner structures would either be on reinforced concrete drilled shaft foundations or would be direct embedded with guy wires, depending on soil types and route angles. Self-supporting single pole or guyed multiple-pole structures would be used for angle structures.

The Applicants propose to use single-pole self-supporting structures set on reinforced concrete drilled shaft foundations for any double-circuit portions of the transmission line. Single-pole self-supporting structures may also be used for single-circuit portions of the transmission line in areas where the available width of the right-of-way is limited by existing infrastructure or development. The height of single-pole single-circuit structures would range from approximately 80 to 100 feet, with the span between structures approximately 400 to 800 feet apart. Double-circuit single pole structures would range in height from approximately 95 to 115 feet with the span between structures from 350 to 700 feet.

1.4 *Associated Facilities*

Wilton Substation

The Project would not require physical expansion of the existing Wilton 230 kV Substation beyond the limits of the existing fenced perimeter. Two new 230 kV breakers and a line termination structure would be added because of the Project, along with modifications to the existing 230 kV buses and relay panels. The Project would also require completion of a new ring bus section, as well as five new 230 kV switches with foundations, steel structures, and control panels.

Boswell Substation

The Project requires the expansion of the Boswell 230 kV Substation by approximately 1.3 acres. No land procurement is currently anticipated, as the entire extension of the substation would 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.

New 230 kV Substation in Cass Lake Area

Depending on which route alternative is constructed, the Project would require upgrading the existing Cass Lake 115/69 kV Substation to 230 kV or constructing a new 230/115 kV substation. Routes 2 and 2C would require the expansion of the existing Cass Lake Substation to accommodate the addition of 230 kV equipment. This would be accomplished by extending the existing fence line approximately 320 feet west. No land procurement would be required because the entire extension of the substation would be on existing Otter Tail Power-owned property. The 230 kV equipment for the substation would include a 230 kV three-breaker ring bus with line switches, a new 230/115 kV transformer (~187 MVA), and associated 115 kV facilities to integrate this transformer into the existing equipment.

Routes 1, 1A, 1B and 1C would require construction of a new substation near the intersection of the route and the existing Nary Junction – Cass Lake 115 kV line. It would be designed and constructed with a 230 kV three-breaker ring bus with 230 kV line switches. The facility would include a 230/115 kV transformer of approximately 187 MVA that steps down the voltage to a 115 kV three-breaker ring bus. In addition, the new substation would require a control house, relay panels, foundations, steel structures, and switches. The substation yard would be approximately 500 feet by 500 feet of yard fence and require an access road.

Nary Breaker Station

If Route 1A is selected, the Project could be double-circuited with an existing 115 kV line between Bemidji and Cass Lake, provided a new 115 kV breaker station is constructed at Nary Junction. This breaker station would be located adjacent to Nary Junction on a site of approximately 5 acres with a fenced and graded area of approximately 200 feet by 200 feet. The breaker station would consist of three 115 kV circuit breakers and associated switches, communications, relay and control equipment, three 115 kV line termination structures, and a control house. An improved access road and small parking lot would also be required to move equipment to the site.

1.5 *Costs*

Transmission line construction costs for the Project are estimated at $790,000 to $1,150,000 per mile of 230 kV transmission line (2007 dollars), depending on the route chosen and double-circuit options. This cost excludes right-of-way acquisition and permitting. The cost for upgrades at the Wilton Substation is estimated to be approximately 1.5 million and at the Boswell Substation is estimated to be approximately $1 million. The cost of an expanded Cass Lake Substation is estimated to be $5.2 million, the cost to construct a new 230 kV substation in the Cass Lake area is estimated to be $5.7 million, and the cost of a possible new Nary Breaker Station is estimated at $2.7 million. The Project's total cost estimate (transmission line and associated facilities) ranges from $63.0 million to $98.8 million depending on route selection, location of the Cass Lake area substation, and whether the Nary Breaker Station (Route 1A only) is required.

The estimated annual operation and maintenance cost for the transmission line is approximately $30,000, and is dependent on setting, the amount of vegetation management necessary, storm damage occurrences, structure types, age of the line, and so on. It is anticipated that very little maintenance would be required for the first several years since the transmission line would be new.

1.6 *Potential Environmental Impacts*

The potential environmental impacts of the Project are addressed in detail in this Application. The following provides a summary of the range of impacts that would occur for each environmental issue reviewed:

- Land Use – The routes would have permanent impacts on 441 to 640 acres. Most of this land is currently forested.

- Human Settlement – Two to 15 residences are located within the proposed right-of-way. Route modifications would be used to avoid/minimize impacts.
- Noise – No impacts are anticipated.
- Aesthetics – Twenty-nine to 88 percent of the routes would be within areas mapped as having high scenic integrity.
- Socioeconomic Factors – The project is expected to have beneficial impacts due to increased electrical reliability and performance.
- Environmental Justice – The routes contain 21 to 26 percent minority populations; the four-county average is 12.4 percent. The routes contain 14 to 15 percent low-income populations; the four-county average is 13.2 percent.
- Cultural Values – No impacts are anticipated.
- Public Services – The routes may have short-term temporary impacts due to construction. Long-term impacts are expected to be beneficial due to increased electric reliability.
- Radio, TV and Cellular Phones – No impacts are anticipated.
- Electric and Magnetic Fields – No impacts are anticipated.
- Archeological and Historic Resources – The routes include from 26 to 37 known sites. Right-of-way modifications would be used to avoid/minimize impacts.
- Geomorphic and Physiographic Environment – No impacts are anticipated.
- Climate – The Project would result in reduced green house gas emissions.
- Soils – There would be permanent impacts to three acres with temporary soil disturbance to 876 to 997 acres due to construction. Impacts would be minimized using erosion control best management practices (BMPs).
- Air Quality – No impacts are anticipated.
- Water Resources – The routes include five to nine public water basins and seven to 13 public water crossings. Impacts would be minimized with BMPs for erosion control and water quality. Impacts would be mitigated in accordance with federal and state regulatory requirements.
- Wetlands – Transmission line structure installation within the routes would permanently impact less than one acre of wetland. Between 166 and 224 acres of forested wetland would be converted to shrub or emergent wetland types. Additional temporary impacts would occur to 59 to 102 acres of wetland due to construction activities. Unavoidable wetland impacts would be mitigated in accordance with the federal, state, and local regulatory requirements.
- Flora – The majority of impact would occur to woodlands, primarily aspen/white birch cover type.
- Fauna – There would be minimal impact. No changes to species composition or regional populations are anticipated.

- Noxious Weeds – There would be minimal impact. BMPs would be implemented to minimize the potential spread of noxious weeds.
- Rare and Unique Species and Communities – There are no confirmed federally listed species present within the routes; the Canada lynx may be present. Zero to two state-listed species have been confirmed within the routes. Zero to four Regional Forest Sensitive Species have been confirmed within the routes. Zero to three species identified by the Leech Lake Band of Ojibwe (LLBO) have been confirmed within the routes. Field surveys would be completed to identify all rare and unique species and communities, and route modifications would be used to avoid/minimize impacts.
- Recreation and Tourism – The routes cross two-to-five CNF bike/walking trails, four to nine snowmobile trails, one to three state trails, one to two scenic byways, and two crossings of the Mississippi River canoe route. Impacts to the Bemidji Slough would range from 0 to 675 acres. Less than one acre of impact would occur within the Bemidji State Game Refuge (SGR). Between 282 and 383 acres of CNF-managed lands would be impacted.
- Agricultural Production – The routes would temporarily impact 31 to 57 acres of agricultural land. Permanent impacts would be less than one acre.
- Transportation – The Project would have short-term impacts during construction. No long-term impacts are anticipated.
- Forestry – The routes would impact 112 to 167 acres of coniferous forest, 8 to 13 acres of coniferous/deciduous forest, and 276 to 510 acres of deciduous forest. The routes would impact 9 to 38 acres of the CNF Ten Section Area, and 0 to 32 acres of the Pike Bay Experimental Forest.
- Mining – No impacts are anticipated.

1.7 *Conclusion*

The data presented in this Application shows that construction of the Bemidji-Grand Rapids Line along the Applicants' preferred route would comply with the applicable standards and criteria set out in Minn. R. 7849.5900. The transmission line would be consistent with State goals to conserve resources; minimize environmental and human settlement impacts and land use conflicts; and ensure the State's electric energy security through efficient, cost-effective infrastructure.

The Applicants are requesting that the PUC issue a Route Permit for the Project. The Route Permit would designate the Applicants' preferred route for the 230 kV transmission line between the upgraded Wilton and Boswell Substations, including a new or expanded 230 kV substation in the Cass Lake area.

2.0 Introduction

The Utilities are applying for a Route Permit to construct a 230 kV transmission line between the Wilton Substation near Bemidji, Minnesota, and the Boswell Substation near Grand Rapids, Minnesota (See Map 2-1). The proposed location of the Project is primarily along existing rights-of-way. The Bemidji-Grand Rapids 230 kV Line is needed to maintain the reliability of the transmission system currently serving the Bemidji area in north central Minnesota, as well as maintain regional transmission reliability for the Red River Valley region in northwestern Minnesota and eastern North Dakota. The Bemidji-Grand Rapids Line is one of four Group 1 Projects within the Capacity Expansion 2020 (CapX2020) initiative. The other three projects are proposed 345 kV transmission lines (345 kV Projects). The CapX2020 initiative is focused on prioritizing the transmission infrastructure investments needed to meet the growing demand for electricity in Minnesota and the surrounding region, and to ensure timely and efficient regulatory review and approval of those investments.

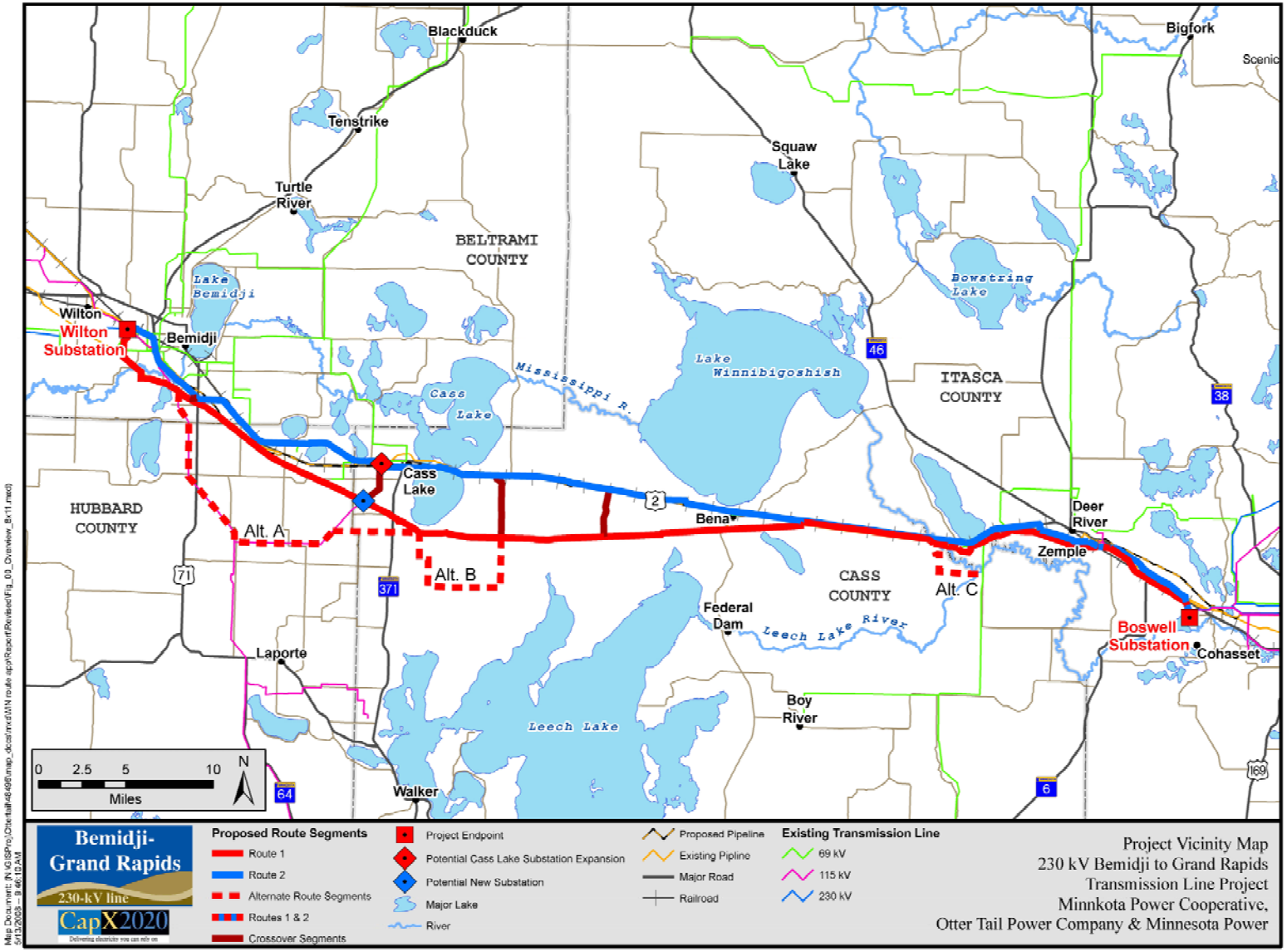
2.1 *Summary of Proposed Action*

2.1.1 Project Location and Description

The Applicants propose constructing a 230 kV transmission line from the Wilton 230/115 kV Substation located just west of Bemidji, Minnesota, to the Boswell 230 kV Substation in Cohasset, Minnesota, located northwest of Grand Rapids, Minnesota. The potential routes for the Project begin at the Wilton Substation northwest of Bemidji and run southeast through Beltrami County, across the northeast corner of Hubbard County, and into Cass County. The routes then run generally due east across Cass County, past the City of Cass Lake and through Bena Township, crossing the Mississippi River into Itasca County to a point between Zemple Township and the City of Deer River. The routes then turn southeast until they reach the Boswell Substation in Cohasset. (See also Figures tab and Appendix A at the end of this document.)

While final engineering and design have not been completed, the Project's construction would likely use two-pole H-frame structures for a majority of the route. These are the typical structures used for a 230 kV transmission line located on wooded, rugged topography. They are also suited for areas requiring longer spans to avoid or minimize the placement of structures in wetlands or waterways. Each H-frame structure would range in height from 70 to 90 feet, and be placed 600 to 1,000 feet apart. (See H-frame structure illustrations in Appendix B.)

Map 2-1 Project Overview



Where conditions warrant, single-pole structures may be used. For this Project, single pole structures would typically be used in areas where the available right-of-way is limited, such as along roads in developed areas. The height of single-pole structures ranges from 80 to 100 feet, with the span between structures from 400 to 800 feet. (See single-pole structure illustrations in Appendix B.)

We anticipate that the project would use 954 ACSR (aluminum conductor, steel reinforced, non-bundled), with a capacity of approximately 470 MVA (Mega Volt Ampere). The conductor size may need to be modified once the ultimate route is selected and additional electrical optimization studies are completed.

The typical right-of-way for a 230 kV transmission line is approximately 125 feet wide. Ultimately, the right-of-way width depends upon the recommended clearances between the conductor and other facilities along the route. The width of the right-of-way may be reduced in certain high-density, developed areas with the use of single-pole construction. The width of the right-of way may also be reduced where the new transmission line follows an existing linear corridor, such as another utility line or roadway. On the other hand, a wider right-of-way may be required for longer spans of the transmission line or where special design requirements are dictated by topography. The Applicants would seek permanent easements providing the right to construct, operate, and maintain the transmission line along the full width and length of its right-of-way, as necessary.

There are opportunities within the proposed routes for the Project to be located in existing rights-of-way and, where feasible, "double-circuited" with existing 115 kV or 69 kV lines. That means the structures for the proposed 230 kV transmission line would be designed to also carry the lower voltage transmission line already located in the right-of-way. The height of single-pole double-circuit structures ranges from 95 to 115 feet, with the span between structures from 350 to 800 feet. (See single-pole, double-circuit structure illustrations in Appendix B). Double-circuiting, however, raises transmission reliability concerns. For example, a single weather-related event could result in the outage of two circuits rather than just one. Double-circuiting can also affect the constructability and costs of the Project.

2.1.2 Associated Facilities

Certain upgrading of the Wilton Substation near Bemidji and the Boswell Substation near Grand Rapids would be required, as well as upgrading an existing 115 kV substation or building a new 230 kV substation in the Cass Lake area. Depending on the route selected, a breaker station may also be constructed at Nary Junction. The upgrades and proposed new construction are discussed below.

Wilton Substation

The Project would not require physical expansion of the existing Wilton 230 kV Substation. Two new 230 kV breakers and a line termination structure would be added as a result of the Project, along with modifications to the existing 230 kV buses and relay panels. The Project would also require completion of a new ring bus section, as well as five new 230 kV switches with foundations, steel structures, and control panels.

Boswell Substation

The Project would require the expansion of the Boswell 230 kV Substation by approximately 1.3 acres. No land procurement is required, however, because the entire expansion of the substation would 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.

New or Upgraded Substation in the Cass Lake Area

The Project would require the expansion of the existing Cass Lake 115/69 kV Substation or construction of a new 230/115 kV substation, depending on which route alternative is constructed. Routes 2 and 2C would require upgrading of the existing Cass Lake Substation. This would be accomplished by extending the existing fence line approximately 320 feet west. No land procurement would be required because the expansion of the substation would be on existing Otter Tail Power-owned property. The expansion would be for the 230 kV equipment, which includes a 230 kV three-breaker ring bus with line switches, a new 230/115 kV transformer (~187 MVA), and associated 115 kV facilities to integrate this transformer into the existing equipment.

Routes 1, 1A, 1B, and 1C would require construction of a new substation to address the load serving concerns between Cass Lake and Bemidji. This new substation would be designed and constructed with a 230 kV three-breaker ring bus with 230 kV line switches. The facility would include a 230/115 kV transformer of approximately 187 MVA that steps down the voltage to a 115 kV three-breaker ring bus to reliably establish a new tap along the existing Nary Junction-Cass Lake 115 kV line. The new substation would require a control house, relay panels, foundations, steel structures, and switches. The substation yard would be approximately 500 square feet, fenced, and require access roads.

Nary Breaker Station

In addition to the substation improvement mentioned above, Route 1A includes a section where the proposed 230 kV line would be double-circuited with an existing 115 kV transmission line between Bemidji and Cass Lake. Double-circuit construction, operation, and maintenance can have impacts on the security and reliability of the transmission system that must always be taken into account. The Applicants believe the Project could be double-circuited with the existing 115 kV transmission lines between Bemidji and Cass Lake without significantly affecting area reliability, provided a 115 kV breaker station is constructed at Nary Junction.

This 115 kV breaker station would be located adjacent to the existing switch at Nary Junction on an approximately 5-acre site with a fenced and graded area of approximately 200-feet-by-200-feet. The breaker station would consist of three 115 kV circuit breakers and associated switches, communications, relay and control equipment, three 115 kV line termination structures, and a control house. An improved access road and small parking lot would also be required to move equipment to the site. Building this 115 kV breaker station sectionalizes the 115 kV circuits serving Bemidji, Cass Lake, Akeley, and Badoura. This

provides back-up (redundant) transmission in the event of an outage of the proposed 230/115 kV double-circuit transmission lines.

2.2 *Proposed Project Ownership*

To execute the recommendations of the CapX2020 initiative, the participating utilities entered into Project Development Agreements for the three 345 kV Projects and the Bemidji-Grand Rapids Line. Xcel Energy and Great River Energy were designated as the Project Development Managers in charge of coordinating and managing the permitting, engineering, procurement, and construction of the three proposed 345 kV transmission lines. Otter Tail Power was designated the Project Development Manager for the Bemidji-Grand Rapids Line, with Minnesota Power as the routing lead for the Project. Due to its significant load in this area, Minnkota Power joined as the technical lead for the Project. A full copy of the Project Development Agreement for the Bemidji-Grand Rapids 230 kV Line is included in the Certificate of Need Application for the Project. The title page and table of contents for the Project Development Agreement are included in Appendix C of this Application.

2.2.1 Project Applicants

Otter Tail Power is an investor-owned electric utility that began operations in 1909, and is headquartered in Fergus Falls, Minnesota. The company provides electric service to approximately 128,000 customers in North Dakota, South Dakota, and Minnesota, of which about 58,000 reside in the latter. A portion of the Project would be located in Otter Tail Power's service area.

Minnesota Power, a division of ALLETE Inc., is an investor-owned utility headquartered in Duluth, Minnesota. The Company provides electricity in a 26,000-square-mile electric service territory located in northeastern Minnesota. Minnesota Power supplies retail electric service to 137,000 customers, and wholesale electric service to 16 municipalities. A portion of the Project would be located in Minnesota Power's service area.

Minnkota Power is a wholesale electric generation and transmission cooperative headquartered in Grand Forks, North Dakota. Incorporated in 1940, Minnkota Power provides wholesale electric service on a nonprofit basis to 11 retail distribution cooperatives, which are the members and owners of Minnkota Power. The member systems' service areas encompass 34,500 square miles in northwestern Minnesota and the eastern third of North-Dakota. The member systems serve approximately 125,000 of the 300,000 residents in the area. A portion of the Project would be located in the service territory of Beltrami Electric Cooperative, a distribution cooperative member of Minnkota Power.

2.2.2 Other Project Owners

Xcel Energy is a wholly owned subsidiary of Xcel Energy Inc., the fourth-largest combination electricity and natural gas energy company in the United States. Xcel Energy Inc. provides a comprehensive portfolio of energy-related products and services to 3.2 million electricity customers and 1.7 million natural gas customers through its regulated operating companies in Colorado, Kansas, Michigan, Minnesota, New Mexico, North-Dakota, Oklahoma, South Dakota, Texas, Wisconsin, and Wyoming. Xcel Energy provides service to approximately 1.2 million electricity customers and 400,000 natural gas

customers in Minnesota. The Project would help serve Xcel Energy's customers in the Red River Valley region.

Great River Energy is a not-for-profit electric cooperative providing electrical energy and related services to 28 distribution cooperatives serving nearly 1.5 million people in Minnesota and Wisconsin. Headquartered in Maple Grove, Minnesota, Great River Energy is the second largest utility in Minnesota and the fifth largest utility of its type in the country. A portion of the Project is located in the service area of Lake Country Power, Inc., a distribution cooperative member of Great River Energy.

3.0 Purpose and Need for Project

Before constructing a transmission line of the voltage and length of the Bemidji-Grand Rapids Line, the Minnesota Public Utilities Commission (PUC) must approve the need for the Project in a Certificate of Need proceeding. The Certificate of Need application for the Project was submitted to the PUC on March 17, 2008, and can be reviewed online at www.capx2020.com, and the eDockets link on the PUC's web site at www.puc.state.mn.us, under docket number E017, E015, ET-6/CN-07-1222.

The Project is also subject to federal environmental review under the National Environmental Protection Act (NEPA). The Rural Utilities Service (RUS) of the US Department of Agriculture is the lead federal agency for this review, and required the Applicants to provide an Alternatives Evaluation Study (AES) detailing the purpose and need for the Project before any environmental review commenced. The Applicants' July 2007 AES, revised May 2008, will be available on the RUS and CapX2020 web sites after the RUS accepts it for publication.

The Project is needed to effectively meet projected future customer demand in the Bemidji area in north central Minnesota. The Bemidji area includes the communities from Bagley, Minnesota, to the west, Walker, Minnesota, to the south, and Blackduck, Minnesota, to the northeast, as well as a large portion of the Leech Lake Reservation to the east. Although the Project is necessary to assure reliable service to the Bemidji area, it is also required to improve the regional transmission reliability of the larger northwestern Minnesota and eastern North Dakota region.

This line would also provide an ancillary benefit: facilitating the addition of new generation sources in the region. Specifically, portions of the Red River Valley and eastern North Dakota have been identified as areas for the potential development of wind-energy generation sources and the added transmission capacity from the Bemidji-Grand Rapids Line would assist in the development of such resources.

3.1 *Need Analysis for the Project*

The need for the Bemidji-Grand Rapids Line has been the subject of extensive studies over the last five years. A 2006 update of an analysis done back in 2002, the 2006 Transmission Improvement Planning Study Update (2006 TIPS Update), focused on the load-serving deficiencies of the Red River Valley region in which the Bemidji load center is located, referred to as the North Zone of the Red River Valley. The 2006 TIPS Update analyzed the current incremental load-serving capability of the system in the North Zone under contingency conditions. While the North Zone currently can support almost 500 MW of incremental load during system intact conditions, that is of little practical value because a system's load-serving capability is assessed based on the incremental load it can handle in the event of one or more contingencies. The analysis in the 2006 TIPS Update showed that the North Zone system currently has a 112 to 150 MW incremental load-serving capability above the zone's current peak winter load of 850 MW depending on which one of several single contingencies occur. However, the system currently has incremental load-serving capability of 0 MW in a double-contingency situation.

Focusing on the Bemidji area of the North Zone, another recent analysis, the 2007 Bemidji Transmission Study, analyzed the peak demand for the Bemidji load center over the next 10 to 15 years, projecting that the peak load by the winter of 2011/2012 would be approximately 280 MW. That projected peak load is 60 MW greater than the projected 220 MW maximum load-serving capability of the system by the winter of 2011/2012 under single-contingency circumstances without local generation running, which it typically does for only a limited number of hours per year.

The Applicants developed another forecast of the winter peak demand for the next 15 years in the Bemidji area and North Zone using the latest vintage data available. The results of that forecasting were included in the Certificate of Need application for the Project.

Consistent with previous forecasts, the most current forecast shows that by the winter of 2011/2012, demand in the Bemidji area during the North Zone winter peak would be approximately 288 MW. That is 68 MW greater than the projected 220 MW maximum load-serving capability of the local transmission system in 2011 under single-contingency circumstances without local generation running.

Whenever the coincident seasonal peak for a specific area is calculated within the context of a much larger region, however, there is a risk that the local area peak would be understated because it does not peak at the same time as the region at large. To ensure the risks facing the local transmission system in the Bemidji area are accurately represented, additional analysis was done to determine the coincident winter peak for the Bemidji area alone.

The anticipated growth of demand in the Bemidji load center when considered in isolation results in its projected winter peak increasing from the approximately 288 MW discussed above to approximately 296 MW. The installation of additional capacitor banks at substations in the Bemidji area and the forced operation of local generator pre-contingency can address the bulk of this 76MW shortfall in the system's operating capability until the Project is installed by the winter of 2011/2012. Even so, these system enhancements likely would not be able to handle the entire capability shortfall in the event of a single contingency, so there is the real risk that under voltage load shedding would be necessary to maintain the system's stability.

3.2 *Need Analysis for an Upgraded or New Substation in the Cass Lake Area*

The 2007 Bemidji Transmission study included a contingency analysis performed for 2006 and 2011 winter peak conditions that identified low voltages on the 115 kV and 69 kV systems in the Cass Lake area. These voltage issues are primarily caused by outages of the 115 kV line sections from Wilton to Bemidji to Nary Junction, with the critical contingency being the loss of the Wilton-to-Bemidji 115 kV line. These contingencies disconnect the Bemidji and Cass Lake areas from the primary 230 kV source into the Bemidji area, which runs between the Winger and Wilton substations. In addition to maintaining adequate voltage levels in the Cass Lake and Bemidji areas for these critical local contingencies, 115 kV line-loading concerns from Badoura to Akeley to Laporte are possible when trying to serve a portion of the Bemidji and Cass Lake loads from Badoura.

Load growth and limitations of the local load-serving transmission system in the Cass Lake and Bemidji areas are evident today. The existing 115/69 kV substation at Cass Lake has a 19 MVA transformer that is overloaded at peak load times during the year. To further exacerbate the issues in the Cass Lake area, a large industrial customer served by the Cass Lake 115 kV transmission system is anticipating a large load expansion in 2012. The expected load increase would more than double the existing electric demand of this customer at its location. For this reason, Otter Tail Power has had to re-sectionalize the 69 kV system in the Cass Lake area during peak load times to rely on additional support from the Bemidji 115 kV source. To alleviate these concerns Otter Tail Power has plans to replace this existing transformer with a 55 MVA transformer in 2009.

Due to the inadequate margin in the existing Bemidji/Cass Lake transmission system, maintenance outages are frequently denied due to high loads because of the possibility of violating reliability criteria in the event there is a contingency during a maintenance outage. The most recent example arose this past winter when Minnkota Power required an outage of the Bemidji-Nary Junction 115 kV line in order to connect the new 115/12.5 kV Helga Substation along this line. Further reinforcement of the transmission system within the Cass Lake area would allow for more operating flexibility in this area. These Cass Lake issues have been further noted within the 2007 MISO Transmission Expansion Plan (MTEP-07).

The addition of the Bemidji-Grand Rapids Line would have immediate benefits to the Bemidji/Wilton area, but unfortunately would not improve the situation in the Cass Lake area for all contingencies. Without reinforcing the Cass Lake area system, certain contingencies on the transmission system would still result in the Cass Lake area being separated from the Bemidji-Grand Rapids Line source at the Wilton Substation.

To address load-serving issues in the Cass Lake area, both short-term and long-term solutions are needed. The short-term solution involves the installation of two, 15 MVAR capacitor banks at the Cass Lake 115 kV bus. Otter Tail Power is planning to install these capacitor banks in the fall of 2009 at an estimated cost of $600,000. Long-term options include (1) adding a new 230/115 kV substation along the Project's route near Cass Lake; (2) adding a 115 kV line between Wilton and Cass Lake; (3) double circuit the Project with a new 115 kV line from Cass Lake to Wilton along the Project; or (4) some combination of these options.

With respect to the first option, the location of a new 230kV substation in the Cass Lake area would depend upon the route selected for the Project. If Route 1, 1A, 1B or 1C were approved, the optimal location would be at the intersection of the route and the existing 11-mile 115 kV line south of Cass Lake. This location would reduce the length of this radial 115 kV line to the existing Cass Lake 115 kV Substation from approximately 11 miles to 3 miles. If Route 2 or 2C were selected, upgrading the existing Cass Lake 115/69 kV substation to 230kV would be desired.

A new 230 kV substation in the Cass Lake area would provide the following benefits:

1. Improved reliability in the Cass Lake area by reducing the amount of exposure currently associated with an 11-mile, 115 kV line;

2. Less transmission expansion required in the future given recent load forecasts received by large industrial customers in the Cass Lake area;
3. More operating flexibility for scheduled maintenance outages; currently much of that activity needs to be scheduled at times when the load in the Bemidji/Cass Lake area is at minimum levels.

3.3 *Evaluation of Future Needs*

The Project connects the Bemidji and Grand Rapids load centers, and the area between them is mainly rural with relatively low electric load density. Once the Project is constructed, it is anticipated that it will be able to handle increasing load in the area in the foreseeable future with no additional high voltage transmission lines needed. The exceptions are the Cass Lake and Deer River areas.

The need for additional facilities to increase reliability around Cass Lake is being addressed by an expanded or new 230 kV substation in the area that is included in the Project. This need is discussed in detail in Section 3.2.

Currently, the Deer River area is supplied by a single radial 115 kV transmission line between the Boswell 115 kV substation and Minnesota Power and Great River Energy 115 kV substations in the area (Boswell-Deer River Line). Both Minnesota Power and Great River Energy serve residential and commercial customers around Deer River, and there is one large industrial customer, Enbridge, that is served via a tap of the Boswell-Deer River Line. Because the Project passes through the Deer River area, it provides opportunities to address future load growth and/or reliability needs in the area. This could involve constructing a new 230/115 kV substation near the Project and looping the Project's line into the new substation. This would minimize the need for new transmission to meet a future need to increase the capacity and/or reliability of the local transmission system serving the Deer River area. The Project's design takes this possible future need into account.

4.0 Agency Actions and Regulatory Approvals

4.1 *Federal Process*

The Rural Utilities Service (RUS) administers the U.S. Department of Agriculture's Rural Development Utilities Program. Because Minnkota Power is requesting funding from RUS for its share of the Project costs, the Project must be reviewed by RUS pursuant to the National Environmental Policy Act (NEPA). NEPA requires federal agencies to integrate environmental values into their decision-making processes on proposed actions by considering the environmental impacts and reasonable alternatives to those actions. RUS has developed regulations and a series of guidance documents to facilitate compliance with NEPA requirements. Under these regulations, the Project requires an Environmental Assessment with Scoping (7 C.F.R. § 1794.24(b)(1)). However, based on consultations with RUS and other federal and state agencies, the Applicants have agreed to an Environmental Impact Statement (EIS) being prepared pursuant to 7 C.F.R. §§ 1794.60 to 1794.64.

It is the Applicants' understanding that RUS and Minnesota's Office of Energy Security (OES) intend to jointly develop one EIS that meets the requirements of both NEPA and Minnesota law to minimize duplication of effort.

The following provides a summary of the federal environmental review process under RUS regulations:

- Develop Alternatives Evaluation Study (AES) to document the need to be addressed and that the Project is the most appropriate solution.
- Develop Macrocorridor Study (MCS) to document preliminary analysis of potential environmental impacts along possible Project routes.
- Publish in the Federal Register a Notice of Intent to prepare a joint federal/state EIS for the Project.
- Hold scoping meetings to obtain public and agency input on the Project.
- Issue decision on the scope of the EA/EIS based on the MCS and public and agency input.
- Develop and publish the Draft EIS.
- Solicit comments from the public and agencies on the Draft EIS.
- Develop and publish the Final EIS.
- Solicit comments from the public and agencies on the Final EIS.
- Issue Record of Decision (ROD) on potential environmental impacts of the Project and identify mitigation measures to minimize these impacts.

4.2 *State Process*

4.2.1 Minnesota Public Utilities Commission

The Minnesota Public Utilities Commission (PUC) regulates transmission line construction in Minnesota. The PUC determines whether there is a need for a transmission line through its Certificate of Need process. The PUC determines the route and any conditions on the construction, operation, and maintenance of the transmission line through its route permitting process.

Certificate of Need

Pursuant to Minn. Stat. § 216B.243, subd. 2, the Applicants filed a Certificate of Need application for the Project with the PUC on March 17, 2008. That application is available online at www.capx2020.com. It is also available at the eDockets link on the PUC website, www.puc.state.mn.us, under Docket No. E017, E015, ET-6/CN-07-1222. The Certificate of Need establishes the size, type, and required end points of the Project.

Route Permit

Minn. Stat. § 216E.03, subd. 2, provides that "[n]o person may construct a high voltage transmission line without a Route Permit from the commission. A high voltage transmission line may be constructed only along a route approved by the Commission." A high voltage transmission line is any transmission line "designed for and capable of operation at a nominal voltage of 100 kilovolts or more…" (Minn. Stat. § 216E.01, subd. 4; Minn. R. 7849.5010, subp. 9). The Project is a 230 kV line that would be at least 68 miles long, and therefore a Route Permit from the PUC is required.

While the Certificate of Need proceedings for a proposed facility may be handled separately from the facility's Route Permit proceedings, the Legislature has directed that they be handled together where appropriate. "Unless the commission determines that a joint hearing on [routing] and need under [the Certificate of Need statute] and the [Route Permit statute] is not feasible or more efficient, or otherwise not in the public interest, a joint hearing under those [statutes] shall be held." Minn. Stat. 216B.243, subd. 4. The Applicants are requesting that the Certificate of Need and Route Permit proceedings be combined for the Project because it is feasible, more efficient, and in the public interest.

Once both applications are filed, they will be reviewed by the commission for completeness. Minn. R. 7849.0200, subp. 5 and 7849.5230, subp. 1. Within 60 days of the commission finding the applications to be complete, it will hold public meetings on the Project. The purpose of the meetings is to obtain public opinion on 1) the necessity of granting a Certificate of Need and Route Permit for the Project; 2) alternative routes; and 3) the appropriate scope of the EIS that the OES will prepare for the Project (which in this case it is preparing jointly with RUS). Minn. Stat. §§ 216B.243, subd.4 and 216E.03, subd. 6; Minn. R. 7849.5260, subp. 1 and 7849.5300, subp.2.

An administrative law judge (ALJ) would also hold a contested case hearing on the Certificate of Need and Route Permit applications, during which interested persons can submit evidence supporting or challenging the Project as proposed. Upon closing the record for the contested case, the administrative law judge will submit a report and

recommendation to the PUC on the applications. Minn. Stat. §§ 216B.243, subd.4 and 2l6E.03, subd.6; Minn. R. 7849.0230, subp.2 and 7849.5330. The PUC will consider the administrative law judge's report and recommendation in reaching its determination whether to grant the applications with or without modifications, or deny them. Minn. R. 7849.5340.

4.2.2 Office of Energy Security – Energy Facility Permitting

Pursuant to Minn. Stat. § 216E.03, subd. 5, the OES must prepare an EIS for proposed high-voltage transmission lines. Generally, an EIS considers issues relating to routing, including the use of existing rights-of-way and the impacts of line construction, operation, and maintenance on environmental features and human settlement. Under Minnesota law, the EIS does not address the need for the Project since that determination is handled through the Certificate of Need process (Minn. R. 7849.5330, subp. 2); in this instance, need will be addressed in the joint state/federal EIS.

OES uses the EIS to disclose potential environmental impacts of the Project and to identify any mitigation measures with respect to the construction, operation, and maintenance of the Project that would minimize those impacts. The Applicants anticipate that the EIS will be prepared jointly by OES and RUS so that one environmental document will be prepared for the Project.

The following provides a summary of the state environmental process:

- Certificate of Need application documenting the need for the Project.
- Review Route Permit application documenting proposed route alternatives for the Project and their potential environmental impacts.
- Publish in the EQB Monitor notices of the Route Permit application filing and the dates and locations for public hearings on the designation of the route for the Project.
- Hold joint public hearings to obtain public and agency input on the Certificate of Need and Route Permit applications, and the scope of the EIS.
- Issue decision on the scope of the EIS.
- Develop and publish the Draft EIS.
- Hold public hearings to obtain comments from public and agencies on the Draft EIS.
- Develop and publish the Final EIS.
- Administrative law judge issues recommendation on adequacy of Final EIS.
- PUC determines the need for the Project, the adequacy of the Final EIS, and designates the route for the Project with any conditions on its construction, operation, and maintenance to minimize environmental impacts.

Graphic 4-1, located at the end of this section, depicts the proposed timeline for the state/federal environmental review process.

4.3 *Agency Decisions*

4.3.1 Minnesota Public Utilities Commission Decisions

Decisions Being Considered in this Route Permit Application

The PUC would use the Route Permit application process to identify an approved Project Route and develop a Route Permit with appropriate conditions.

Decisions Not Being Considered in this Route Permit Application

The PUC will not use the Route Permit Application to determine the need for the Project. The PUC will use the Certificate of Need application to determine Project need. The Applicants anticipate that the joint state/federal EIS will include information on both the project need and routing issues, to comply with the federal environmental review process.

4.3.2 Federal Agency Decisions

There are no federal requirements for this Route Permit application, and thus no federal agency decisions depend on it.

4.4 *Environmental Permits, Approvals, and Decisions*

In addition to the state Certificate of Need, Route Permit, and the joint state/federal EIS, the Applicants are actively working with local, state, and federal agencies to ensure that all other permits, approvals, and decisions required for the Project can be obtained. Table 4-1 lists the other possible permits, approvals, and decisions required for this Project.

Table 4-1 List of Possible Permits and Decisions

Permit/Decision	Jurisdiction
Federal Approvals	
Special Use Permit	USFS Chippewa National Forest
Section 106 Consultation	USDA Rural Utilities Service and US Army Corps of Engineers
Section 10 Permit	US Army Corps of Engineers
Section 404 Permit	US Army Corps of Engineers
Section 7 Consultation/Biological Assessment	US Fish and Wildlife Service and USFS Chippewa National Forest
Permit to Cross Federal Aid Highway	Federal Highway Administration
Farmland Protection Policy Act/Farmland Conversion Impact rating	Department of Agriculture/ Natural Resource Conservation Service
Minnesota State Approvals	
Cultural and Historic Resources Review	State Historic Preservation Office
Utility Permit	Department of Transportation
Endangered Species Consultation	Department of Natural Resources Ecological Services

Permit/Decision	Jurisdiction
License to Cross Public Lands and Waters	Department of Natural Resources Lands and Minerals
Public Waters Work Permit	Department of Natural Resources Waters
Wetland Conservation Act Permit	Board of Water & Soil Resources
Section 401 Water Quality Certification	Pollution Control Agency
National Pollutant Discharge Elimination System Permit	Pollution Control Agency
Noxious Weed Management Plan	Department of Agriculture
Local Approvals	
Road Crossing/Right-of-Way Permits	County, Township, City
Public Lands Permits	County, Township, City
Building Permits	County, Township, City
Overwidth Load Permits	County, Township, City
Driveway Access Permits	County, Township, City

4.4.1 Federal Approvals

In addition to the federal EA/EIS process, the Applicants are actively working with federal agencies to ensure that the following approvals can be obtained as required. The Utilities are also currently in discussions with the Leech Lake Band of Ojibwe (LLBO) regarding any accommodations for locating a portion of the Project within the Leech Lake Reservation:

- Special Use Permit - The Study Area crosses land in the Chippewa National Forest (CNF), requiring a Special Use Permit from the US Forest Service pursuant to 36 C.F.R. § 251.58.
- Section 106 Consultation - Section 106 of the National Historic Preservation Act, 16 U.S.C. §§ 470f, and its implementing regulations, 36 C.F.R. §§ 800.1-80016, require federal agency consultation with Indian Tribes that may be affected by the Project. RUS together with the US Army Corps of Engineers (USACE) are coordinating this consultation with the LLBO and other tribes.
- Section 10 Permit - USACE regulates impacts to navigable waters of the United States pursuant to Section 10 of the Rivers and Harbors Act of 1899, 33 U.S.C. § 403. The Mississippi River is classified by USACE as navigable water, and the Applicants will apply for a permit for the Project to cross it.
- Section 404 Permit - USACE regulates discharges of dredged or fill material into waters of the United States under Section 404 of the Clean Water Act, 33 U.S.C. § 1344. The Applicants would apply for these permits as necessary once a route for the Project is determined.

- Section 7 Consultation - The Applicants have initiated informal consultation with the US Fish and Wildlife Service under Section 7 of the Endangered Species Act (16 U.S.C. §§ 1531-1534) to assess the potential impact of the Project on sensitive resources. As part of this consultation, the Applicants will prepare a Biological Assessment (BA) to document the potential effects. The BA contents will be in accord with 50 CFR §402.12(f).
- Permit to Cross Federal Aid Highway - Transmission line crossings of a federal highway require a use and occupancy agreement under 23 CFR §645.213. The Applicants will work with the Minnesota Department of Transportation (MN/DOT) (responsible for administering the agreements) to obtain the required approvals.
- Farmland Protection Policy Act/Farmland Conversion Impact Rating – The Department of Agriculture oversees farmland conversions under 7 U.S.C. 4201-4208. The Applicants will complete form AD-1006 Farmland Conversion Impact Rating and provide it to the Natural Resource Conservation Service for review.

4.4.2 State Approvals

Based on the proposed Project macrocorridor, the Applicants are actively working with state agencies to ensure that the following approvals can be obtained as required:

- Cultural and Historic Resources Review -Minn. Stat. § ch. 138 designates the director of the Minnesota Historical Society as the State Historic Preservation Officer (Minn. Stat. § 138.081) and places responsibility for the historic preservation program with the Minnesota Historical Society. Consultation with program staff has been initiated on the project regarding historic and archaeological resources.
- Utility Permit - A permit from MN/DOT is required under Minn. R. 8810.3300 for construction, placement, or maintenance of utility lines adjacent or across highway right-of-way. The Applicants are coordinating MN/DOT review of the Project's route alternatives for possible permitting.
- Endangered Species Consultation - The Minnesota Department of Natural Resources (DNR) Natural Heritage and Nongame Research Program collects, manages, and interprets information about nongame species (Minn. Stat. § 4.0895; Minn. R. 6134.0100-0400 and 6212.1800-2200). Consultation with program staff has been initiated on the Project regarding rare and unique species.
- License to Cross Public Lands and Water - The DNR's Division of Lands and Minerals regulates utility crossings over, under, or across any state land or public water identified on the Public Waters and Wetlands Maps. A license to cross public waters is required under Minn. Stat. § 84.415 and Minn. R. ch. 6135. There are route alternatives crossing the Mississippi River, Ball Club River, and other waterways that would require a public water crossing license. The Project route alternatives also cross state lands that would require a public land crossing license. The Applicants are coordinating DNR review of the Project's route alternatives for possible licensing.

- Public Waters Work Permit – The purpose of this program is to regulate development activities below the ordinary high water mark of wetlands, streams and lakes in Minnesota. Under Minnesota Statute 103G.245, Subdivision 1, a Public Waters Work Permit is required for any action taken by the State, political subdivision of the state, corporation or person that alters or develops any obstruction to public waters or changes the course of a public waterway or body. The Applicants would apply for this permit as necessary.
- Wetland Conservation Act Permit - The Minnesota Board of Water and Soil Resources administers the state Wetland Conservation Act pursuant to Minn. R. ch. 8420. The Project may require a permit under these rules if permanent impacts to wetlands are anticipated because of construction. The Applicants would apply for this permit (which is applied for jointly with a Section 404 permit from USACE) as necessary.
- Section 401 Water Quality Certification – Minnesota Pollution Control Agency regulates water quality under Section 401 of the Clean Water Act 33 U.S.C. § 1344. Applicants would apply for this certification if a Section 404 permit is required.
- National Pollutant Discharge Elimination System (NPDES) Permit - An NPDES permit from the Minnesota Pollution Control Agency (MPCA) is required for stormwater discharges associated with construction activities disturbing an area of one acre or more (Minn. R. 7090.0030). A requirement of the permit is to develop and implement a Stormwater Pollution Prevention Plan, which includes best management practices to minimize discharge of pollutants from the site. This permit would be acquired if the modification of existing substations and/or construction of a new/upgraded Cass Lake Substation would cause a disturbance of greater than one acre.
- Noxious Weed Management Plan – Under Minn. Stat. § 18G.04, the Minnesota Department of Agriculture has the responsibility for eradication, control and abatement of nuisance plant species. The local County Agricultural Inspector administers the program. The Applicants will develop a vegetation maintenance/management plan for the Project.

4.4.3 Local Actions

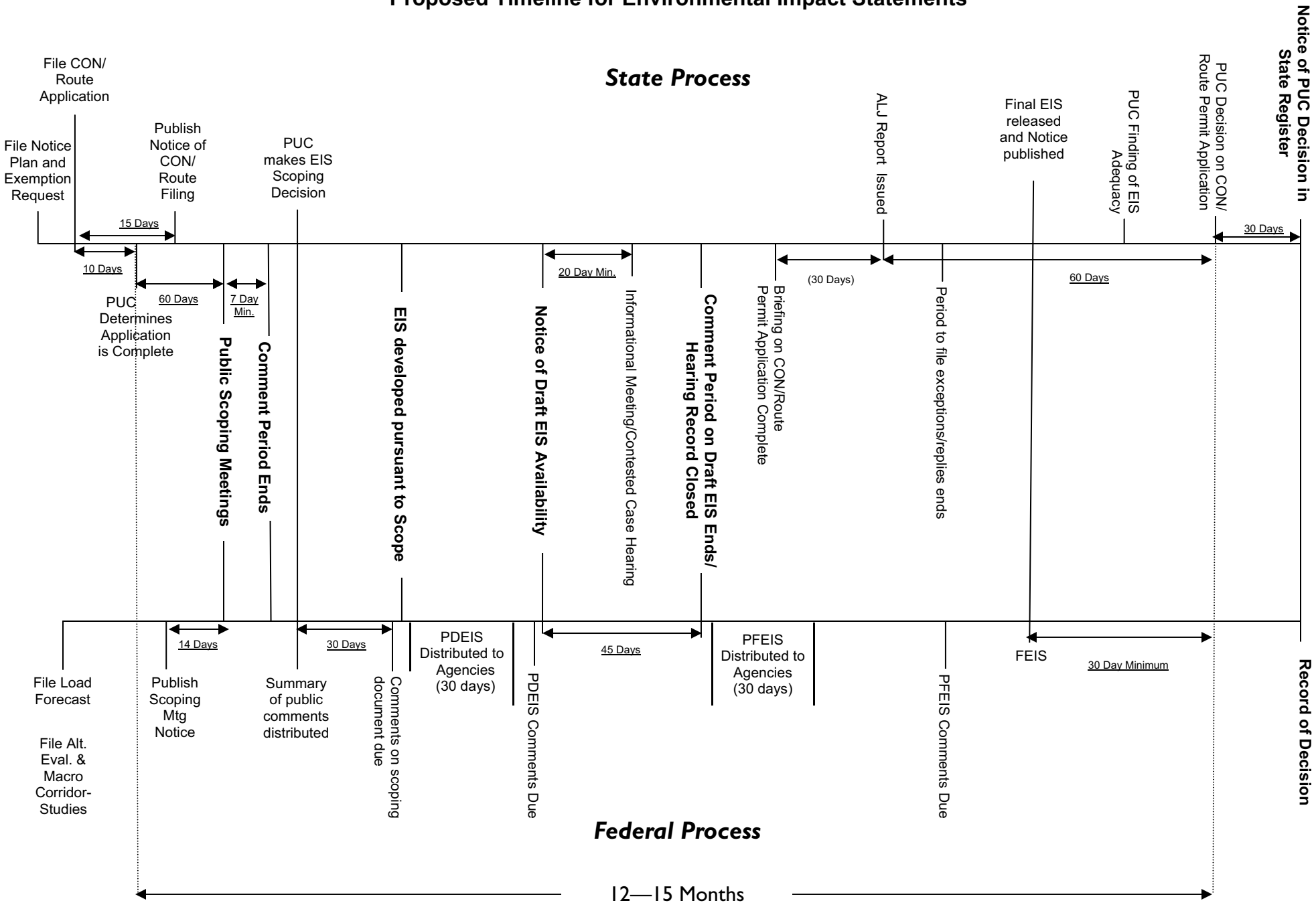
Once the routing and design of the Project are complete, the Applicants would work with local units of government to obtain any of the following approvals that may be required:

- Road Crossing/Right-of-Way Permits - These permits may be required to cross or occupy county, township, and city road rights-of-way.
- Public Lands Permits - These permits may be required to occupy county, township, and city lands such as parklands, watershed districts, and other properties owned by these entities.
- Building Permits - These permits may be required by the local jurisdictions for substation modifications and construction.

- Over-width Load Permits - These permits may be required to move over-width or heavy loads on county, township, or city roads.
- Driveway Access Permits - These permits may be required to construct access roads or driveways from county, township, or city roads.

Graphic 4-1

State and Federal
Proposed Timeline for Environmental Impact Statements



( ) Estimated
__ Required in Statute or Rule

5.0 Development and Screening of Alternatives

5.1 *Project Alternatives*

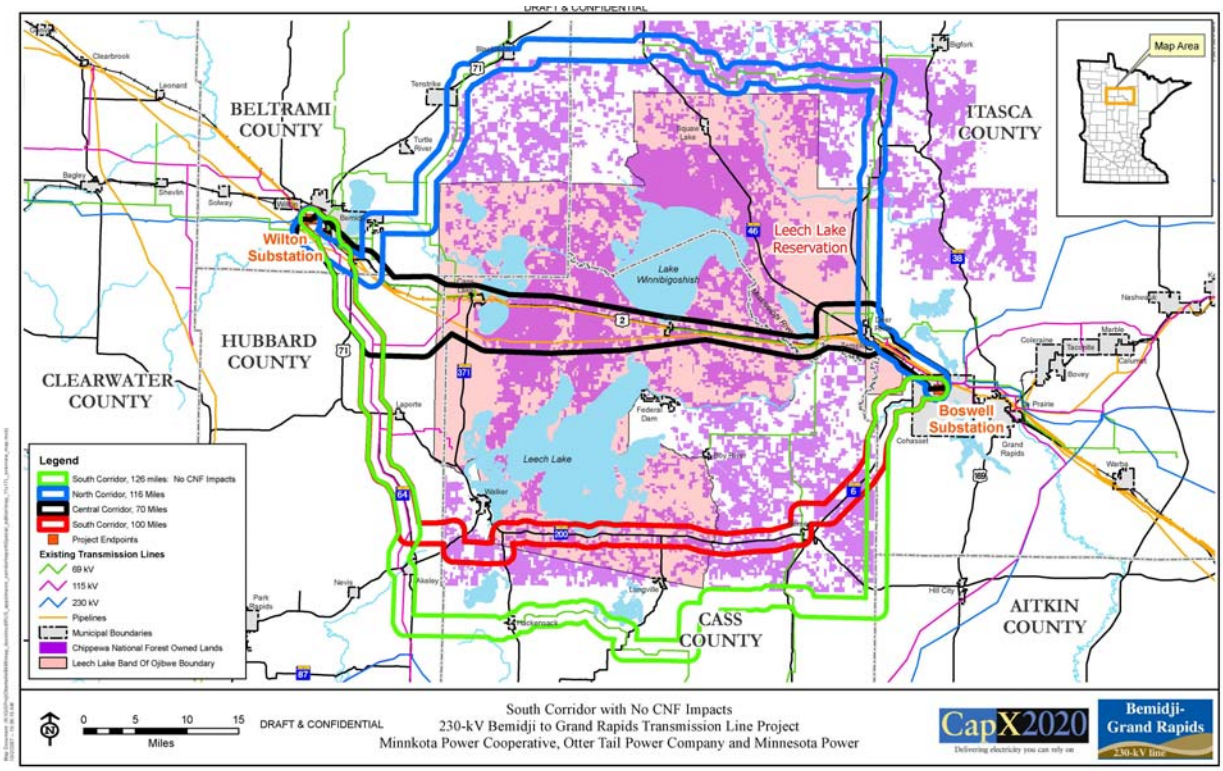
5.1.1 Generation and Electrical System Alternatives

Several levels of alternatives analyses were conducted for the proposed Project. Initial studies were conducted to determine the alternatives' ability to meet the requirements of anticipated future customer demand in the Bemidji area and Red River Valley. The alternatives considered were: 1) a "no-build" alternative, which focused on reactive power supply improvements in the Bemidji area and the impact of the Applicants' planned load management/energy conservation programs; 2) a new local generation alternative in the Bemidji area; and 3) alternative transmission lines to the proposed Bemidji-Grand Rapids Line. With respect to transmission alternatives, over 30 concepts were considered, 11 of which were comprehensively analyzed to determine their ability to address the existing inadequacies in the transmission system serving the Bemidji area and greater Red River Valley. This extensive evaluation process indicated that the Bemidji-Grand Rapids Line, with the Wilton and Boswell Substations as endpoints, is the best way to meet the bulk electric delivery need in the Bemidji area, along with providing other regional benefits. Details on the Applicants' analysis of alternatives are contained in the Certificate of Need application and Alternatives Evaluation Study (AES) for the Project, both of which can be reviewed online at www.capx2020.com.

5.1.2 Macrocorridor Alternatives

As part of its environmental review under the National Environmental Policy Act (NEPA), Rural Utility Service (RUS) required the Applicants to provide a Macrocorridor Study (MCS) identifying the area where the Project should be located and providing a preliminary analysis of the environment to be studied in that area. Initially, the Applicants identified a single macrocorridor as the study area for potential routes for the Project, referred to as the "Central Macrocorridor." This corridor ranges between 2 and approximately 7.5 miles wide (wider in the Bemidji area to allow for options). The Applicants then held discussions with a broad range of stakeholders including local, state, and federal agencies, and the Leech Lake Band of Ojibwe (LLBO) and its Department of Resource Management (DRM). Based on feedback from these stakeholders, the Applicants identified two additional macrocorridors, referred to as the "North Macrocorridor" and "South Macrocorridor." These corridors are approximately 2 miles wide along their length. The Chippewa National Forest (CNF) requested an additional corridor be added following review of the Draft MCS. This corridor is similar to the South Macrocorridor, but continues further south to avoid land within the CNF (see Map 5-1 below).

Map 5-1 North, Central, South, and Non-CNF Macrocorridors



The principal factor in identifying the three alternative macrocorridors to the Central Macrocorridor was the potential to use existing rights-of-way while avoiding major water bodies and land within the Leech Lake Reservation (LLR) and the CNF. Analysis of the macrocorridor alternatives was based on field surveys, existing agency data, and area maps, including review of available land use/land cover data, existing infrastructure data, and environmental constraints. The MCS is currently pending acceptance by the RUS. The final MCS will be available at the CapX2020 web site www.capx2020.com. A brief description of the four macrocorridors is provided below.

North Macrocorridor

The North Macrocorridor, which is approximately 116 miles long and two miles wide, connects the Wilton and Boswell Substations by generally following existing pipeline, transmission, and county road rights-of-way to the west, north, and east of the LLR. From Wilton, the North Macrocorridor follows a pipeline right-of-way to the southeast, and then travels north along an existing 69 kV line right-of-way east of Bemidji. This macrocorridor continues to follow the 69 kV line north until just south of Blackduck, where it turns east and follows an existing county road right-of-way for approximately 15 miles. At this point the North Macrocorridor continues east and then south along an existing 69 kV line right-of-way to just east of Deer River. The macrocorridor then follows an existing 115 kV line right-of-way southeast, ending at the Boswell Substation.

Central Macrocorridor

The Central Macrocorridor is approximately 69 miles long and from two to eight miles wide. It runs parallel to US Highway (Hwy) 2 between Bemidji and Grand Rapids. It directly connects the two end points by following existing infrastructure rights-of-way, including: 1) Minnesota Power and Otter Tail Power 115 kV transmission lines; 2) Great River Energy 69 kV transmission lines; 3) US Hwy 2, 4) Burlington Northern Santa Fe (BNSF) rail line; 5) Enbridge pipelines; and 6) Great Lakes Gas pipelines. This macrocorridor is the shortest distance between the two endpoints of the Project.

South Macrocorridor

The South Macrocorridor is approximately 100 miles long and two miles wide. It connects the Wilton and Boswell Substations by generally following existing pipeline, transmission line, and state/county road rights-of-way to the south and around the LLR. However, the South Macrocorridor still traverses a portion of the LLR. This macrocorridor follows an existing 115 kV line right-of-way east and south from Wilton to a point southwest of Walker. It then turns east to Minnesota Hwy 371, then north to Minnesota Hwy 200, and continues east to the city of Remer. At this point the South Macrocorridor turns northeast and follows Trunk Highway (TH) 6 to the Boswell Substation.

Non-Chippewa National Forest Macrocorridor

The Non-CNF Macrocorridor is approximately 126 miles in length. Starting at the Wilton Substation, this macrocorridor follows an existing 115 kV line right-of-way to a point 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, where it continues east to TH 6. At this point, the Non-CNF Macrocorridor turns northeast and follows TH 6 to the Boswell Substation.

Findings from the MCS are summarized in Table 5-1 and Table 5-2.

Table 5-1 Summary of Potential Impacts in the North, Central, South, and Non-CNF Macrocorridors

Issue	North Macrocorridor	Central Macrocorridor	South Macrocorridor	Non-CNF South Macrocorridor
Macrocorridor Length	116 miles	68 miles	100 miles	126 miles
Existing Linear Features	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/ No Existing Linear Features	1.6 miles new macrocorridor	2.4 miles new macrocorridor	11.5 miles new macrocorridor	24.2 miles new macrocorridor
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
State Forest – state owned property	154 ac	51 ac	180 ac	0 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

Note: *Potential impacts 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 would be evaluated in more detail and refined during the environmental review process.*

Table 5-2 Summary of Identified Resources Located Within the North, Central, South, and Non-CNF Macrocorridors

Issue	North Macrocorridor	Central Macrocorridor	South Macrocorridor	Non-CNF Macrocorridor
Federal Listed Species (Known)	0	0	0	0
CNF Species of Concern	16 species	25 species	19 species	0 species
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	0
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%

Note: *The identified resources in this summary include all resources located within the macrocorridor. This summary does not represent impacts on those resources since the macrocorridors do not constitute specific rights-of-way, and the exact locations of these resources relative to ROW have yet to be determined. Potential impacts to these resources would be identified during the environmental review process.*

[1]*Based on 2000 US Census Bureau data. Range is given for counties within macrocorridor.*

[2]*Based on 2006 US Census Bureau data. Range is given for counties within macrocorridor*

5.2 *Double-Circuiting Options*

There are opportunities in each of the four macrocorridors for existing 115 or 69 kV transmission lines to be double-circuited with the Project. The benefit of having portions of the route share an existing right-of-way with another transmission line must be balanced, however, against the potential harmful impact of a single incident (such as a severe storm) taking out two lines rather than just one. In addition to this transmission reliability concern, double-circuiting raises construction and maintenance issues that must be addressed. The Applicants have concluded that constructing double-circuit structures that would carry both existing and the proposed line in certain areas would be appropriate, provided adverse impacts to reliability are properly addressed.

5.3 *Alternatives Considered But Eliminated*

Both state Certificate of Need regulations and federal NEPA regulations require an evaluation and rejection of possible alternatives to a proposed project before proceeding

with environmental review and a routing determination. These include evaluations of a no-build (state)/no action (federal) alternative, a generation alternative, and other transmission alternatives to the proposed Project.

5.3.1 No Build Alternative

The Applicants discuss this alternative in detail in Section 5.2 of their Certificate of Need application for the Project, concluding that it is not a reasonable alternative. First, although demand side management (DSM) and conservation improvement programs (CIP) have and continue to be executed to manage the growth of load in the Bemidji area, the forecasted winter peak load for 2011/2012 would still exceed the load reliability limits of the existing transmission system. Relying on even greater DSM and CIP efforts is therefore not a viable alternative to adding new transmission or generation to address the area's increasing demand for energy.

Second, existing facilities in the area have been upgraded to meet the increase in demand. The addition of more reactive support to area substations, and the increased operation of area peaking generation, would help maintain system load-serving capability up to 2011/2012. However, at that point the forecasted load for the area would require additional transmission or generation.

5.3.2 Generation and Other Transmission Alternatives

Adding generation near the load center is a theoretical alternative for improving the power system's load serving capability. Section 5.3 of the Certificate of Need application for the Project discusses the impracticality of adding a new local generation resource to secure increases in local load-serving capability, and the high cost and regulatory obstacles involved with installing distributed generation resources. Section 5.4 of the Certificate of Need application also discusses four transmission alternatives to the Project, none of which increased the load serving capability of the bulk transmission system in the Bemidji area to the extent of the Project, and all of which were therefore more expensive than the Project. The Applicants concluded that generation and the other transmission options are not feasible alternatives to the Project.

5.3.3 Macrocorridor Alternatives

Having determined that the Bemidji-Grand Rapids Line is the appropriate solution to the bulk power delivery and associated load serving deficiencies of the Bemidji area's transmission system, the Applicants conducted an analysis of the impacts on the Project's electrical performance and cost if it is located in the North, Central, South, and Non-CNF Macrocorridors. Locating the route for the Bemidji-Grand Rapids Line in the Central Corridor provides more reliable electric service for the Bemidji area than the alternative corridors because it maximizes the load serving ability of the line and it provides the most flexibility to make other reliability improvements in the area, most notably at Cass Lake.

A transmission line's ability to transport increasing amounts of electric power, referred to as the line's loading limit, is generally constrained by the line's thermal limit. When a transmission line is short, the impedance of the conductor is smaller and therefore the line can be loaded up to its capacity, or thermal limit, and still maintain stable voltage (steady state stability). The longer the transmission line becomes, however, the higher the impedance

of its conductor and the lower its ability to maintain acceptable steady state voltage. In short, as a line's length increases its loading limit becomes less than its thermal limit, resulting in a longer line providing less load-serving capacity than a shorter line of the same voltage.

The South Macrocorridor is almost half again as long as the Central Macrocorridor (100 miles vs. 69 miles), resulting in the loading limit of a 230 kV line in the Southern Corridor being about 85 percent of the limit of a 230 kV line in the Utilities' preferred macrocorridor. The North Macrocorridor is 116 miles, which results in a 230 kV line's load ability in that macrocorridor being only around 75 percent of what it would be in the preferred macrocorridor. The Non-CNF Macrocorridor is even longer (126 miles), resulting in the loading limit of a 230 kV line being about 72 percent of the Central Macrocorridor. The reduced loading limits of transmission facilities in the alternative corridors directly diminish the lines' ability to effectively address post-contingent voltage concerns in the Bemidji area and reduce the load serving capability of the line.

A further consideration is the need for additional electric power support in the vicinity of Cass Lake. If the existing 115 kV line between Bemidji and Nary Junction southeast of Bemidji experiences an outage, Cass Lake has only one electrical source remaining, which is from Badoura to the south. As discussed in Section 3.2, studies show that with any significant growth in the Cass Lake area it would be difficult to serve Cass Lake from Badoura alone. The Central Macrocorridor passes very near Cass Lake making available low-impact alternatives to reinforce electric service performance. This would involve segmenting the Bemidji-Grand Rapids Line with a new 230/115 kV substation located near Cass Lake, or upgrading the existing 115/69 kV Cass Lake Substation to 230 kV to handle the new line. Either of these alternatives can be accomplished with minimal impact on right-of-way requirements and at relatively low expense compared to what would be required to improve Cass Lake service if the Bemidji-Grand Rapids Line is located in the South or North Macrocorridors. It would be necessary to build a new 10-to-12-mile 115 or 230 kV line in new right-of-way to connect either of those corridors to Cass Lake.

Finally, system design considerations do not support locating the route for the Bemidji-Grand Rapids Line in the South or Non-CNF Macrocorridors. Large portions of these two macrocorridors overlay the route of the existing Wilton-Bemidji-Nary-Laporte-Akeley 115 kV line. Locating the Bemidji-Grand Rapids Line along the same route as the Wilton-to-Akeley 115 kV line would result in two of the four transmission facilities for the Bemidji area being directed through the same geographic region south of Bemidji. Choosing to configure the system like this heightens the risk that the Bemidji-Grand Rapids and Wilton-Akeley transmission lines could both experience an outage from the same weather-related event along this 45-mile corridor. The North American Electric Reliability Corporation (NERC) recognizes the loss of all circuits within a common right-of-way as a credible contingency that must be considered in transmission planning studies. See NERC Standard TPL-004-0, Category D.7.

The Utilities also conducted demand and energy loss and cost of ownership analyses of the Bemidji-Grand Rapids Line in the four corridors. The North, South, and Non-CNF Macrocorridors yield smaller loss reductions (21 and 19, and 18 MW, respectively) than the Central Macrocorridor's 23 MW loss reduction. The alternative corridors' inferior performance is due to their greater lengths, and therefore higher impedance, which result in

less power flow on the line and consequently offer less loading relief for existing transmission sources in the Bemidji area.

The annual summer peak demand loss reductions for the corridors were translated into demand-related cost savings. The annual savings of locating the Project's route in the Central Macrocorridor are 11 percent greater than if the route is located in the Southern Macrocorridor, 21 percent greater than if the route was located in the Northern Macrocorridor, and 25 percent greater than if the route was located in the Non-CNF Macrocorridor. The annual energy losses and associated cost savings were also calculated for the four corridors, with the Central Macrocorridor projected to deliver annual energy loss savings of over $4.3 million, which is 16 percent greater than the loss savings of the South Macrocorridor ($3.7 million), 24 percent greater than those of the North Macrocorridor ($3.5 million), and 30 percent greater than those of the Non-CNF Macrocorridor ($3.4 million).

To put the loss savings of the macrocorridors into perspective relative to the construction costs of the line, the cumulative present value of the revenue requirements (PVRR) to construct the line was calculated based on both the construction costs and loss savings. The Central Macrocorridor has a PVRR of $90 million, with the PVRR for the South Macrocorridor being 59 percent higher ($143 million), the PVRR for the North Macrocorridor being 94 percent higher ($175 million), and the PVRR for the Non-CNF Macrocorridor would be even higher.

Finally, the Applicants also conducted a preliminary analysis of the environmental impact of placing the line in the North, Central, South, and Non-CNF Macrocorridors. In general, the environmental analysis contained in the MCS concludes that the Non-CNF Macrocorridor would require the largest amount of new right-of-way and have the greatest impact on public water crossings, wetlands, and forested lands. The South Macrocorridor would have the largest impact on public lands, including CNF and state forests. The South Macrocorridor also has the longest length of new right-of-way that is not adjacent to existing rights-of-way. The North Macrocorridor would have the largest amount of impact on agricultural lands. While the North Macrocorridor follows a majority of existing transmission lines, these routes are located adjacent to roads; therefore, they have a higher probability of impacting more residences. This initial review of environmental conditions in the alternative macrocorridors indicates that locating the Bemidji-Grand Rapids Line in the Central Macrocorridor would likely have the least environmental impacts. Therefore the Applicants provide in this Route Permit Application a detailed analysis of a preferred and alternate route for the Project in the Central Macrocorridor.

In summary, the Applicants prefer the Central Macrocorridor based on electrical performance, cost, and an initial review of environmental conditions. The upcoming environmental scoping process under state transmission routing regulations and federal NEPA regulations offers interested persons an opportunity to comment on this conclusion and offer alternatives. Through the scoping process, state and federal agencies would determine the alternatives to be reviewed and the impacts to be considered.

5.3.4 Transmission Technology Alternatives

Direct Current Alternative

The Applicants were required to evaluate the possibility of constructing a direct current (DC) transmission line as an alternative to the alternating current (AC) transmission line being proposed in their certificate of need application. A DC line is typically proposed for transmitting large amounts of electricity over long distances because there are considerably less line losses on a DC line than on an AC line. There are only two DC lines in existence in Minnesota, one of which is +/- 250 kVDC, and the other is +/- 400 kVDC.

A DC line is not a realistic option in this situation. A line intended for local load serving purposes must be able to be readily tapped to serve customers. While this can be done with an AC line, a DC line requires two conversion systems: one to convert the generation of AC electricity to DC current to flow through the DC line, and another to convert the DC current back to AC current that can be used by customers. Such converters would add dramatically to the cost of the Project, which the increase in line loss reductions could not offset. The economic justification for a DC line does not exist in this case.

Transmission Structures

Consideration of potential transmission structures for the Project was limited to H-frames and single-poles. Lattice structures of various configurations were eliminated from further consideration because they are costly to install and typically require relatively large land areas.

Undergrounding

The CNF and DNR requested that the Applicants consider underground installation of the 230 kV line at the Mississippi River Crossings. The primary concerns expressed included visual impacts to river viewers and potential bird collisions within the river corridor.

Undergrounding is an option that is seldom used for transmission lines. One major reason is the significant incremental construction, operation, and maintenance expenses incurred in comparison to traditional overhead line construction. The cost range for an underground line depends on such factors as the line voltage, type of underground cable required, the extent of underground obstructions such as rock formations, the thermal capability of the soil, and the length. Generally, the construction cost of locating the transmission line underground is estimated to be as much as 10 to 15 times greater per mile than if constructed as an overhead line. The estimated cost range for the proposed overhead 230 kV line is $790,000 to $1,150,000 per mile. The estimated cost range for the same voltage line to be placed underground is $10 to $15 million per mile, more than a 12-fold increase as compared to the overhead cost. This cost range for an underground line does not include the cost for substations with large inductors that are necessary approximately every 20 miles to counteract the greater line charging currents associated with undergrounding. In addition, there are increased line losses and maintenance expenses incurred throughout the useful life of an underground line that makes its cost versus an overhead line even greater.

Because of the significantly greater expense associated with underground transmission construction, it is limited to locations where physical circumstances allow no other option or where overhead construction is prohibited. Examples include congested downtown centers

where there is no space available between city streets and adjacent buildings for adequate clearance.

While underground lines reduce visual impact (other than at the overhead/underground transition locations), and may minimize surface impacts after construction, there are distinct environmental consequences. The predominant environmental impact from the construction, operation, and maintenance of underground transmission lines arises from the need to develop and maintain a right-of-way totally cleared of woody vegetation. The construction activities for an overhead transmission line are typically concentrated around the line's structures, with the areas between structures left relatively undisturbed except for the removal of trees that could interfere with the energized conductors. A narrow pathway between structures is often all that is necessary to string the conductors. With underground construction, however, the entire right-of-way must be cleared for construction activities along the entire length of the corridor. This increases impacts to wetland areas due to the installation of access roads capable of supporting heavy construction equipment, trenching activities, and cable installation. These wetland impacts would be permanent if a drivable road were constructed to allow quick access to repair the underground line in the event of an incident taking it out of service. Underground lines also present challenging reliability and service issues. While overhead lines are subject to more frequent outages then underground cables, service is usually quickly restored by the automatic re-closing of circuit breakers, resulting in only a momentary outage of the transmission line. The lower incidence of outages with underground cables is offset by the fact that the outages are much longer. This is because re-closing circuit breakers is not recommended until it is verified that there is no fault in the underground cable.

Restoration of a faulted underground line also takes much longer due to the difficulty in locating the fault and accessing the site to make repairs. Repairing failures in high voltage extruded dielectric cables is typically not done; instead the cable is completely replaced between man-hole splice points that are generally located every 1,500 to 2,000 feet along the cable. This is expensive and very time consuming, with restoration taking several weeks or longer depending on location and access. Replacing cable involves bringing in heavy equipment, including cable reels weighing 30,000 to 40,000 pounds, during all seasons of the year. If the failure is in a splice, it may be feasible to make a repair at the splice location without having to replace large quantities of cable, but access is still required for equipment and personnel. If the fault occurs in a wetland area where all-season roads are not maintained, restoration can be further delayed as matting is installed to gain access to the manholes used to replace the failed cable.

The Applicants believe that undergrounding at the Mississippi River crossings is not a viable option for this Project. The concerns with maintaining or repairing an underground line should an outage occur, as well as the increased cost of constructing and operating the line out weigh the benefits to river viewers and wildlife. The Applicants have identified several alternatives that specifically address issues related to the Mississippi River crossings.

6.0 Proposed Action and Alternatives

6.1 *Route Selection Process*

Transmission planning, designing, engineering, and environmental criteria were used to develop a preferred and alternate route for the Project. State and federal regulatory requirements as well as input from stakeholders were also considered. Based on the information gathered to date, this application focuses on the Central Macrocorridor as identified in Chapter 5.0. Preliminary routes within this Macrocorridor were developed by considering the following:

- **Follow existing rights-of-way, survey lines, natural division lines, and agricultural field boundaries when feasible –** A primary factor in identifying routes is Minnesota's policy that new right-of-way for a project should be avoided where existing right-of-way can be used. This is called the nonproliferation policy, adopted by the Minnesota Supreme Court in *People for Environmental Enlightenment and Responsibility, Inc. (PEER) v. Minnesota Environmental Quality Council*, 266 N.W.2d 858, 868 (Minn.1978). In that case, the Supreme Court held that "as a matter of law, [one should] choose a pre-existing route unless there are extremely strong reasons not to do so." *Id.* at 868. The PUC's rules also recognize that nonproliferation is an important consideration in selecting final routes for new transmission. Minn. R. 7849.5910 H and J. Selecting a route that would result in completely new right-of-way would run counter to the nonproliferation policy. The Applicants used geographic information system (GIS) mapping and field verification to identify existing rights-of-way (transmission lines, pipelines, railroads, roads, etc.), and natural division and field boundaries.

- **Minimize length –** Minimizing the length of a route generally decreases its impacts on the environment. In some situations, however, a longer route or route segment is chosen to avoid specific, undesirable impacts.

- **Avoid populated areas where feasible –** One of the most common comments received at the Applicants' public meetings was that residences should be avoided where possible.

- **Avoid major environmental features where feasible –** Major natural features such as non-fragmented forest land, threatened and endangered species, waterbodies and wetlands, and biodiversity areas identified by the Chippewa National Forest (CNF), Leech Lake Band of Ojibwe (LLBO), and the Minnesota County Biological Survey (including Wildlife Management Areas (WMAs), Scientific and Natural Areas (SNAs), and State Game Refuges (SGRs)) were identified, mapped, and avoided where feasible.

- **Maximize transmission system reliability and promote system redundancy where feasible –** Both the routing of the Project in close proximity to existing lines or double-circuiting it with existing lines were considered. In some cases, however, there were system reliability and safety concerns that supported keeping the Project separate. Routing options were excluded from further

consideration if the construction or maintenance of the Project as a double-circuit or parallel line with an existing transmission line would compromise system reliability or violate North American Electric Reliability Corporation (NERC) regulations.

- **Avoid agricultural production –** Consideration was given to avoiding center pivots and farming operations where feasible.
- **Avoid airports and other conflicting land uses –** The Applicants worked with federal and state agencies, the LLBO, and local governments to identify and map land uses that could conflict with the Project. These included airports, WMAs, SNAs, SGRs, trails, sensitive CNF management areas, and tribal and Indian-owned lands. These land uses were avoided where feasible.

In addition, consideration was given to comments received during two series of public information meetings, and numerous agency meetings, which echoed many of the points discussed above. These comments included:

- Utilize existing rights-of-way where feasible.
- Avoid or minimize impacts to CNF, Leech Lake Reservation (LLR), privately owned lands, and population concentrations.
- Minimize impact to property values.
- Avoid or minimize impacts to water resources and wildlife.
- Avoid or minimize conflicts with adjacent land uses such as forestry and sensitive species.
- Avoid or minimize impacts to cultural resources.
- Avoid or minimize impacts to businesses.

Section 8.0 provides an evaluation of the potential environmental impacts for each route under consideration. All route segments and associated environmental information considered in the route selection process are included in Appendix A.

6.2 *Route and Segment Descriptions*

The Applicants are proposing two general routes with four route alternatives as described below. Both routes would begin at the Wilton Substation near Bemidji, Minnesota (the western end of the Project), and terminate at the Boswell Substation near Grand Rapids, Minnesota (the eastern end of the Project). The Applicants have also identified four segments that can be used as crossovers between the two primary routes.

The routes and specific route segments are described in Section 6.2.1 through 6.2.6. Crossover segments are described in Section 6.3. Section 6.4 discusses options considered for the Mississippi River Crossing. All other segments initially considered by the Applicants but not used are described in Section 6.5. The routes, including township/section/range locations, are identified on the overview and detailed route maps in Appendix A. Figures A.28 to A.30 in Appendix A display the eliminated segments.

The PUC may grant a permit for a route that is up to 1.25 miles wide, within which the right-of-way for the proposed transmission line would be located (Minn. Stat. 116C.52, subd. 8). The Applicants request that the PUC approve a narrower route, only 1,000 feet wide in most cases, within which the Project would be located. The Applicants believe this width will enable them to minimize environmental impacts during the design and construction of the Project, as well as address any landowner and adjacent linear facility owner routing issues that may occur along the proposed route alignment. The 1,000-foot wide routes are shown on the route maps in Appendix A.

The Applicants intend to use H-frame structures for the Project. However, certain transmission design considerations (such as double-circuiting) and/or geographical constraints (e.g., points-of-inflection, narrow rights-of-way in developed areas, etc.) may arise where single pole, steel structures would be necessary.

The route descriptions have been divided into segments based on the associated facilities and adjacent rights-of-way. Appendix A provides the segment maps.

6.2.1 Route 1

Route 1 generally follows the Great Lakes Gas Transmission Company (Great Lakes) pipeline right-of-way from the Wilton Substation to just east of Deer River, where it then follows a Minnesota Power 115 kV transmission line to the Boswell Substation. For transmission line construction costs Route 1 was analyzed for double-circuit and no double-circuit options (See Table 6.8). Route 1 includes the following segments, which are described in Table 6-1 below from west to east: 1, 15, 17a, 17b, 24, 26, 27, 29, 37B, 37C, 39, 41, 42, 47, 51, 57, 58, 66, 68, 69, and 73.

Table 6-1 Route 1 Segments

Segment ID	Length (Miles)	Associated ROW (% of segment)	Map Sheet	Description
1	5.2	69 kV line & Pipeline (83%) New corridor (17%)	A.5, A.6	Wilton Substation – Bemidji – runs south following two 69 kV transmission lines for 1.2 miles before intersecting County State Aid Highway (CSAH) 14. At this point, Segment 1 continues south cross-country (on new alignment) for approximately 2,000 feet to the Great Lakes right-of-way. The route segment turns southeast following the Great Lakes pipelines. Approximately 1,800 feet west of the Mississippi River, Segment 1 leaves the Great Lakes right-of-way to avoid a housing development by turning south for about 1,900 feet, then east for about another 2,700 feet; before joining back up with the Great Lakes right-of-way. Segment 1 then proceeds southeast to Otter Tail Power's 115 kV transmission line (Bemidji-to-Nary).
15	0.5	Pipeline (100%)	A.6	Proceeds southeast along the Great Lakes pipeline, where the Bemidji-to-Nary line runs south-southeast, between Marquette and Carr lakes
17A	0.7	Pipeline (100%)	A.6	Continues to follow the Great Lakes pipeline between CSAH 11 and Madison Ave. SW
17B	11.6	Pipeline (100%)	A.6 - A.9	Continues to head southeast following the Great Lakes pipeline from Madison Ave. SW to Otter Tail Power's 115 kV transmission line (Nary-to-Cass Lake). The beginning of Segment 17b is wide to have a route around the Bemidji Slough WMA.

Segment ID	Length (Miles)	Associated ROW (% of segment)	Map Sheet	Description
24	3.8	Pipeline (100%)	A.11, A.12	Follows Great Lakes pipeline from the Nary-to-Cass Lake line to the intersection of Wilkenson Road, Hart Lake Road, and Lupine Dr NW (Lake 13 Road)
26	4.7	Pipeline (100%)	A.12, A.15	Follows the Great Lakes pipeline from the intersection of Wilkenson Road to Cuba Hill Road in the CNF. This segment travels between Moss Lake and Ten Section Lake, and between Twin Lake and Camp Lake.
27	5.9	Pipeline (100%)	A.15, A.16	Continues east along the Great Lakes pipeline from Cuba Hill Road to Sucker Bay Road, south of the Sucker Lakes in the CNF
29	11.5	Pipeline (100%)	A.16 – A.18	Proceeds east along the Great Lakes pipeline from Sucker Bay Road to Six Mile Lake Road along the south side of Portage Lake and the City of Bena, and along the north side of Leech Lake and Six Mile Lake
37B	7.3	69 kV line, Pipeline, & Railway (100%)	A.18 – A.20	Follows GRE 69 kV transmission line and Enbridge pipelines east to Mud Lake Road, just west of the Mississippi River
37C	0.2	New corridor (100%)	A.18	Parallels north-south segment of Mud Lake Road
39	0.2	69 kV line & Pipeline (100%)	A.20	Follows GRE's 69 kV line between Enbridge pipelines and Great Lakes pipelines on the west side of the Mississippi River
41	0.8	69 kV line & Pipeline (100%)	A.20	Crosses Mississippi River and follows Great Lakes, Enbridge, and GRE rights of way
42	0.6	69 kV line & Pipeline (100%)	A.20	Continues along Great Lakes, Enbridge, and GRE rights of way to just east of CR 119
47	1.1	New corridor (100%)	A.20	Departs from the Great Lakes, Enbridge, and Great River Energy rights-of-way at CR 119, heading cross-country in a southeasterly direction to CR 118. The segment then follows CR 118 for about 1,200 feet, continues east cross country, and then turns north for about 1,000 feet before turning northeast and north for another 2,150 feet where it rejoins the Great Lakes rights-of-way
51	1.0	Pipeline (100%)	A.20	Heads northeast following the Great Lakes right-of-way south of Ball Club Lake, past CSAH 18, to where GRE's 69 kV transmission line intersects the Great Lakes right-of-way
57	0.9	69 kV line & Pipeline (100%)	A.20, A.21	Follows Great Lakes and GRE rights-of-way, northeast, to the point where the 69 kV line heads north
58	5.8	69 kV line, railway, & Pipeline (100%)	A.21, A.22	Heads east from the 69 kV transmission line for about 2.0 miles along the Great Lakes right-of-way to Cedar Road. At Cedar Road, Segment 58 heads southeast for 3.8 miles paralleling the rights-of-way for Great Lakes pipeline and BNSF railway. Segment 58 runs south of the City of Zemple and north of White Oak Lake
66	0.7	Pipeline (100%)	A.22	Heads east following the Great Lakes right-of-way from the BNSF railway to CASH 11 and a Minnesota Power 115 kV transmission line
68	1.8	115 kV line & Pipeline (100%)	A.22	Heads southeast along the 115 kV transmission line to the intersection of the line and the BNSF railway
69	3.6	115 kV line & Railway (100%)	A.22, A.23	Continues southeast along the 115 kV transmission line right-of-way from the intersection of the BNSF railway to the northside of Blackwater Lake

Segment ID	Length (Miles)	Associated ROW (% of segment)	Map Sheet	Description
73	0.9	115 kV line (100%)	A.23	Heads south on the eastside of Blackwater Lake adjacent to the 115 kV transmission line right-of-way into the Boswell Substation

6.2.2 Route 1A

Route 1A was developed to collocate with an existing 115 kV transmission line from Bemidji to Cass Lake instead of following the Great Lakes pipeline. East of Cass Lake, Route 1 A is the same as Route 1. This alternative replaces segments 17a, 17b, and 24 of Route 1 with segments 18 and 22. The following segments make up this route alternative, from west to east: 1, 15, 18, 22, 26, 27, 29, 37b, 37C, 39, 41, 42, 47, 51, 57, 58, 66, 68, 69, and 73. Segments 18 and 22 are described in Table 6-2 below.

Table 6-2 Route 1A Segments Varying from Route 1

Segment ID	Length (Miles)	Associated ROW (% of segment)	Map Sheet	Description
18	15.7	115 kV line (100%)	A.6, A.11, A.24, A.25, A.26	Follows OTP's Bemidji-to-Nary 115 kV transmission line south for about 10 miles to where it intersects with OTP's Nary-to-Cass Lake 115 kV transmission line, then proceeds east and northeast along the Nary-to-Cass Lake line for about 6 miles to the intersection of 317th Ave. and 460th Street in Hubbard County
22	5.0	Pipeline (100%)	A.11, A.12	Continues east along 460th Street in Hubbard County and 143rd Street NW in Cass County, on the south side of Pike Bay

6.2.3 Route 1B

Route 1B was developed to avoid the Ten Section Area and Pike Bay Experimental Forest of the CNF. This alternative replaces Segment 26 of Route 1 with Segment 71. The following segments make up this route alternative, from west to east: 1, 15, 17a, 17b, 24, 71, 27, 29, 37b, 37C, 39, 41, 42, 47, 51, 57, 58, 66, 68, 69, and 73. A description of Segment 71 follows in Table 6-3 below.

Table 6-3 Route 1B Segments Varying from Route 1

Segment ID	Length (Miles)	Associated ROW (% of segment)	Map Sheet	Description
71	10.5	New corridor (100%)	A.12, A.15, A.27	Proceeds south from the intersection of Wilkenson Road and Lupine Dr NW (Lake 13 Road) for approximately 2 miles. The segment then follows 56th Ave. SW south for 1.5 miles, where it heads east on a new right-of-way for about 4.0 miles to Cuba Hill Road. At Cuba Hill Road, Segment 71 turns and heads north cross-county for about 3.0 miles where it reconnects with the Great Lakes pipeline corridor.

6.2.4 Route 1C

Route 1C was developed to reduce the number of transmission lines that cross the Mississippi River at the preferred river crossing location. This route alternative would replace the existing Great River Energy 69 kV line crossing the Mississippi River (Bena Substation-to-Bena Tap located at CSAH 18) with the proposed 230 kV transmission line. Great River Energy's 69 kV line would be re-routed to the south along a new right-of-way. Route 1C includes a single circuit crossing of the Mississippi River and construction of 4.4 miles of 69 kV line. This route adds Segment 72 to the Route 1 description above. The following segments make up this route alternative, west to east: 1, 15, 17a, 17b, 24, 26, 27, 29, 37b, 37C, 39, 41, 42, 47, 51, 57, 58, 66, 68, 69, 72, and 73. A description of Segment 72 is provided below in Table 6-4.

Table 6-4 Route 1C Segments Varying from Route 1

Segment ID	Length (Miles)	Associated ROW (% of segment)	Map Sheet	Description
72	4.4	New corridor (100%)	A.20	Reroute of an existing 69 kV transmission line from its crossing at the Mississippi River to CSAH 18. Segment 72 heads south for about 2 miles from between Mud Lake Road and Forest Road No. 2127 - Spur No. 3075 (Segment 39). The segment then turns east and travels for about 2.5 miles to CSAH 18 where it connects with the existing Salem Switch-to-Boy River 69 kV transmission line.

6.2.5 Route 2

Route 2 generally follows US Highway 2 (US 2) and the Enbridge pipeline rights-of-way. It includes the following segments, from west to east: 3, 7, 9, 13a, 13b, 19, 21, 31, 33, 45, 50, 54, 62, 63, 64, 66, 67, and 73. The segments are described below in Table 6-5.

Table 6-5 Route 2 Segments

Segment ID	Length (Miles)	Associated ROW (% of segment)	Map Sheet	Description
3	2.1	Railway (56%) US Hwy 2 (24%) New corridor (20%)	A.5	Wilton Substation – Bemidji – proceeds east along a new corridor for 2,200 feet to the BNSF railway, where the route proceeds southeast along the railway to the US 2 and US 71 corridor. At the US 2 and US 71 interchange, Segment 3 turns south and follows US 2/71 for approximately 2,700 feet to Otter Tail Power's Wilton-to-Bemidji 115 kV transmission line.
7	0.3	US Hwy 2 (100%)	A.5	Continues south parallel to US 2/71, between the 115 kV transmission line and the Enbridge pipeline.
9	0.6	US Hwy 2 (100%)	A.5	Continues south parallel to US 2/71, between the Enbridge pipeline and Otter Tail Power's Bemidji-to-Nary 115 kV transmission line.
13a	3.0	US Hwy 2 (100%)	A.5, A.6	Proceeds southeast along US 2/71, between the Bemidji-to-Nary transmission line to the US 2 and US 71 interchange.
13b	0.8	US Hwy 2 (100%)	A.6	Begins on the east side of the interchange, at crossover Segment 70, and continues east to where the Enbridge pipelines cross US 2.

Segment ID	Length (Miles)	Associated ROW (% of segment)	Map Sheet	Description
19	11.8	US Hwy 2 (25%) 69 kV line (75%)	A.6 – A.9	Continues east from the Enbridge pipeline crossing along the US 2 for about 3 miles to the intersection with an Otter Tail Power 69 kV line. The segment continues generally east following US 2 and the 69 kV line for approximately 8.3 miles, then heads south along the 69 kV line for about 1,000 feet ending at the Cass Lake Substation.
21	2.4	Pipeline & Railway (100%)	A.9, A.10	Heads east from the Cass Lake Substation along the BNSF railway and the Enbridge pipeline, passing through the City of Cass Lake.
31	2.5	Pipeline & Railway (40%) US Hwy 2, Pipeline, & Railway (60%)	A.10	Begins on the east side of the City of Cass Lake, continuing to follow the BNSF and Enbridge rights-of-way east between Pike Bay and Cass Lake for about 1 mile. The segment continues southeast joining the US 2 corridor for about 1.5 miles.
33	28.2	US Hwy 2, Pipeline, & Railway (100%)	A.10, A.13, A.14, A.17 – A.20	Continues east following US 2 from the east side of Pike Bay to just east of the Mississippi River crossing near Ball Club Lake. This segment (from west to east) passes by Sucker Lake, Portage Lake, Little Portage Lake, the City of Bena, Winnibigoshish Lake, Six Mile Lake, and crosses the Mississippi River.
45	1.0	US Hwy 2, Pipeline, & Railway (100%)	A.20	Continues east along US 2 and the BNSF right-of-way, between East Mississippi Road (near the Mississippi River crossing) and CR 137 (near Ball Club Lake).
50	0.7	US Hwy 2, Pipeline, & Railway (100%)	A.20	Heads east and northeast along highway, railway, and pipeline rights-of-way, just south of Ball Club Lake.
54	1.7	69 kV line, US Hwy 2, Pipeline, & Railway (100%)	A.20	Maintains a northeasterly direction following US 2 and the BNSF railway between Ball Club Lake and Great River Energy's 69 kV line.
62	2.4	US Hwy 2 & Railway (95%) New Corridor (5%)	A.21	Continues to run east along US 2 and BNSF rights-of-way to Cedar Road. On the east side of Cedar Road, Segment 62 proceeds south to the Enbridge pipeline right-of-way.
63	2.9	Pipeline (100%)	A.21, A.22	Progresses southeast and follows the Enbridge pipeline to the intersection of 6th Ave. SE and the White Oak Lake access road. At that intersection, the segment heads east along 6th Ave. SE and the pipeline rights-of-way through the City of Zemple. The segment then continues east along the pipeline right-of-way to the Deer River crossing and the BNSF railway.
64	0.6	Railway (100%)	A.22	Heads southeast following the BNSF railway.
66	0.7	Pipeline (100%)	A.22	Heads east following the Great Lakes right-of-way, from the BNSF railway to CASH 11 and a Minnesota Power 115 kV transmission line.

Segment ID	Length (Miles)	Associated ROW (% of segment)	Map Sheet	Description
67	5.6	US Hwy 2 & Pipeline (95%) New corridor (5%)	A.22, A.23	Continues east cross-country from the intersection of CSAH 11 and Minnesota Power's 115 kV transmission line to US 2, then heads southeast along US 2 for about 2 miles. The segment then follows the Great Lakes right-of-way to just north of Blackwater Lake where the segment heads cross-country to the 115 kV line..
73	0.9	115 kV line (100%)	A.23	Heads south on the eastside of Blackwater Lake adjacent to the 115 kV transmission line right-of-way into the Boswell Substation

6.2.6 Route 2C

Route 2 has only one alternative, called Route 2C. Route 2C was developed to reduce the number of transmission lines crossing the Mississippi River at the preferred crossing location. This route alternative would replace Great River Energy's 69 kV line crossing the Mississippi River (Bena Substation-to-Bena Tap located at CSAH 18) with the proposed 230 kV transmission line. Great River Energy's 69 kV line would be re-routed to the south along a new right-of-way. This route adds Segment 72 to the Route 2 description above. The following segments make-up this route alternative from west to east: 3, 7, 9, 13a, 13b, 19, 21, 31, 33, 45, 50, 54, 62, 63, 64, 66, 67, 72, and 73. Segment 72 is described in Table 6-5 above.

6.3 *Crossover Segments*

A crossover segment serves as a route alternative to switch between Route 1 and Route 2. The potential crossover segments, from west to east, are described below.

Crossover Segment 70 is an east-west route alternative located on the south-west side of the US 2 and US 71 interchange.

Crossover Segment 25 is a mostly north-south route alternative located on the west side of the City of Cass Lake. The crossover follows Otter Tail Power's Nary-to-Cass Lake 115 kV transmission line.

Crossover Segment 28 is a north-south route alternative located on the west side of Cuba Hill Road, between Pike Bay and the Sucker Lakes.

Crossover Segment 30 is a north-south route alternative located on the west side of Sucker Bay Road, between the Sucker Lakes and Portage Lake.

6.4 *Double-Circuiting*

As discussed in Section 4.1.3, double-circuiting the Project with other power lines is a possibility in certain areas. The load centers are at each end of the BGR line. Future electrical needs for the area are considered to be load growth at those load centers and not along the center portion of the proposed line route.

There are, however, environmental, system reliability, construction, and maintenance cost factors to evaluate when considering double-circuiting. A double-circuit design would require less right-of-way than two parallel single-circuit lines and may result in less aesthetic

impact and possibly less avian mortality. However, there are reliability issues because a single incident (for example, high winds or lightning) could take out both lines on a common structure. These impacts to reliability must be taken into account when determining if double-circuit construction is prudent. Additionally, 230/69 kV and 230/115 kV double-circuit construction costs more than a new 230 kV single-circuit line constructed parallel to an existing 69 kV or 115 kV line. There are also maintenance issues that must be addressed; additional operational precaution may be required when performing planned and/or emergency maintenance on a double-circuit line.

A number of the segments follow existing 115 kV or 69 kV lines for all or portions of their length. Table 6-6 identifies the potential double-circuiting opportunities for each of the routes.

Table 6-6 Potential Double-Circuiting Opportunities

Segment	Description	Length of Double-Circuit (Miles)	Owner	Routes
Segment 1 (part)	69 kV Wilton Substation to CSAH 14	1.2	Minnkota	Rt 1, 1A. 1B, 1C
Segment 15	115 kV terminating at Bemidji	0.5	Otter Tail Power	Rt 1, 1A, 1B, 1C
Segments 18	115 kV terminating at Bemidji	15.7	Otter Tail Power	Rt 1A
Segments 19 (part)	69 kV Cass Lake to Bemidji	8.5	Otter Tail Power	Rt 2 and 2C
Segments 37B, 39,and 57	69 kV Ball Club to Bena	8.4	Great River Energy	Rt 1C
Segments 37B, 39, 41, 42, 47, 51, and 57	69 kV Ball Club to Bena	11.9	Great River Energy	Rt 1, 1A, 1B
Segments 68 and 69	115 kV Cohasset to Deer River	5.4	Minnesota Power	Rt 1, 1A. 1B, 1C
Segment 73	115 kV terminating at Boswell Substation	0.9	Minnesota Power	All

Based on the factors discussed above, the Project could be double-circuited with the existing Minnkota Power and Otter Tail Power 69 kV lines in the Bemidji/Cass Lake area and with the GRE 69 kV line between Bena and Ball Club and with the Minnesota Power Boswell/Deer River area 115 kV line without significantly impacting system reliability or maintenance activities. In addition, the Project could be double-circuited with the existing 115 kV line between Bemidji and Cass Lake in Route 1A without significantly impacting area reliability, provided a new 115 kV breaker station (Nary Breaker Station) is constructed at the existing Nary Junction. The Nary Breaker Station is discussed in Section 6.8.4. This 115 kV line provides connections between Otter Tail Power's Bemidji Substation, Helga Substation, and Laporte Tap (which serves loads between Laporte and Leech Lake), and Minnesota Power's Akeley Substation, Badoura Substation, and a 115 kV tap from Nary Junction to the Cass Lake Substation. Nary Junction is located between the Helga Substation and Laporte Tap. Building this new 115 kV breaker station at Nary Junction would sectionalize the 115 kV circuits serving Bemidji, Cass Lake, Akeley, and Badoura. In addition

it would also provide back-up (redundant) transmission in the event of an outage of the 230/115 kV double-circuit transmission line.

6.5 *Mississippi River Crossing Alternatives*

6.5.1 Route Alternatives

As identified in previous sections, Route Alternatives 1C and 2C would replace Great River Energy's existing 69 kV line crossing the Mississippi River with the proposed 230 kV transmission line. The existing 69 kV line would be rerouted to the south and east along a new right-of-way, known as Segment 72.

These alternatives would have less visual impact than Routes 1 or 2 at the Mississippi River crossing because they exchange a 69 kV line for a 230 kV line. In comparison, the Route 1 and Route 2 alternatives would add the 230 kV line to the 69 kV line, resulting in two lines crossing the river. Eliminating a line across the Mississippi River has the potential to minimize bird collisions, as well as minimize visual impacts. However, these alternatives would require about 4.4 miles (approximately 65 acres) of new transmission line right-of-way to reroute the existing 69 kV line.

6.5.2 69 kV Double-Circuit Crossing

The double-circuit alternative involves installing new structures in place of the existing 69 kV line structures to carry both the proposed 230 kV line and existing 69 kV line, i.e. a double-circuit. Design options include horizontal conductor configuration (H-frame, horizontal stacked conductor design) and vertical conductor configuration (single pole, side-by-side conductor design). Please see typical drawings in Appendix B. A wider right-of-way would likely be needed to enable construction of the double-circuit structures while maintaining the 69 kV line in service.

6.6 *Segment Alternatives Considered but Eliminated*

The Applicants reviewed many potential route segments during the corridor and route development processes. Segments were eliminated in the course of these processes for one or more of the following reasons: no collocation with existing rights-of-way; to minimize Project length; to avoid human settlement; and to avoid major environmental features. See Development and Screening of Proposed Corridors (Chapter 5.0) and Route Selection Process (Section 6.1) for a more detailed discussion of corridor and route selection, respectively. The following segments were reviewed but eliminated from inclusion in the route alternatives analysis: Segments 2, 4, 5, 6, 8, 10, 11, 12, 14, 16, 20, 23, 32, 34, 35, 36, 37a, 38, 40, 43, 44, 46, 48, 49, 52, 53, 55, 56, 59, 60, 61, and 65. Figures A.28 to A.30 in Appendix A display the eliminated segments. Descriptions of the eliminated route segments are provided in Table 6-7 on the following page.

Table 6-7 Eliminated Route Segments

Segment ID	Length (Miles)	Map Sheet	Reason Eliminated	Description
2	1.6	A.28	Constrained ROW due to multiple pipelines and a 115 kV line, plus structures at the southern portion	A north-south segment following Otter Tail Power's Wilton-to-Bemidji 115 kV transmission line and the Enbridge pipeline rights-of-way from the Wilton Substation to the point where the 115 kV line does not share a right-of-way with the pipelines, which is approximately 1.6 miles south of the Wilton Substation
4	0.3	A.28	Since Segment 2 was eliminated the westend has no connection to a route	An east-west segment following Otter Tail Power's Wilton-to-Bemidji 115 kV transmission line between the Enbridge pipeline and US 2 and US 71 rights-of-way.
5	0.7	A.28	Constrained ROW due to structures at the northern portion of the ROW	Heads east for approximately 1,100 feet along Otter Tail Power's Wilton-to-Bemidji 115 kV transmission line, then heads south for approximately 2,500 feet (past Otter Tail Power's Bemidji Substation) along Minnkota Power's 69 kV and Otter Tail Power's 115 kV Wilton-to-Bemidji-to-Nary lines to the Enbridge pipeline rights-of-way.
6	0.5	A.28	Since Segment 2 was eliminated the westend has no connection to a route	Heads southeast following the Enbridge pipeline right-of-way from Otter Tail Power's Wilton-to-Bemidji 115 kV transmission line to the US 2 and CASH 7 interchange.
8	0.2	A.28	Since Segment 2 was eliminated the westend has no connection to a route	Heads southeast following the Enbridge pipeline right-of-way from the US 2 and CASH 7 interchange to Otter Tail Power's Bemidji-to-Nary transmission line.
10	0.2	A.28	No connection to a route on the westend with segments 8 or 5 eliminated	Heads south along Otter Tail Power's Bemidji-to-Nary 115 kV transmission line between the Enbridge pipeline right-of-way and the US 2 and US 71 corridors.
11	3.8	A.28	Reduce proximity to the developments along Lake Irving	Heads southeast following the US 2/71 corridor from Otter Tail Power's Bemidji-to-Nary 115 kV transmission line to CSAH 11. The segment then turns east for about 1,500 feet along CSAH 11 to the Enbridge pipeline right-of-way where the segment turns southeast to follow those rights-of-way to the US 2/US 71 corridor.
12	0.1	A.28	No connection to a route with segment s9 and 14 eliminated	Heads south across US 2/71 following Otter Tail Power's Bemidji-to-Nary 115 kV transmission line.
14	1.7	A.28	Avoid large wetland areas adjacent to the Mississippi River	Heads south from Segment 12 (the US 2/71 crossing) feetto 15th St. SW following Otter Tail Power's Bemidji-to-Nary 115 kV transmission line. At 15th St. SW, Segment 14 heads southeast to the Great Lakes pipeline right-of-way following Otter Tail Power's Bemidji-to-Nary line.
16	0.6	A.28	Segment 16 follows the 115 kV line and Segment 15 follows the pipline.	Heads south, then east, then south to CSAH 11 along Otter Tail Power's Bemidji-to-Nary 115 kV transmission line.

Segment ID	Length (Miles)	Map Sheet	Reason Eliminated	Description
20	11.0	A.28	Constrained ROW with multiple pipelines and railway	Heads southeast following the Enbridge pipeline right-of-way from Segment 12 (the US 2/71 crossing) around the south side of South Midge Lake to the Cass Lake Substation.
23	2.5	A.28	Reduce ROW length and	Proceeds northeast following the Nary-to-Cass Lake transmission line from the intersection of Township Road 3 and Hart Lake Road (aka CR 143 and Wilkenson Road) to the Great Lakes right-of-way.
32	1.9	A.29	Constrained ROW with multiple pipelines and railway on the southside of US Hwy 2	An east-west segment following the Enbridge pipeline right-of way between Pike Bay Loop Road and Cuba Hill Road, located on the east side of Pike Bay.
34	6.5	A.29	Constrained ROW with multiple pipelines and railway on the southside of US Hwy 2	An east-west segment following the Enbridge pipeline right-of-way between Cuba Hill Road and Sucker Bay Road, located between the Sucker Lakes.
35	4.8	A.29	Constrained ROW with multiple pipelines and railway on the southside of US Hwy 2	An east-west segment following the Enbridge pipeline right-of-way between Sucker Bay Road and Wildwood Drive, located north of Portage Lake.
36	2.9	A.29	Constrained ROW with multiple pipelines and railway on the southside of US Hwy 2	An east-west segment following the Enbridge pipeline right-of-way between Wildwood Drive and Great River Energy's Bena Substation to Bena Tap at CSAH 18 69 kV line, located north of Bena and south of Lake Winnibigoshish.
37a	3.9	A.29	Constrained ROW with multiple pipelines, railway, and 69 kV line on the southside of US Hwy 2	An east-west segment following the Enbridge pipeline and BNSF railway rights-of-way, and Great River Energy's Bena Substation to Bena Tap at CSAH 18 69 kV line, between Bena and Six Mile Lake Road.
38	7.5	A.30	Avoid crossing Nushka Lake	Proceeds east along the Great Lakes and Enbridge pipelines north of Nuchka Lake, from Six Mile Lake Road to an area approximately 1,600 feet west of the Mississippi River where Great River Energy's 69 kV line joins the pipeline rights-of-way.

Segment ID	Length (Miles)	Map Sheet	Reason Eliminated	Description
40	1.0	A.30	Avoid crossing the railway on the east end. Segment 40 would cross the railway to avoid LLR-owned lands	An east-west segment following the Enbridge pipeline right-of-way across the Mississippi River on the southwest side of Ball Club Lake.
43	0.3	A.30	A north-south segment would not be needed at this area as determined through route development	A north-south segment between the Enbridge and Great Lakes rights-of-way, following a new cross-country route that is located about 1,300 feet west of CR 119.
44	0.1	A.30	Avoid creating a new corridor	A north-south segment between US 2 and the Enbridge pipeline right-of-way. This segment follows a new cross-country route directly south of the East Mississippi Road, which is located about 500 feet west of the intersection of US 2 and Ball Club Lake Road.
46	0.8	A.30	Constrained ROW with multiple pipelines, railway, and LLR-owned lands on the southside of US Hwy 2	An east-west segment following the Enbridge pipeline right-of-way, CR 137, and Wolf Drive, located south of Ball Club Lake.
48	0.4	A.30	Avoid creating a new corridor	A north-south segment from the Great Lakes right-of-way to Wolf Drive that crosses Great River Energy's Bena Substation to Bena Tap at CSAH 18 69 kV line.
49	0.3	A.30	Constrained ROW with multiple pipelines and railway. Avoid creating a new corridor over the railway.	Heads east-west for about 1,200 feet along Wolf Drive and the Enbridge pipeline right-of-way, then heads north for about 440 feet along CR 137, crossing the Enbridge pipeline and BNSF railway rights-of-way to end at US 2.
52	0.7	A.30	Constrained ROW with multiple pipelines, railway, and 69 kV line. Minimize wetland impacts.	Heads northwest from Segment 47 following Great River Energy's Bena Substation to Bena Tap at CSAH 18 69 kV line to the point where the transmission line proceeds east towards CSAH 18.
53	0.3	A.30	Avoid creating a new corridor	Trends east-west between the US 2 corridor and the point where Great River Energy's Bena Substation to Bena Tap at CSAH 18 69 kV line runs towards CSAH 18.

Segment ID	Length (Miles)	Map Sheet	Reason Eliminated	Description
55	1.5	A.30	Constrained ROW with multiple pipelines, railway, and LLR-owned lands on the southside of US Hwy 2	Heads northwest around the Ball Club River oxbows following the Enbridge pipeline and BNSF railway rights-of-way, between Great River Energy's Bena Substation to Bena Tap at CSAH 18 69 kV line and the Enbridge pipeline crossing.
56	0.3	A.30	Mininmize wetland impacts and avoid impacts to LLR-owned lands	Trends east-west over CSAH 18 along Great River Energy's Bena Substation to Bena Tap at CSAH 18 69 kV line, between the Enbridge and Great Lakes pipeline rights-of-way.
59	0.3	A.30	Through route development this crossover was not necessary and avoids impacts to LLR-owned lands.	Trends north-south following Great River Energy's Bena Substation to Bena Tap at CSAH 18 69 kV line, between the Enbridge and Great Lakes pipeline rights-of-way.
60	2.2	A.30	Constrained ROW with multiple pipelines, railway, and LLR-owned lands on the southside of US Hwy 2. Plus would avoid effects to the concrete plant	Heads east-west along the Enbridge pipeline right-of-way between Great River Energy's Bena Substation to Bena Tap at CSAH 18 69 kV line's crossing of US 2 and Cedar Road.
61	0.1	A.30	Through route development this crossover was not necessary and avoids impacts to LLR-owned lands.	Follows Great River Energy's Bena Substation to Bena Tap at CSAH 18 69 kV line across US 2, between the Enbridge pipeline right-of-way and US 2.
65	2.4	A.30	Eliminated in order to collocate with MP's exisitng 115 kV line	Follows the BNSF railway southeast between the Great Lakes pipeline right-of-way and a Minnesota Power 115 kV transmission line.

6.6.1 Underground Alternative Crossing

The underground alternative involves installing a new line by directional boring and/or open trenching across the Mississippi River. Although possible, the underground option raises

environmental and electric reliability concerns. The significant additional construction costs of an underground line must also be taken into consideration.

The terrain in the area of the Mississippi River crossing is a large floodplain wetland with multiple oxbows. Crossing the river and adjacent wetland area would involve burying the line for a distance of approximately 6,000 feet.

The underground option would involve construction of a transition station at each end to connect the underground conductor with the overhead conductors. Typically, fenced areas around these sites would be approximately 80 feet by 100 feet. The sites are essentially small switching stations or substations consisting of dead-end towers, risers, insulators, switches, and surge arresters. If high pressure oil filled pipe-type cable is used, the sites would be larger and include pressurizing plants, oil storage tanks, and associated oil management equipment. There also would be a need to run a distribution power supply, as well as alarm and control circuits, to the two transition stations. In addition, utility personnel would need to visit the site at least monthly for maintenance, requiring a permanent access road to each of the two transition stations.

While extruded dielectric cables could be used for a 230 kV line, directional boring across the full 6,000 feet length of the crossing would not be possible due to splice requirements of that type of cable. Therefore trenching would likely be required across the wetland to install the underground cable, and permanent access throughout the wetland would be needed for maintenance and repair of the cable. Splice points would be constructed at a minimum of three locations and consist of concrete vaults with manhole access to the cable splice.

Repair and restoration of a faulted cable can take several weeks or significantly longer, depending on access. For extruded-dielectric cable, repair requires replacement of the entire cable between the splice points. Consequently, access to manholes along the full length of the underground crossing must be possible during all seasons of the year. Repair would require locating the fault and replacing the faulted cable between the manhole access points, which are generally 1,500 to 2,000 feet apart. Heavy equipment would be brought to the site, including cable reels, which weigh in excess of 30,000 pounds. The failed cable would be pulled out, and 1,500 to 2,000 feet of new cable installed into the duct between manholes. These activities would likely result in impacts to the surrounding wetlands in the Mississippi River. If a year-round road is not maintained for access, repair of a faulted cable would be delayed until matting was brought in to allow access for the heavy equipment.

Installing cable in cold ambient conditions is not recommended because it can damage the cable. For this reason, a fault that occurred during the winter would also require the installation of temporary cable warming huts where the cable would be warmed for several days before being installed. This would further delay restoration of service during a time when the Bemidji area's transmission system is most at risk, the winter season.

Directional boring across the full 6,000 foot crossing could be used to install a high pressure oil-filled pipe-type cable. However, if the cable failed the line would be out of service for at least 4 to 6 months while replacement cable is fabricated and installed. Therefore, this is not considered a practicable alternative for the Mississippi River crossing.

Installation of an underground transmission line at the Mississippi River crossing would also have a direct impact on electric reliability and security. This is not only due to the time required to repair a faulted cable, but also due to cable operational issues. For example, reclosing (re-energizing) an underground circuit after a transmission fault has been detected is not recommended until it is verified that the fault is not in the cable. This is because re-energizing a faulted cable can result in the explosion of gaseous byproducts from the fault. Because of this, outages that would typically be only momentary events lasting less than a tenth of a second on an overhead line would increase in length to several hours while it is verified that the fault was not in the underground portion of the line. This would impact the security and reliability of the electric service provided by the Project, diminishing the benefits that the Project would otherwise provide with respect to improving the bulk power delivery and voltage stability deficiencies of the Bemidji area transmission system.

The operation and maintenance requirements for an underground line would unfavorably impact the reliability and security of the transmission system in the area. In light of this and the environmental impacts associated with the installation, maintenance, and repair of underground cable, the Applicants prefer an overhead crossing of the Mississippi River.

6.7 *Transmission Structure Design and Right-of-Way*

The Applicants' propose to construct single-circuit portions of the transmission line using predominantly H-frame 230 kV structures embedded in a 24-inch to 36-inch diameter holes augured to a depth of approximately 10 to 15 feet. The H-frame's poles would be set approximately 20 feet apart in the augured holes, which would then be backfilled with native soils or granular material.

H-frame structures are suitable for single-circuit construction in rugged terrain, and for areas requiring longer spans to avoid or minimize the placement of structures in wetlands or waterways. Each H-frame would range in height from approximately 70 to 90 feet and be placed approximately 600 to 1,000 feet apart. A typical H-frame structure would have two 24- to 36-inch-diameter poles about 19.5 feet apart from each other. Corner structures would either be on reinforced concrete drilled shaft foundations or would be direct embedded with guy wires, depending on soil types and route angles. Either single or multiple pole structures may be utilized as angle structures.

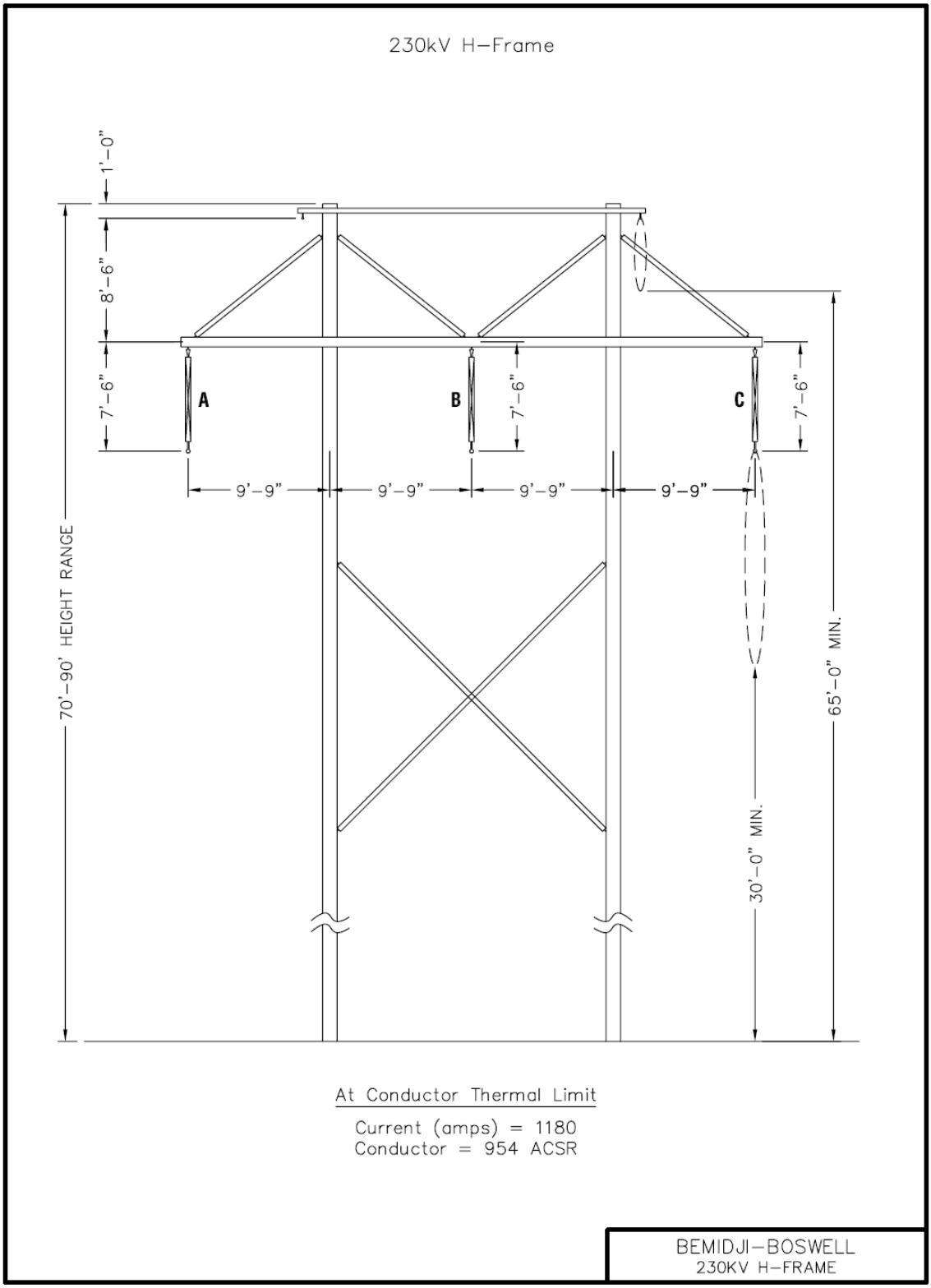
The Applicants propose to use single-pole self-supporting structures set on reinforced concrete drilled shaft foundations for double-circuit portions of the transmission line. Single-pole self-supporting structures may also be used for single-circuit portions of the transmission line in areas where the available width of the right-of-way is limited by existing infrastructure or development. The height of single-pole single-circuit structures would range from approximately 80 to 100 feet, with the span between structures approximately 400 to 800 feet apart. Double-circuit single pole structures would range in height from approximately 95 to 115 feet with the span between structures approximately 350 to 700 feet.

Graphic 6-1 illustrates the typical 230 kV H-frame structures being considered for the route alternatives. Graphic 6-2 illustrates the typical 230 kV single-pole structure. Graphic 6-3 illustrates the typical 230/115 kV single-pole double-circuit structure. General construction

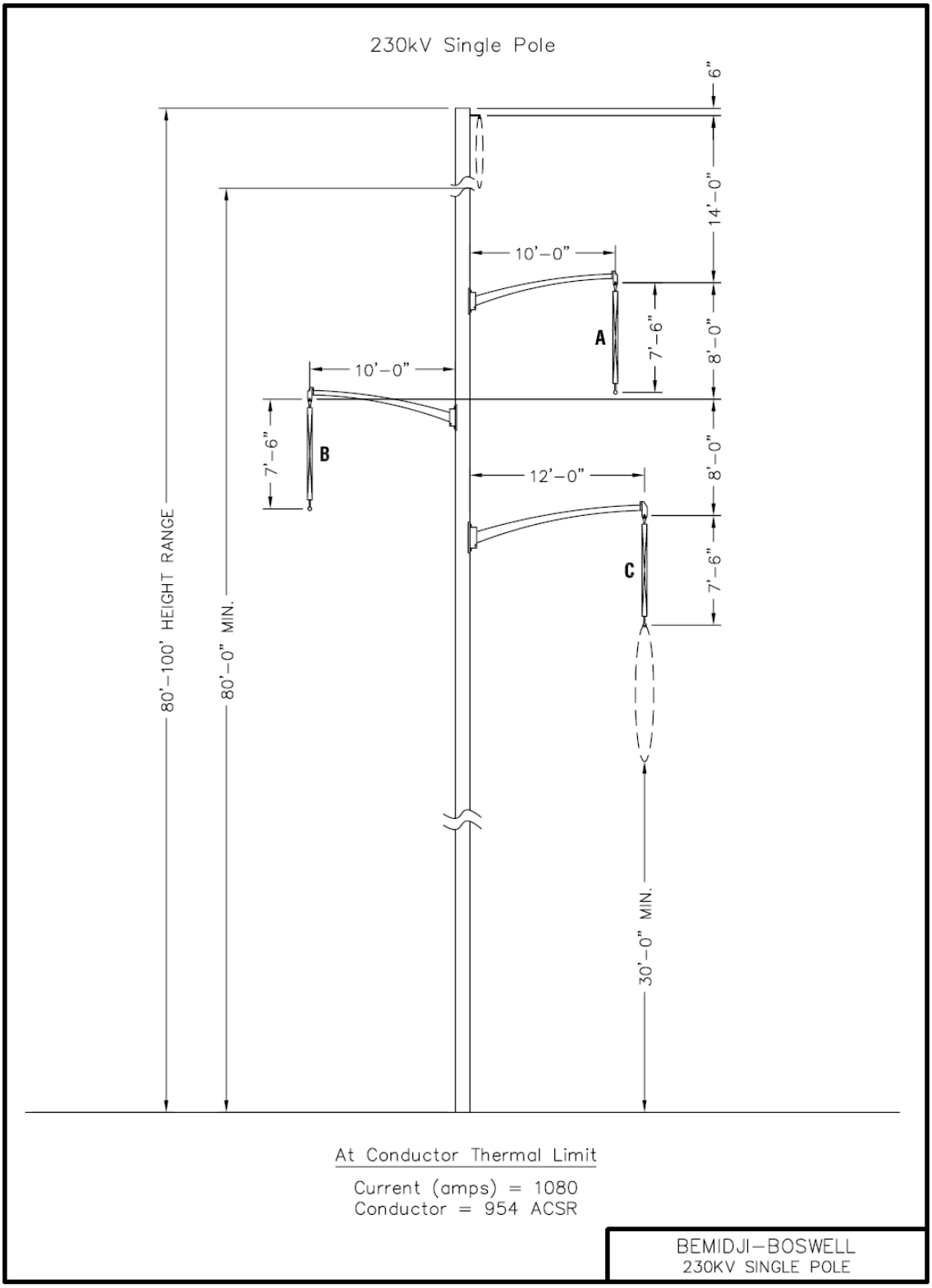
procedures are discussed in Section 6.12.1. However, final decisions on structure types, locations, and construction methodology would not be made until final design.

For each phase of the 230 kV circuit, the Applicants propose 954 kcmil aluminum conductor steel reinforced (ACSR). The Applicants propose to use 3/8-inch diameter extra high strength steel (EHS) and fiber optic ground wire (OPGW) for the shield wires. Conductor size and shield wire selection are subject to change pending completion of additional electrical optimization studies. The typical right-of-way for a 230 kV line is 125 feet wide. Appendix B identifies right-of-way requirements.

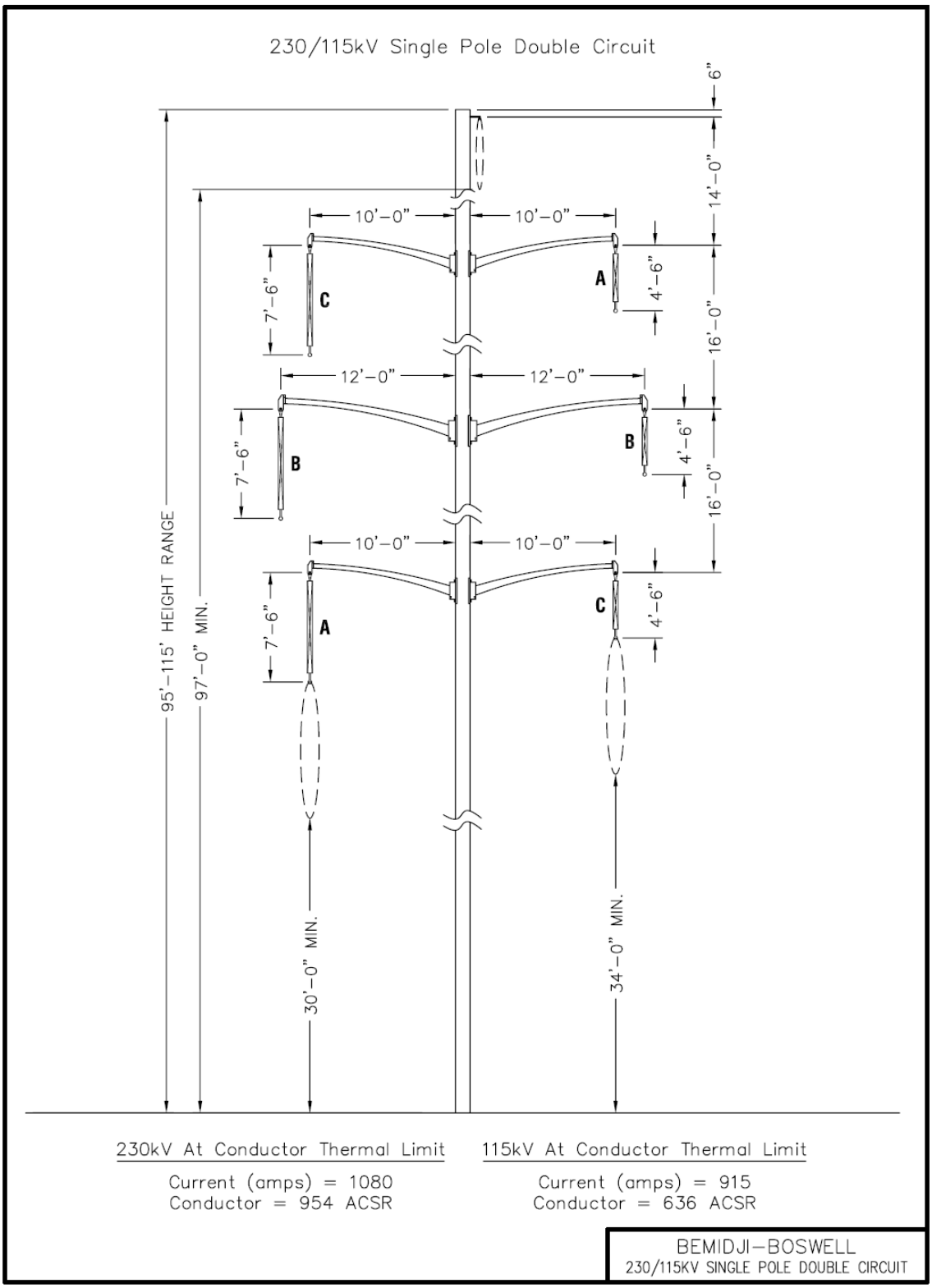
Graphic 6-1 Typical 230 kV H-Frame



Graphic 6-2 Typical 230 kV Single-Pole Structure



Graphic 6-3 Typical 230/115 kV Single-Pole Double-Circuit Structure



6.8 *Substation Design*

The Project would require modifications at the Wilton Substation near Bemidji and the Boswell Substation near Grand Rapids. A new or expanded substation in the Cass Lake area and breaker station at Nary Junction may also be required, depending on routing and double-circuiting determinations.

6.8.1 Wilton Substation

Project modification of the existing Wilton 230 kV Substation would not require physical expansion beyond the limits of the existing fenced perimeter. Two new 230 kV breakers and a line termination structure would be added as a result of the Project, along with modifications to the existing 230 kV buses and relay panels. The Project would also require completion of a new ring bus section, as well as five new 230 kV switches with foundations, steel structures, and control panels.

6.8.2 Boswell Substation

The Project would require expanding of the Boswell 230 kV Substation by approximately 1.3 acres. No land procurement is anticipated as the expansion of the substation would be on Minnesota Power-owned property. The following modifications are proposed: 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.

6.8.3 New or Expanded Substation in the Cass Lake Area

As discussed in Section 3.2, either upgrading the existing 115 kV substation at Cass Lake to 230 kV or adding a new 230 kV substation in the immediate area would address the load serving deficiencies in the area between Cass Lake and Bemidji. If Route 1 is selected, a new 230/115 kV substation would be located in Section 30 of Pike Bay Township (Township 145N, Range 31W) in Cass County where Route 1 crosses the existing 115 kV transmission line between the Nary Junction and Cass Lake substations. This crossing point is approximately two and a half miles south of the existing Cass Lake 115/69 kV Substation.

The new substation would be designed and constructed with a 230 kV three-breaker ring bus with 230 kV line switches. The facility would include a 230/115 kV transformer of approximately 187 MVA that steps down the voltage to a 115 kV three-breaker ring bus to reliably establish a connection to the existing Nary Junction – Cass Lake 115 kV line. The new substation would also require a control house, relay panels, foundations, steel structures, and switches. The substation yard would be approximately 500 feet by 500 feet of yard fence and require access roads. The cost for equipment and construction is estimated to be $5.5 million.

If Route 2 is selected, the existing Cass Lake 115/69 kV substation would be upgraded to 230 kV in order that the Bemidji–Grand Rapids 230 kV line could run through it. To add a new 230 kV switchyard to the existing substation would require the expansion of the Cass Lake 115/69 kV substation, which is located Section 17 of Pike Bay Township (Township 145N, Range 31W) in Cass County.

The expansion would be located directly west of the existing Cass Lake Substation, requiring the extension of the existing fence line approximately 320 feet west. No land procurement would be required because the entire extension of the substation would occur on existing Otter Tail Power -owned property. The new 230 kV equipment would include a 230 kV three-breaker ring bus with line switches, a new 230/115 kV transformer (~187 MVA), and associated 115 kV facilities to integrate this transformer into the existing equipment. It is expected that a new 115 kV four-breaker ring bus with switches would be installed to connect into the 115 kV line back to the Nary Junction, up to the 115 kV line serving Enbridge pumping station load, and into the existing 115/69 kV transformer. Due to the addition of new 230 kV equipment and associated protection facilities, the substation would require a new control house, relay panels, foundations, steel structures, and switches. The estimated substation expansion area is approximately 2.2 acres. The existing substation would remain energized during and after the expansion to serve local loads. The estimated cost of the equipment and construction is $5 million.

6.8.4 Nary Breaker Station

As discussed in Section 6.4, if Route 1A is selected, a double-circuit is possible along the proposed 230 kV line with the existing 115 kV transmission line between Bemidji and Cass Lake. This existing 115 kV line provides connections between Otter Tail Power's Bemidji Substation, the Helga Substation, the Laporte Tap (which serves loads between Laporte and Leech Lake), Minnesota Power's Akeley Substation, Badoura Substation, and a 115 kV tap from the Nary Junction to the Cass Lake 115/69 kV Substation. Nary Junction is located between the Helga Substation and the Laporte Tap.

As previously discussed, double-circuit construction, operation and maintenance can have impacts on the security and reliability of the transmission system and this must be taken into account when determining if double-circuit construction is appropriate. The Project could be double-circuited with the existing 115 kV transmission lines between Bemidji and Cass Lake without significantly impacting area reliability provided a new 115 kV breaker station is constructed at the existing Nary Junction.

The new 115 kV breaker station would be located adjacent to the existing Nary Junction on an approximately 5-acre site with a fenced and graded area of approximately 200 feet by 200 feet. The breaker station would consist of three 115 kV circuit breakers and associated switches, communications, relay and control equipment, three 115 kV line termination structures and a control house. An improved access road and small parking lot would also be required in order to move equipment to the site. Building this 115 kV breaker station sectionalizes the 115 kV circuits serving Bemidji, Cass Lake, Akeley, and Badoura. It also provides for back-up (redundant) transmission for outage of the proposed 230/115 kV double-circuit transmission line. The estimated cost of the Nary Breaker Station is $2.6 million.

6.9 *Right-of-Way Acquisition*

6.9.1 Transmission Line Right-of-Way

Following issuance of a route permit, the Applicants would begin the process of acquiring easements for the location and construction of the new transmission line. The right-of-way

agent would complete a search of the public records of all lands involved in the Project. A title report would be developed to determine the legal description of the property, the owner(s) of record of the property, and information regarding easements, liens, restrictions, encumbrances, and other conditions of record. The Applicants anticipate that a majority of the landowners would have been notified of the Project due to the numerous public notices published and public meetings held during the state/federal environmental review and state permitting processes.

Once the property owners along the approved route have been identified, a right-of-way agent would inform them of the construction of the transmission line and how it may affect their property. With a property owner's permission, survey crews would enter the property to complete the preliminary survey work and possibly conduct soil investigations for structure location. As the design of the transmission line nears completion, the survey crews would stake the structure locations. The right-of-way representative would show the landowner where the structure is proposed to be located on the property and would discuss any location concerns.

During the acquisition process, the property on which easement rights are required would be evaluated by the agent to determine the amount of just compensation. In the event that a complicated appraisal problem arises, or if a statutory requirement in the local jurisdiction dictates, the right-of-way agent would arrange for an appraisal to determine the value of the rights being acquired. The Applicants would then make an offer to the owner based on the appraisal.

The right-of-way agent would begin the negotiating process by presenting the required legal documents to the property owner. Property owners would also be provided maps of the transmission line route or site showing the landowner's parcel. The offer of compensation for an easement or for purchase of the property would be explained as requested, and the landowner would be allowed a reasonable amount of time in which to consider the offer, obtain an appraisal, and present information the owner believes is relevant to determining the value of the property.

The agent would work closely with the landowner to try to arrive at a negotiated settlement that is fair and acceptable to all parties. In most cases, right-of-way agents are able to work with the landowners to address their concerns.

In some cases a negotiated settlement is not possible and the Applicants may choose to obtain the right-of-way by exercising their right of eminent domain (condemnation). Condemnation proceedings would only be initiated by the Applicants if reasonable efforts to negotiate an agreement at what is believed to be just compensation have failed.

There also may be instances where property is purchased by the Applicants pursuant to Minn. Stat. § 216E.12, subd. 4 (sometimes referred to as the "buy the farm" provision). This provision provides that under certain circumstances, the property owner may require the Applicants to purchase the owner's entire property if the transmission line crosses a portion of the property. If the statutorily required special circumstances exist, this option may be chosen at the landowner's discretion.

6.9.2 Substation Property

Currently the Applicants do not believe that any additional land is needed for the 230 kV upgrades at the Wilton and Boswell Substations, or the possible 230 kV upgrade at the Cass Lake Substation. In the event that route selection and transmission line design considerations indicate that additional land would be necessary, the Applicants would contact the appropriate landowners to obtain the property. However, land must be acquired if the route selected requires a new 230 kV Substation in the Cass Lake area or the Nary Breaker Station. The Applicants would seek to obtain the property through a voluntary purchase, and if an agreement could not be reached, would consider exercising their right of eminent domain.

6.10 *Preconstruction Activities*

Preconstruction activities include preparation and approval of the Certificate of Need and the Route Permit applications, completing the required environmental review, coordinating and obtaining all other necessary permits and approvals, and acquiring right-of-way easements.

6.11 *Construction Procedures*

6.11.1 Transmission Line

Once access to the land is granted, preparation of the right-of-way for construction begins in coordination with landowners. Underground utilities would be identified and located in cooperation with local utility companies to minimize conflicts to the existing utilities along the route. Preparation for construction begins with development of access points from existing roads. Clearing of all woody vegetation and brush within the 125-foot-wide right-of-way would be required to facilitate the safe and efficient construction, operation, and maintenance of the transmission line. A reasonably level access path is required to provide for safe passage of construction equipment. At structure locations, a stable working surface free of tripping hazards is required for framing and erecting structures, and for the installation of concrete foundations if required.

Vegetation would be cut at or slightly above the ground surface. Rootstock would be left in place to stabilize existing soils and to regenerate vegetation after construction. With the approval of the landowner or land manager, stumps of tall-growing species would be treated with an approved herbicide to discourage re-growth. Merchantable timber is typically cut to standard log lengths and stacked along the right-of-way. Vegetation clearing debris (unmerchantable trees, brush, and slash) may be cut and scattered, placed in windrow piles, chipped or burned, depending on location. In some special circumstances, this material may be collected for use as fuel.

To minimize the potential for tire and chassis damage to construction equipment, and to maintain a safe, level access path and structure installation area, incidental stump removal would occur. Stumps that interfere with the placement of mats or movement of construction equipment would be ground down to a point at or slightly below ground level .The stump grinding equipment would mix woody material with soils. This mixture would be evenly spread in the vicinity of the stump to a depth that would allow existing low-growing vegetation to re-establish.

If temporary removal or relocation of fences is necessary, the installation of temporary or permanent gates would be coordinated with the landowner. The right-of-way agent would also work with landowners for early harvest of crops, where possible. During the construction process, the Applicants may ask the property owner to remove or relocate equipment and livestock from the right-of-way.

Transmission line structures are generally designed for installation at existing grades. However, if vehicles or installation equipment cannot safely access or operate near the structure, minor grading of the immediate terrain would be performed to provide a reasonable level working surface for construction and maintenance of the structure.

Environmentally sensitive areas or areas susceptible to soil erosion would require special construction techniques. These techniques may include the use of low ground pressure equipment, timber mats, terracing, water bars, bale checks, rock checks, or temporary mulching and seeding of disturbed areas exposed during long periods of construction inactivity. Permanent soil erosion control measures may include permanent seeding, mulching, erosion control mats, or other measures depending on site conditions. Temporary silt fence, sedimentation ponds, and other measures may be utilized to prevent sediment from running off into wetlands or other surface waters.

Construction equipment would be inspected frequently to ensure hydraulic systems and oil pans are in good condition and free of significant leaks. Portable spill containment kits would be required for each piece of construction equipment with the potential to discharge a significant amount of oil to the environment. Operators would be present at the nozzle at all times when refueling is in progress. In the event of a spill, the source of the spill would be identified and contained immediately upon discovery. The spill and contaminated soils would be collected and treated and disposed of in accordance with all applicable federal, state and local requirements. If a significant spill were to occur to surface waters, methods to contain and recover released material such as floating booms and skimmer pumps would be used. Noticeably contaminated soils would be excavated and placed on and covered by plastic sheeting in bermed areas. An emergency response contractor would be secured, if necessary, to further contain and clean up a severe spill. Refueling of equipment in wetlands would not be permitted.

In the event that protected species or cultural and historical artifacts are likely to be encountered during construction activities, project management personnel would consult with regulatory authorities regarding appropriate construction procedures and mitigation measures.

Construction materials would be hauled either directly from the local highway or railroad network to structure sites, or brought first to material staging areas and then to the structure sites. The transmission line components, including the poles, arms, and hardware, are normally brought to the temporary staging areas on flatbed trucks. These materials are stored until needed and then loaded on flatbed trailers or special pole trailers for delivery to the structure site where they are unloaded for installation.

A stable working surface is required at structure locations. Timber mats are commonly used to provide a working surface in unstable soils. Structures are normally assembled on the

ground along with insulator assemblies and single-leader p-line ropes and then raised into position. For direct embedment type structures, the poles are set in augered holes with large rubber-tired or tracked cranes. The annular space between the pole and the augered hole is backfilled with native soils if suitable or with granular materials.

Where reinforced concrete foundations are required, large rubber tired or track mounted auger equipment is used to excavate a circular hole of the appropriate diameter and depth. In upland areas, excavated material would be spread evenly around the structure base to promote site drainage. Reinforcing steel and anchor bolts are set in position. Ready-mixed concrete is then placed in the excavation. In wetland areas, a telescoping temporary steel caisson would be placed in the foundation hole to stabilize the soil walls. Concrete is placed in the excavation using the tremie method. Water pumped from the excavation would be placed into tanker trucks or empty concrete trucks and hauled away to a specially designated upland disposal area, or brought back to the concrete batch plant for discharge. Concrete truck washwater would be discharged only in specially designated upland disposal areas or at the concrete batch plant.

After the concrete is poured, the steel caisson is removed. In some situations, a permanent caisson may be required to stabilize the excavation. During drilling, a minimal amount of granular material (from an outside source) would be placed in the area between the caissons and the timber mats (if required at that location) to provide safe footing for construction personnel. During final restoration, the granular material is leveled or removed to restore the original ground contours for re-vegetation of native species. After the foundation concrete is placed, excess excavated materials would be transported to a suitable upland site by truck for disposal. After allowing adequate curing time, the steel pole structure base plates are bolted to the concrete foundations.

The wire stringing process starts in a setup area prepared to accommodate the stringing equipment and materials, normally located mid-span on the centerline of the right-of-way. The rope machine, new conductor wire trailers, and tensioner are located at the wire stringing set-up area. This phase of construction occurs after the structures have been erected, and fitted with stringing blocks (also called dollies or sheaves) and with single-leader "p-line" ropes that reach the ground. Stringing blocks are a type of pulley that attaches to the insulator assembly and temporarily support a pulling rope or "p-line" and a wire rope or "hard line," which in turn supports the conductor before it is permanently "clipped in."

The process starts as the construction crew pulls the p-lines toward the first structure beyond the setup area. The p-lines are normally pulled down the right-of-way with a small wide-track bombardier or other small equipment. At each structure, the ropes are detached from the bombardier and attached to the single leader p-line to lift the ropes up into the dollies. Then the ropes are reattached to the bombardier and driven to the next structure for the same process. After the p-line has been strung through all the structures for all phases within the stringing interval, the pulling ropes are attached to a hard line and pulled, one at a time, back through the dollies to the beginning of the interval. A hard line set-up is located at the opposite end of the interval from the wire stringing setup area. Each hard line is then attached to the conductor wire with an attachment called a "sock," which is pulled back through the dollies to the end of the interval. Crewmembers travel along the access route in a pickup truck, follow the "sock" as it is being pulled to make sure it does not get hung up in

the dollies. One at a time, the conductor wires are then pulled to the appropriate tension and clipped into place utilizing permanent suspension hardware. Wire stringing and hard line set-up areas are normally located in upland areas during spring, summer or fall conditions. During winter when frozen conditions provide a stable working surface, set-ups may be located in wetland areas. If set-ups in wetlands are required when surface conditions are not stable, extensive use of timber matting is required.

The most effective means to minimize impacts to water areas during construction is to span streams and rivers by placing structures above the normal high water level. In general, construction equipment is permitted to be driven across waterways except under special circumstances, and then only after discussion with the appropriate resource agency. Where waterways must be crossed by construction equipment the Applicants would use temporary clear span bridges to minimize the impact on the waterway. For those waterways which cannot be crossed with construction equipment, workers might walk across or use boats during wire stringing operations to pull in the new conductors and shield wires or in the winter drive equipment across the ice. In areas where construction occurs close to waterways, appropriate measures would be employed to minimize soil erosion and prevent sedimentation of the waterways. The applicants would ensure that equipment fueling and lubricating occur at a reasonable distance from the waterways.

6.11.2 Substations

The substation upgrades involve adding new equipment, modifying existing equipment, or replacing existing equipment with new equipment. All construction work for the Wilton, Boswell, and the possible upgrading of the existing Cass Lake substation would occur within the existing substation property. Construction work on a new possible Cass Lake area substation and Nary Breaker Station would occur on newly acquired property.

The substations would be built or upgraded in compliance with the applicable requirements of the National Electrical Safety Code (NESC), Occupational Safety and Health Act (OSHA), and state and local regulations. The final design of new or upgraded substations would take the local conditions of the sites into consideration, and where warranted, would include safety provisions beyond the minimum requirements established in the various applicable safety codes. Contractors would be required to adhere to all such safe working practices. The new and upgraded substations would be designed to allow future maintenance to be done with minimum impact on substation operation and with the necessary clearance from energized equipment to ensure safety.

6.12 *Maintenance and Operation*

6.12.1 Transmission Line

Access to the transmission line's right-of-way is required to perform periodic inspections, conduct maintenance, and repair damage. Regular maintenance and inspections would be performed during the life of the transmission line to ensure its continued integrity. Inspections would be limited to the right-of-way and to areas where obstructions or terrain may require off-right-of-way access. If problems are found during inspection, repairs would be performed and the landowner would be compensated for any loss.

The right-of-way would be managed to control vegetation that interferes with the operation and maintenance of the transmission line. Portions of the Project route would be in forested areas, requiring tree maintenance to maintain the integrity of the transmission line. Native shrubs that would not interfere with the safe operation of the transmission line would be allowed to reestablish in the right-of-way. The Applicants' practice provides for the inspection of major transmission lines every year to determine if clearing is required. Other transmission lines are typically reviewed on a two-year cycle. Right-of-way clearing practices include a combination of mechanical and hand clearing, along with herbicide application where allowed, to remove or control vegetation growth. Noxious weed control with herbicides would be conducted on a two-year cycle around structures and anchors, where approved for use.

6.12.2 Substations

Inspections would be performed regularly over the life of the substations to maintain equipment and make necessary repairs. Routine maintenance would be conducted as required to remove undesirable vegetation that may interfere with the safe and reliable operation of the substations.

6.13 *Environmental Protection Measures*

Limited ground disturbance may occur at the structure sites during construction. For example, the construction contractor generally establishes a main staging area for temporary storage of materials and equipment. A previously-disturbed or developed area is typically used. Such an area includes sufficient space to lay down material and pre-assemble some structural components or hardware. Other staging areas located along the right-of-way are limited to a structure site for lay down and framing prior to structure installation. Stringing setup areas are also used to store conductors and the equipment necessary for stringing operations. Disturbed areas are restored to their original condition to the maximum extent practicable, or as negotiated with the landowner.

Unless otherwise agreed upon by the landowner, all storage and construction buildings, including concrete footings and slabs and all construction materials and debris, would be removed from the site once construction is complete. Post-construction reclamation activities involve restoring the areas to their original condition to the extent practicable, including removing and disposing of debris; removing all temporary facilities, including staging and laydown areas; employing appropriate erosion control measures; and reseeding areas disturbed by construction activities with vegetation similar to that which was removed. Seed mixture would be certified as free of noxious or invasive weeds. In cases where soil compaction has occurred, the construction crew or a restoration contractor uses various methods to alleviate the compaction, or as negotiated with landowners.

Once post-construction reclamation is completed, landowners are contacted by the right-of-way agent to determine if the clean-up measures have been finished to their satisfaction and if any other damage may have occurred. If damage has occurred to crops, fences or the property, the Applicants would compensate the landowner. In some cases, an outside contractor may be hired to restore the damaged property as near as possible to its original condition.

6.14 *Estimated Costs*

The Project construction costs are estimated at $790,000 to $1,150,000 per mile of 230 kV transmission line (2007 dollars), depending on the route chosen and double-circuit options. The cost excludes right-of-way acquisition and permitting. The cost for upgrades at the Wilton Substation is estimated to be approximately $1.5 million and the Boswell Substation is estimated to be approximately $1.0 million. The cost of an expanded Cass Lake Substation is estimated to be $5.2 million, the cost to construct a new 230 kV substation in the Cass Lake area is estimated to be $5.7 million, and the cost of a possible new Nary Breaker Station is estimated at $2.7 million. The Project's total cost estimate (transmission line and facilities) ranges from $63.0 million to $98.0 million depending on route selection, location of a 230 kV Cass Lake area substation, and whether the Nary Breaker Station (Route Alternative 1A requirement only) is required. Table 6-8 provides a breakdown of the estimated construction costs.

The estimated annual operation and maintenance cost for the transmission line is approximately $30,000, and is dependent on setting, the amount of vegetation management necessary, storm damage occurrences, structure types, age of the line, and so on. It is anticipated that very little maintenance would be required for the first several years since the transmission line would be new.

Table 6-8 Transmission Line Construction Costs

	Route 1 No Dbl Crt	Route 1 w/ Dbl-Crt	Route 1A w/ Dbl-Crt	Route 1B w/ Dbl-Crt	Route 1C w/ Dbl-Crt	Route 2 w/ Dbl-Crt	Route 2C w/ Dbl-Crt
	Million $						
Transmission Line Costs							
230 kV Base Cost	44.2	45.6	51.2	49.3	45.5	43.9	44.1
230/115 kV Double-Circuit Adder	0.6	4.3	14.4	4.3	4.3	0.6	0.6
230/69 kV Double-Circuit Adder	0.0	10.5	10.5	10.5	8.5	5.2	5.2
Alternate 69 kV Adder	0.0	0.0	0.0	0.0	1.7	0.0	1.7
Wooded Adder	4.5	4.3	4.4	4.8	4.5	3.8	4.2
Wetland Adder (w/ mat procurement)	5.2	6.5	7.0	6.9	5.8	4.5	4.9
Subtotal Transmission Line	54.4	71.3	87.3	75.8	70.4	57.9	60.6

	Route 1 No Dbl Crt	Route 1 w/ Dbl-Crt	Route 1A w/ Dbl-Crt	Route 1B w/ Dbl-Crt	Route 1C w/ Dbl-Crt	Route 2 w/ Dbl-Crt	Route 2C w/ Dbl-Crt
Associated Facility Costs							
Boswell Sub Expansion	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Wilton Sub Expansion	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Cass Lake Sub Expansion	0.0	0.0	0.0	0.0	0.0	5.2	5.2
Cass Lake Sub New Construction	5.7	5.7	5.7	5.7	5.7	0.0	0.0
Nary Breaker Station	0.0	0.0	2.7	0.0	0.0	0.0	0.0
Subtotal Facility	8.3	8.3	10.9	8.3	8.3	7.7	7.8
Total	62.7	79.6	98.2	84.0	78.7	65.7	68.3

Note: *The base cost to construct a generic 230 kV line was estimated at $572,000/mile; to double-circuit with a 115 kV line the cost adder was estimated at $639,000/mile; to double-circuit with a 69 kV line the adder cost was estimated at $608,000/mile; 69 kV adder estimated at $388,000/mile; wooded terrain adder was estimated at $122,000/mile for base ($100,000 for double-circuit and $80,000 for 69 kV adder); wetland terrain adder was estimated at $86,000/mile for base and 69 kV adder and $180,000 for double-circuit ; and wetland mat procurement was estimated at $188,000/mile for base and $250,000 for double-circuit. Cass Lake Substation costs may range from $5.0 to $5.7 million. Wetland adder includes mat procurement. All transmission line costs include an AFUDC at 8.0 percent annually. All facility costs include an AFUDC at 8.0 percent annually. Note that Route 1C is same as Route 1* double-circuit*, except that Route 1C includes a single circuit crossing of the Mississippi River and construction of 4.4 miles of 69 kV line. Total and subtotals may not add-up due to number rounding.*

6.15 *Project Schedule*

The Applicants require an in-service date of December 2011. The Applicants expect to complete the need and route permit approval processes (including state and federal environmental review) by summer 2009. Project construction is slated to commence once the final design is completed, estimated to be in November 2009.

6.16 *Summary of Impacts by Alternative*

The potential environmental impacts of the Project are addressed in detail in Chapter 8.0 of this application. Some of the impacts, such as land use, noise, public services, antennas and towers, electromagnetic fields, geomorphic and physiographic environment, climate, air quality, water quality, and transportation are essentially the same regardless of which route is selected. A table summarizing the potential impacts is provided in Chapter 8.0.

The Applicants would implement BMPs to minimize impacts from the construction of the transmission lines. Agricultural land that is crossed would be restored after construction is complete, work in wetland areas would be conducted in the wintertime to the extent

practicable, and runoff to surface waters would be controlled in accordance with state and federal permits.

7.0 Environmental Review Methods and Regulations

Impact calculations for all resources were based upon the following general assumptions:

- Maximum structure spacing distance of 800 feet
- Each structure would have two poles
- Each pole would be 36-inch diameter, therefore each pole would be 7.075 square feet
- Each structure would require an area of 14.15 square feet (0.0003 acre)
- The right-of-way would be 125 feet wide
- Permanent impacts would be 300 square feet per structure except for those placed in wetlands
- Permanent impacts to wetlands would be 40 square feet per structure

The right-of-way used to determine direct impacts to resources within the Study Area follows a representative centerline within the 1,000-foot-wide route. Therefore, the estimated impacts would be revised if the right-of-way shifts to avoid sensitive areas. Table 7-1 provides the specific characteristics of the route lengths, route areas, and rights-of-way.

Table 7-1 Route Characteristics

Type	Route 1	Route 1A	Route 1B	Route 1C[1]	Route 2	Route 2C[1]
Route Length in Miles						
Entire	69.0	73.6	74.8	73.4	68.0	72.4
CNF Owned	22.9	22.5	23.0	25.4	18.8	21.3
LLR	43.7	43.1	49.5	47.7	43.2	47.2
Route Area in Acres						
Entire	8,382	8,842	9,091	8,907	8,200	8,725
CNF Owned	2,790	2,730	2,866	3,115	2,309	2,634
LLR	5,232	5,149	5,941	5,714	5,174	5,656
Right-of-way Area in Acres						
Entire	1,045	1,115	1,133	1,112	1,032	1,098
CNF Owned	348	341	351	389	284	325
LLR	662	653	750	723	660	721
Estimated Number of Structures						
Entire	455	486	494	484	449	478
CNF Owned	151	148	152	168	124	140
LLR	288	284	327	315	288	314

[1] This includes additional 4.4 miles of 69 kV reroute.

7.1 *Land Use*

Land use was identified using Minnesota Geographical Analysis Program (GAP) data obtained from the Department of Natural Resources (DNR). GAP land cover is broken down into four levels. Level 1 provides basic vegetation cover data, while Level 4 gives detailed cover information ranging from vegetation types to urban density.

Types of landcover analyzed included: forest, shrubland, cropland/grassland, aquatic environment, urban area, and transportation. Impacts to forest cover were determined by quantifying the areas classified by Level 1 GAP data as deciduous, coniferous, or mixed forests. For each route and its right-of-way, impacts to shrubland, cropland/grassland, and aquatic environment were determined by comparing Level 2 GAP data for each route and its representative right-of-way. Urban areas were determined by identifying the areas classified by Level 4 GAP data as high-density urban, low-density urban, and mixed development. Impacts to transportation were also determined using Level 4 GAP data.

Permanent impacts to land cover are primarily the result of structure placement and maintenance/access paths. Permanent impacts were determined by quantifying the percent of each route with a specific affected cover type, calculated using the following equation:

$$\text{Route length (miles)} \times \frac{\text{number of structures}}{\text{mile}} \times \frac{\text{300 square feet}}{\text{structure}} \times \text{percent cover in route}$$

Permanent forestland impacts were calculated using geographical information system (GIS). All forestlands within the right-of-way were identified as impacted.

Temporary impacts were assumed to occur for all land cover types except cropland/grassland in all areas within the 125-foot-wide right-of-way that were not permanently impacted. Temporary impacts were determined by subtracting the permanent impacts from the total area of these cover types within the right-of-way. Temporary impacts for cropland/grassland areas were calculated assuming a 30-foot wide impact area rather than the full 125-foot right-of-way.

Impacts for the Leech Lake Reservation and Chippewa National Forest (CNF) were calculated in the same way as described above. However, the CNF impacts are only for that portion of the route that would be located on federally owned parcels, while the impacts for the reservation are only for that portion of the route that would be located on public and private land. None of the route would be located on tribally or Indian-owned land.

7.2 *Human Settlement*

Residences near the routes were identified through field identification and review of high resolution aerial photographs. Using GIS, the area within 1,000 feet of the right-of-way centerline was divided into four zones: .0 to 62.5 feet; 62.5 to 200 feet; 200 to 500 feet; and 500 to 1,000 feet. Each zone was evaluated to identify the number of residences present. The 0 to 62.5-foot buffer represents the area within the 125-foot-wide right-of-way. The first three zones, from 0 to 500 feet, represent the 1,000-foot-wide route. Based on this approach, the margin of error in the number of residences identified is expected to be plus or minus 5 percent. The results of this analysis are shown in Appendix E.

7.3 *Noise*

The Applicants modeled noise from various conductors using the Bonneville Power Administration CFI8X model. Where possible, the model was run using a worst-case scenario benchmark to ensure that noise was not under-predicted. The Project was modeled using both H-frame and single-pole structures. Single-circuit configurations were modeled as stand-alone structures, and also alongside existing 115kV and 69 kV transmission lines. Table 7-2 displays the model assumptions. Model results are included in Appendix F.

Table 7-2 Assumed Model Parameters for Single-Circuit

Parameter	230 kV H-Frame	230 kV Single Pole	115 kV H-Frame	69 kV Single Pole
Conductor Type	954 ACSR	954 ACSR	336 ACSR	2/0 ACSR
Conductor Diameter	1.196 in	1.196 in	0.684 in	0.447 in
Line Current	1080 A	1080 A	614 A	232 A
Conductor Horizontal Locations (feet, relative to center)	-19.5, 0, 19.5	-12, 10, -10	-11, 0, 11	-4.5, 0, 4.5
Conductor Vertical Locations (feet, relative to ground)	30	30, 38, 46	25	24

Table 7-3 displays the model assumptions for double-circuit configurations.

Table 7-3 Assumed Model Parameters for Double-Circuit

Parameter	230/115 kV	230/69 kV
Conductor Type	954 ACSR/636 ACSR	954 ACSR/336 ACSR
Conductor Diameter	1.196 in/0.990 in	1.196 in/0.684 in
Line Current	1080 A/915 A	1080 A/614 A
Conductor Horizontal Locations (feet, relative to center)	(-10, -12, -10) / (10,12,10)	(-10, -12, -10) / (10,12,10)
Conductor Vertical Locations (feet, relative to ground)	(30, 46, 62) / (34, 50, 66)	(30, 46, 62) / (35, 51, 67)

7.4 *Aesthetics*

According to the US Forest Service (USFS) *Handbook for Scenery Management*, the relative scenic importance of an area is a complex concept that is highly dependent on its "landscape visibility." Landscape visibility incorporates the broad notion that in order for an area to be considered of scenic importance, the area must be able to be seen by viewers and perceived by viewers in a context that applies a positive visual value to the area. The idea of landscape visibility also acknowledges that the number of viewers, the duration of view, the degree of discernible detail, and the seasonal variation all affect the relative scenic importance of a

visual resource (USFS, 1995). Thus, areas that have a positive visual value and are seen by a large number of viewers for long periods of time and over most of the seasons are typically considered to have higher scenic importance than areas that are rarely seen by people.

CNF SIO Areas

As part of the 2004 USFS Chippewa National Forest (CNF) *Land and Resource Management Plan*, the USFS has mapped the planned visual management of CNF forestry resources based upon three Scenic Integrity Objective (SIO) classifications: High, Moderate, and Low (Figure 8 in Figures Appendix). The CNF 2004 *Management Plan* specifically defines "Scenic Integrity" as being "the state of naturalness, or conversely, the state of disturbance created by human activities or alteration. It is a measure of the degree to which a landscape is usually perceived to be 'complete.'" Classifications of the relative visual quality of USFS forest areas within the CNF have typically been assigned according to viewpoints from travel ways, recreations sites, and lakes with access. According to the CNF Forest Plan, High and Moderate classified areas contain vegetation that enhances views, creates vistas, features natural openings, retains canopies over travel routes, encourages vegetative diversity and seasonal color contrast, and enhances big-tree appearance.

The 2004 CNF *Management Plan* broadly categorizes its SIO values as follows:

- **High SIO**: Landscapes where the valued landscape character appears intact. Deviations may be present, but must repeat the form, line, color, texture, and pattern common to the landscape character, so completely and at such a scale that they are not noticeable.
- **Moderate SIO**: Landscapes where the valued landscape character appears slightly altered. Noticeable deviations must remain visually subordinate to the landscape character being viewed.
- **Low SIO:** Landscapes where the valued landscape character appears moderately altered. Deviations begin to dominate the valued landscape character being viewed, but they have similar valued attributes to the outside of the landscape being viewed, such as size, shape, edge effect, and pattern of natural openings, vegetative type changes, or architectural styles.

Areas in 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 forest areas that display scenic value along secondary travel ways and recreational use areas. Low SIO classifications are generally 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 its recommended guidance on the aesthetic treatment of overhead utilities in CNF areas. Specifically, the USFS prefers that, "In Moderate and High SIO areas, 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:** Temporary openings would be similar in size, shape, and edge characteristics to natural openings in the landscape being viewed. Temporary openings may mimic a natural disturbance.
- **Moderate SIO:** 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:** Temporary openings may dominate the view.

SIO Analysis of the Study Area Outside CNF

Due to the rather subjective nature of mapping the perceived "completeness" or "naturalness" of a landscape, the SIO values in non-CNF areas emphasize the USFS's objective method of mapping areas within one-quarter mile—the foreground in a flat landscape—of frequently used corridors such as travel ways, recreation areas, and bodies of water with access. Municipal areas, which represent a landscape that is both highly visible and highly altered, were assigned a Moderate SIO value.

The Study Area outside of the CNF was mapped by applying this buffer to the following visual locations:

- **High SIO:** US and MN roads; Lakes with Public Access; Mississippi River; Paul Bunyan Trail; Heartland Trail.
- **Moderate SIO:** County State Aid Highways; Municipal Areas.
- **Low SIO:** All areas not identified according to the aforementioned criteria.

7.5 *Socioeconomic Factors*

Socioeconomic data were gathered primarily from standard sources, such as the US Census Bureau and state economic development agency (MN PRO). Census data were summarized at different geographic levels: national, state, county, census tracts, block group, and block. Data were also summarized for selected political subdivisions and places. As the name suggests, block level data represents aggregate data for entire city blocks or an area delineated by the Census Bureau. Blocks are further aggregated into block groups, which comprise census tracts, perhaps the most familiar summary level for census data. Because the privacy of individuals living within blocks may be jeopardized by disclosing income data at block summary level, income data are available only at the block group level. For this project, employment data were gathered at the county level because this project would benefit the greater portion of the counties.

7.6 *Environmental Justice*

Federal Executive Order 12898 (February 11, 1994) (EO12898) states that "each federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." The RUS subsequently provided further guidance in RUS Bulletin 1794A-603. EO 12898 and subsequent actions on environmental justice are based in part on

Title VI of the Civil Rights Act of 1964. For purposes of environmental justice, "minority" is defined as those persons identifying as Hispanic or Latino, Black or African-American, American Indian and Alaskan Native, Asian, or Native Hawaiian and other Pacific Islander. Hispanic is classified as an ethnicity rather than a distinct race in the 2000 U.S. Census and is presented as such in this document. "Low income" is defined as persons with household income at or below the federally defined poverty threshold.

EO 13166 requires federal agencies to examine the services they provide, identify any need for services to those with Limited English Proficiency (LEP), and develop and implement a system to provide those services so LEP persons can have meaningful access to them.

The primary source for data on the racial, ethnic, and low-income composition of the Study Area is the 2000 census. Two data files provided by the U.S. Census Bureau (USCB) were used to examine these data. Summary File 1 (SF 1) provides actual, 100-percent counts of the total population (meaning data on race and ethnicity were collected at every household during the 2000 Census), including data on race and Hispanic or Latino ethnicity (USCB, 2001). Summary File 3 (SF 3) provides sample data collected from approximately one of every six households enumerated in Census 2000, including data on poverty status (USCB, 2002). SF 3 was also used to determine the ability of the population to speak English.

Guidance for addressing minority and low-income populations in association with the National Environmental Policy Act (NEPA) is provided by the Council on Environmental Quality who is responsible for implementing NEPA and Executive Order 12898. This guidance states that minority populations should be identified where either:

- The minority population of the affected area exceeds 50 percent of the total population, or,
- The minority population percentage of the affected area is meaningfully greater than the minority population percentage in the general population.

This analysis identified census block groups where minority populations were greater than 50 percent of the total population. Additionally, the analysis identified any census block groups where the percentage of the minority population exceeded the percentage found in the Region of Concern (ROC), without regard to whether the percentage of minority population in these census block groups was "meaningfully greater" than the percentage found in the general population. Census block groups were also used to determine concentrations of low-income populations. This analysis identified census block groups where the percentage of low-income populations was greater than the percentage found in the ROC.

7.7 *Cultural Values*

Meetings were conducted with members of the Leech Lake Band of Ojibwe (LLBO) and the CNF to inform them of the Project and learn their concerns. This information was used to develop the cultural values discussion.

7.8 *Public Services*

An internet search identified the locations of hospitals, police departments, and fire departments within the Study Area.

7.9 *Radio, Television, and Cellular Phone*

Tower location data were analyzed against the route locations in GIS to determine which towers may be located within the 1000-foot-wide routes. Distances were calculated using GIS.

7.10 *Electric and Magnetic Fields*

Information about electric and magnetic fields was obtained from state and federal internet web sites and from the Applicants. Census data and aerial photographs were used to identify proximity to residences.

7.11 *Archaeological and Historic Resources*

Information on known cultural resources within the Study Area was gathered from the Minnesota State Historic Preservation Office (SHPO) in St. Paul, Minnesota, and the CNF, and incorporated into GIS. Maps were generated and spatial relationships compared between the routes and recorded resource locations. The individual route data presented in Section 8.11 generally reflects resources within the 1,000-foot-wide route. For the overall Study Area, a 3-mile-wide corridor was considered. The data used were as current as possible for this study, and reflect information available on cultural resources within the routes as provided by cooperating agencies. Data on traditional cultural properties and traditional use areas were neither requested nor received from the LLBO staff.

7.12 *Geomorphic and Physiographic Environment*

Information on geology and topography from the DNR and US Geological Survey was analyzed to determine the Study Area's existing conditions and potential effects on those conditions.

7.13 *Climate*

Information on climate was analyzed to determine the Study Area's existing conditions and the Project's potential effects on the existing conditions.

7.14 *Soils*

Electronic soils data were obtained from the Natural Resource Conservation Service (NRCS) STATSGO database. Prime farmlands were identified using NRCS SSURGO data.

Permanent impacts were identified for each structure assuming an impact area of 300 square feet per structure. Temporary impacts were calculated by subtracting the permanent impacts from the total area within the right-of-way. Temporary impacts were assumed to occur within the entire 125-foot-wide right-of-way, except in agricultural areas where the impact would be reduced to a 30-foot width to avoid crop damage.

7.15 *Air Quality*

Information on air quality and National and Minnesota Ambient Air Quality Standards was analyzed to determine the Study Area's existing conditions and the Project's potential effects on the existing conditions.

7.16 *Water Resources and Floodplains*

Public Waters (PW) in Minnesota are water basins and watercourses of significant recreational or natural resource value as defined in Minn. Stat. 103G.005. The DNR has regulatory jurisdiction over these waters. Spatial GIS coverage of these PW basins and watercourses was obtained from the DNR and their relationship to the routes was analyzed in GIS.

When available, flood data derived from the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRM), were used to identify portions of the Study Area that fall within the 100-year floodplain. FEMA flood data, however, has not been fully developed for much of northern Minnesota, including much of the Study Area. Therefore, the absence of a FEMA identified floodplain does not exclude the possibility of the presence of a 100-year floodplain along bodies of water. Calculations were based on an average spacing of 800 feet between structures, and each transmission structure was anticipated to have two 36-inch diameter poles.

7.17 *Wetlands*

Wetlands are defined by the United States Army Corps of Engineers (USACE) as "Waters of the US" and are subject to jurisdiction under Section 404 of the Clean Water Act (1973). Waters of the US include both wetlands and non-wetlands that meet USACE criteria. In Minnesota, all wetlands are also regulated by a local government unit (LGU) under the Wetland Conservation Act (Minn. Rules Ch. 8420) and by the Deparmtent of Natural Resources (DNR) under Chapter 6115, Public Water Resources. Projects that propose to fill jurisdictional wetlands must be permitted by USACE, local government unit (LGU) and/or the Minnesota Department of Natural Resources (DNR).

The wetland evaluation was based on National Wetland Inventory (NWI) data available from the US Fish and Wildlife Service (USFWS). These data provide a general estimate of wetlands that may be present in the Study Area. Most often the NWI underestimates the number and size of wetlands present. However, the relative impact estimates using NWI data are adequate for this level of evaluation. More detailed wetland field surveys would be conducted once a preferred corridor is identified.

Due to the nature of wetlands in the Study Area, three types of wetland impacts were identified: temporary, permanent, and conversion. Temporary impacts are those impacts related to construction activity. Once construction is complete, the temporary impact areas would be restored to pre-construction conditions. Permanent impacts would occur for any fill that is placed in a wetland, including permanent access roads and structures. Permanent impacts for structures were assumed to be 300 square feet. Access roads were assumed to be 30 feet wide. Conversion impacts occur to forested wetlands that are not permanently impacted, but are converted to emergent or shrub wetlands due to clearing and maintenance activities. All forested wetlands within the 125-foot right-of-way would either be permanently impacted or converted.

Spatial GIS coverage of PWI basins and watercourses was compared to NWI locations along each route alternative to determine those NWI areas associated with PWIs.

7.18 *Flora*

GAP Level 4 landcover data, the most detailed GAP information available, was analyzed to identify the broad forest community types within the Study Area. Within the CNF, forest resource information provided by CNF and landscape ecosystem information from the 2004 *Chippewa National Forest Land and Resource Management Plan* was used instead of GAP data.

7.19 *Fauna*

Species information was identified primarily using species records and ranges that have been compiled by DNR and USFS.

7.20 *Noxious Weeds & Exotic Organisms*

The Minnesota Noxious Weed Law (Minn. Stat. §§ 18.76 to 18.88) regulates noxious weeds that are deemed by the Commissioner of Agriculture to be "injurious to public health, the environment, public roads, crops, livestock, and other property."

The law gives county agricultural inspectors and local weed inspectors the authority to inspect land and ask landowners to destroy noxious weeds (Minn. Stat. § 18.78 subd. 1). Selling noxious weeds without a permit; transporting noxious weeds along a public highway without a permit; hindering weed inspectors; and failing to comply with weed inspector notices to eradicate noxious weeds are all considered misdemeanors (Minn. Stat. §§ 18.86 and 18.87).

Primary and secondary weed lists for the state of Minnesota were used to identify regulated noxious weeds in Beltrami, Cass, Hubbard, and Itasca Counties. Data collected by the Weed Integrated Pest Management Project (WIPM) and CNF were used to identify currently known noxious weed species near the routes.

7.21 *Rare and Unique Species and Communities*

The Study Area for rare and unique species and communities includes the proposed routes plus a one-mile wide buffer. Since the routes have not undergone detailed field studies the Study Area for this analysis is wider than the routes to provide a comprehensive evaluation of the species that may be located within the routes. Therefore, the species identified within the larger Study Area may or may not be found within the individual routes. Detailed field studies for rare and unique species and communities would be conducted for the preferred route.

Rare and unique resources were identified using the DNR Natural Heritage Information System (NHIS) and data received from USFS. DNR Scientific and Natural Areas (SNAs) were also identified near the study area. Because NHIS species locations may be documenting the same species occurrences listed in the CNF/USFS database, adding the NHIS records to the CNF/USFS records would likely result in an overestimation of the known frequency of an individual species. Similarly, habitat requirements need to be considered when evaluating the potential distribution of a species, as many of the occurrences represent clusters of species, and not an even distribution of a species, throughout the study area.

The federal government and Minnesota both have regulations specific to threatened and endangered species. In addition, the USFS and LLBO identify locally sensitive species. The following is a summary of the four jurisdictions that identify the species considered in this analysis.

7.21.1 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.

While the bald eagle has been recently delisted from the ESA, the bald eagle is still protected by other federal laws. The Migratory Bird Treaty Act (16 U.S.C. 703-712) regulates the taking, selling, transporting, and importing of migratory birds, their nests, eggs, parts, or products. The Bald and Golden Eagle Protection Act (16 U.S.C. 668-668c) makes it illegal to kill, harass, possess (without a permit), or sell bald eagles.

7.21.2 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 state endangered or threatened species. Species identified as of special concern are not legally protected. The DNR is responsible for overseeing the regulations and permitting for development projects.

7.21.3 US Forest Service Sensitive Species

US Forest Service Sensitive Species (FSSS) 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), and species considered sensitive based on National Forest and Grassland Risk Evaluations. The list of FSSS was provided by the CNF.

7.21.4 Tribal Sensitive Species

Tribal Sensitive Species include those species that have significance based on local customs, local gathering/harvest practices, and ceremonial use. The list of tribal sensitive species was provided by the LLBO.

7.22 *Recreation and Tourism*

The DNR's Recreation Compass was used to locate federal and state recreational areas, lakes, water access points, and trails. City web sites were searched to identify local recreation and tourist destinations. All length and area measurements were calculated in GIS. Hunting information was obtained through the DNR web site.

7.23 *Agricultural Production*

USDA agricultural census data (1997 and 2002) were used to identify agricultural production and value within Beltrami, Cass, Hubbard, and Itasca counties. GAP Level 2 landcover data and NRCS SSURGO soils data were used to identify cropland and prime farmland areas within the routes.

All calculations were completed in GIS using GAP data (cropland and grassland). Grassland includes hayed land. Agricultural land is identified as "cultivated agricultural land" per Minn. Stat. § 216B.243, subd. 7(b). Prime farmland includes soil designated as prime farmland, prime farmland when drained, and farmland of statewide importance. Permanent impacts for structures were estimated to be 300 square feet. Temporary impacts were assumed to occur for construction access, and included a 30-foot-wide area within the right-of-way.

7.24 *Transportation*

Infrastructure, airports, and pipelines were identified within the Study Area using GIS analysis. Annual average daily traffic (AADT) volumes on trunk highways were assessed using GIS data provided as part of the 2006 MN/DOT Trunk Highway Volume maps. Future transportation plans were identified in consultation with MN/DOT.

7.25 *Forestry*

GAP Level 1 landcover data were used to identify broad forest types within the routes. CNF's Fiscal Year 2006 Monitoring and Evaluation Report, DNR's Chippewa Plains/Pine Moraines and Outwash Plains Subsection Forest Resource Management Plan (SFRMP) Assessment, and CNF's 2004 Land and Resource Management Plan were used to identify current forest management trends within the vicinity of the routes.

7.26 *Mining*

Aggregate source information was obtained from MN/DOT. This information was loaded into GIS and the location of aggregate mining operations was verified with aerial photographs. This information displays the location of aggregate mining operations and indicates whether they are active or inactive.

8.0 Affected Environment and Environmental Consequences

This chapter describes the existing conditions of the natural and built environments, potential impacts to these environments, and recommended mitigation for the Project. Each environmental issue/topic has its own section, for example, Land Use is in Section 8.1.

- The existing conditions are identified for the Study Area, which generally includes all of the 1,000-foot-wide routes.
- The impacts/effects are described for a 125-foot-wide right-of-way within each route.
- This impacts/effects discussion provides specific analyses for the public land managed by the US Forest Service within the Chippewa National Forest (CNF), and for land located within the boundaries of the Leech Lake Reservation (LLR).
- The impacts/effects for the overlapping CNF and LLR are a subset of those described for the routes, and are not cumulative.
- Mitigation is generally discussed for all of the routes, and is applicable for the overall project as well as for impacts identified within the CNF and LLR.

Table 8-1 provides a summary of the potential impacts/effects for the Project. Table 8-2 summarizes the proposed mitigation measures for those impacts/effects. Sections 8.1-8.26 provide detailed analyses for each issue environmental issue.

Table 8-1 Summary of Potential Impacts and Effects within the 125-foot ROW

Issue	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C	Summary
Land Use							
Temporary impacts (ac)	299	332	320	305	493	499	Temporary impacts to Routes 2 and 2C are highest due to greater temporary impacts to shrub land areas
Permanent impacts (ac)	580	601	639	640	441	500	Nearly all permanent impacts are a result of forest clearing within the ROW
Human Settlement							
Number of residences within ROW	3	2	4	3	15	15	Routes 2 and 2C contain the highest number of existing residences for all of the routes studied.
Noise							
Transmission line and substation noise	no impacts	no impacts	no impacts	no impacts	no impacts	no impacts	Transmission line noise is essentially inaudible at the edge of the ROW and within permissible noise levels (<50 dBA) directly under the line. No additional noise associated with modifications to existing substations.

Issue	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C	Summary
Aesthetics							
Percent of route mapped as a High Scenic Integrity Objective (SIO) Area	33	31	29	32	88	84	Routes 2 and 2C would have higher impacts to areas classified as needing management for High Scenic Integrity. The primary negative visual impacts within Routes 2 and 2C are associated with co-locating with the US 2 corridor.
Socioeconomic Factors							
Economic impacts to local communities	Long-term benefit	Long-term benefit	Long-term benefit	Long-term benefit	Long-term benefit	Long-term benefit	The project is expected to create short-term jobs and increase short-term revenues for local businesses. Expect long-term benefit to businesses, industries, and residential customers because of improved electric reliability and adequate electric service capacity.
Environmental Justice							
Minority populations (percent of population within block groups)	21	21	21	21	26	26	All routes contain higher percentages of minority populations than the four-county average, which is 12.4 percent.
Low income populations (percent of population within block groups)	14	14	14	14	15	15	All routes contain slightly higher percentages of low income populations than the four-county average, which is 13.2 percent.
Cultural Values							
Impacts	none expected	none expected	none expected	none expected	none expected	none expected	No direct or indirect impacts to cultural values anticipated.
Public Services							
Impacts	Short-term impact, long-term benefit	Short-term impact, long-term benefit	Short-term impact, long-term benefit	Short-term impact, long-term benefit	Short-term impact, long-term benefit	Short-term impact, long-term benefit	Indirect impacts related to construction activities that may disrupt roadways. Positive effect upon public services by providing improved electrical reliability and meeting future demands.
Radio, TV, and Cell Phone							
Impacts	none expected	none expected	none expected	none expected	none expected	none expected	No direct or indirect impacts to communication towers are anticipated. The Applicants would work with tower operators to resolve any issues directly related to the Project.
Electric and Magnetic Fields							
Peak magnitude of electric field underneath the conductors at one meter above ground level	2.6 kV/m	2.6 kV/m	2.6 kV/m	2.6 kV/m	2.6 kV/m	2.6 kV/m	The predicted levels are significantly less than the maximum limit of 8.0 kV/m that has been a typical permit condition in other transmission line applications.

Issue	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C	Summary
Peak magnitude of magnetic field density underneath the conductors	260 mG	260 mG	260 mG	260 mG	260 mG	260 mG	According to the EPA, these densities represent smaller magnetic fields than those associated with many household appliances. Therefore, the Project would not have direct or indirect effects associated with magnetic fields.
Stray voltage	none	none	none	none	none	none	No stray voltage issues are anticipated with this Project.
Archaeological and Historic Resources							
Known Sites	37	26	31	37	30	30	These sites include: archaeological; cemetery or burial; architectural; and NRHP. When comparing Route 1 and its alternatives to Routes 2 and 2C, Route 1 and it alternatives contain more known archaeological sites and Route 2 and 2C contain more architectural and NRHP sites.
Geomorphic and Physiographic Environment							
Impacts	none expected	none expected	none expected	none expected	none expected	none expected	No direct impacts are expected.
Climate							
Impacts	Reduced transmission line losses; reduced GHG emission	Reduced transmission line losses; reduced GHG emission	Reduced transmission line losses; reduced GHG emission	Reduced transmission line losses; reduced GHG emission	Reduced transmission line losses; reduced GHG emission	Reduced transmission line losses; reduced GHG emission	Small amounts of greenhouse gas (GHG) emissions are expected from the short-term operation of construction equipment. The routes are not expected to have any long-term direct or indirect effects to climate as the project would not increase emissions of GHGs.
Soils							
Temp impacts (ac)	876	930	956	942	931	997	Route 1 is expected to have the least impacts and Route 2C is expect to have the potential for the most impacts.
Perm. impacts (ac)	3	3	3	3	3	3	All routes are expected to have similar impacts as a result of structure placement.
Air Quality							
Impacts	none	none	none	none	none	none	No permanent impacts are expected. Temporary, localized impacts may occur due to fugitive dust.
Water Resources							
Number of PWI basins within ROW	7	7	6	9	5	7	No direct impacts are anticipated as PWI basins would either be spanned or avoided entirely.
Number of PWI watercourses within ROW	12	11	11	13	7	8	No direct impacts are anticipated as PWI watercourses would either be spanned or avoided entirely.
Wetlands							
NWI temp. impacts (ac)	83	102	89	85	59	62	Route 1A would have the highest temporary NWI wetland impacts
NWI perm. wetland type conversion (ac)	209	198	223	224	166	181	Route 1 and its alternatives would clear more NWI forested/scrub shrub area the Routes 2 and 2C

Issue	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C	Summary
NWI perm. impacts (ac)	0.10	0.11	0.11	0.11	0.08	0.09	All routes would have minor permanent impacts.
Estimated number of structures placed within NWI wetlands	113	115	119	117	93	96	Route 1 and its alternatives would place more poles in NWI wetlands than Routes 2 and 2C.
Flora							
Primary landcover type	Broad-leaf forest	Broad-leaf forest	Broad-leaf forest	Broad-leaf forest	Broad-leaf forest	Broad-leaf forest	Aspen/white birch is the most frequently mapped cover type. Cropland, upland deciduous, lowland deciduous shrub, red/white pine, and emergent/sedge wetland communities are also commonly mapped within the route right-of-ways. Forest communities are more common within CNF managed areas.
Fauna							
Impacts	none expected	none expected	none expected	none expected	none expected	none expected	The primary concerns related to potential avian collisions associated with the transmission line. The Applicants would work with the CNF and the DNR to address any potential issues.
Noxious Weeds and Exotic Organisms							
Impacts	none expected	none expected	none expected	none expected	none expected	none expected	Best management practices would be used to contain and minimize the potential spread of noxious weeds.
Rare and Unique Species and Communities *(note: the following records represent overlapping designations. Refer to Table 8.21-1 for additional information on the specific classification of listed species.)*							
Number of federally listed species recorded within right-of-way	0	0	0	0	0	0	The routes are located within the fringe of the potential range of the Canada Lynx, a threatened (T) species. The routes are not expected to impact this species.
Number of state listed species recorded within the route right-of-way	2	2	2	2	0	0	Two special concern (SC) plant species documented within the right-of-way of Route 1 and its alternatives. Overall routes included seven listed species within Route 1 and its alternatives (one SC bird, two T plants, and four SC plants) and five within Routes 2 and 2C (one SC bird, one endangered plant, one T plant, and two SC plants.
Number of CNF listed species recorded within the route right-of-way	4	4	4	4	0	0	There is one RFSS bird, two RFSS plants, and one watch list plant recorded within the right-of-way of Route 1 and its alternatives. Overall, the routes include10 listed species within Route 1 and its alternatives (four birds and six plants), and six listed species within Routes 2 and 2C (one bird and five plants).

Issue	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C	Summary
Number of LLR listed species recorded within the route right-of-way	3	3	3	3	0	0	Two T plants and one sensitive (S) plant within the right-of-way of Route 1 and its alternatives. Overall, the routes include 12 listed species within Route 1 and its alternatives (two T birds, three S birds, one E plant, four T plants, and two S plants), and nine listed species within Routes 2 and 2C (two T birds, one S bird, one E plant, four T plants, and one S plants).
Recreation and Tourism							
Number of federal biking/walking trails crossed	5	5	2	5	2	2	Trails include Lake 13 bike route, Pike Bay bike loop, Mi-Ge-Zi trail, Norway Beach Interpretive Trail, Moss Lake Rd bike route, and South Boundary bike route.
Number of snowmobile trails crossed	4	4	4	4	9	9	Routes 2 and 2C cross more different snowmobile trails that Route 1 and its alternatives.
Number of state trails crossed	3	3	3	3	1	1	Route 1 and its alternatives cross more different state trails than Routes 2 and 2C.
Number of scenic byways crossed	1	1	1	1	2	2	All routes cross the Great River Road scenic byway. Routes 2 and 2C also cross the Ladyslipper scenic byway.
Number of Mississippi River crossings	2	2	2	2	2	2	Routes 1C and 2C also include a 169 kV crossing of the Leech Lake River (located south of Ball Club).
Permanent impacts to Bemidji Slough WMA (sq ft)	675	None	675	675	0	0	The route areas offer the opportunity to potentially avoid directly impacting this WMA.
Permanent impacts to Bemidji State Game Refuge (ac)	0.3	0.1	0.3	0.3	0.4	0.4	All routes are expected to have similar impacts within the Bemidji State Game Refuge
Permanent and temporary impacts on CNF lands crossed by right-of-way (ac)	342	336	345	383	282	323	Within these lands, Route 1 and its alternatives impact more forest land than Routes 2 and 2C. Routes 2 and 2C impact more shrublands than Route 1 and its alternatives.
Agricultural Production							
Temporary impacts to agricultural land (ac)	52	57	54	52	31	31	Route 1 and its alternatives would impact more agricultural land than Route 2 and 2C
Permanent impacts to agricultural land (ac)	< 1	< 1	< 1	< 1	< 1	< 1	These acreages represent land taken out of production due to the placement of structures.

Issue	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C	Summary
Permanent impacts to prime farmland (ac)	< 1	< 1	< 1	< 1	< 1	< 1	These acreages represent land taken out of production due to the placement of structures.
Transportation							
Short-term impacts	yes	yes	yes	yes	yes	yes	Short-term impacts would likely occur at roadway crossings due to traffic delays or detours associated within construction.
Long-term impacts	none expected	none expected	none expected	none expected	none expected	none expected	The project is not expected to impact current or planned roadway right-of-way areas.
Forestry							
Conifer forest perm. impacts (ac)	118	112	116	132	152	167	Conifer forest impacts would be higher in Routes 2 and 2C than Route 1 and its alternatives.
Conifer-deciduous forest perm. impacts (ac)	9	8	13	9	11	11	All routes would have similar conifer-deciduous forest impacts.
Deciduous forest perm. impacts (ac)	452	479	510	498	276	321	Deciduous forest impacts would be higher in Route 1 and its alternatives than for Routes 2 and 2C.
CNF-managed Ten Section Area impact (ac)	38	31	9	38	27	27	The right-of-way for Route 1B impacts the south and west edge of the Ten Section Area. There is opportunity within Route 1B, however, to avoid the Ten Section Area.
CNF-managed Pike Bay Experimental Forest impacts (ac)	32	32	0	32	0	0	The right-of-way of Routes 1B, 2, and 2C avoid the Pike Bay Experimental Forest.
Mining							
Potential mining impacts	none expected	none expected	none expected	none expected	possible	possible	Routes 2 and 2C cross along the north side of an active aggregate mining operation located along the south side of US 2 in Hubbard County.

Table 8-2 Proposed Mitigation Measures

Resource	Proposed Mitigation
Land Use	• The exact location of structure sites, right-of-way, and other disturbed areas would be determined with landowners' or agencies' input. • The Applicants would work with the DNR and the CNF to minimize and avoid impacts to sensitive forested areas within the state and national forests. Areas disturbed in state and national forest land will be reseeded with a seed mix recommended by the appropriate agency's management. • The minimum area necessary would be used for access roads to the transmission line. • Conductor spans would be adjusted such that power line structures, where practicable, would avoid sensitive land uses. Likewise, construction and maintenance access roads would be located to avoid sensitive conditions. • Construction activities would be limited to the right-of-way, unless access permission is obtained

Resource	Proposed Mitigation
	from adjacent landowners. • Fences, gates, and similar improvements that are removed or damaged would be promptly repaired or replaced.
Human Settlement	• The Project intends to be routed such that no person would be displaced from their residence or business. • Property or easement acquisition would be conducted in accordance with state and federal regulations. • The location of individual structures would be coordinated with property owners, to the extent practicable. • The Applicants may use single pole structures in urban areas to reduce encroachment with existing residences or buildings. • The Project would be designed with local, state, Rural Utilities Service (RUS), and National Electric Safety Code (NESC) standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials and right-of-way widths. • The proposed transmission line would be equipped with protective devices to safeguard the public if an accident occurs such as a structure or conductor falling to the ground.
Noise	• No noise impacts are anticipated from the Proposed Routes.
Aesthetics	• The location of structures, rights-of-way, and other disturbed areas would be determined by considering input from landowners and the CNF to minimize visual impacts. • Structure types (designs) would be uniform, to the extent practical. The Project proposes to primarily use wood poles, which would tend to blend into the surrounding wooded landscape. • Structures would be placed at the maximum feasible distance from highway, waterway, and trail crossings, within the limits of the structure's design. • The height of structures may be reduced, as feasible, to minimize impacts within areas of high scenic importance. Use of H-frame structures for the Mississippi River crossing would have a lower profile than single pole structures. • Care would be given to preserving the natural landscape; construction and operation would be conducted to prevent any unnecessary destruction, scarring or defacing of the natural surroundings in the vicinity of the work. • To the extent practicable, waterways would be crossed in the same location as existing utility lines. • Existing transmission lines would be double-circuited to the extent practicable and consistent with sound engineering principles or system reliability criteria. • New transmission lines would parallel existing transmission line, pipeline, and other rights-of-way, to the extent practicable and consistent with sound engineering principles or system reliability criteria.
Socioeconomic Factors	• Because impacts to socioeconomic factors generally would be short-term and beneficial, no mitigation is necessary or proposed.

Resource	Proposed Mitigation
Environmental Justice	• Corridor safety would be designed into any of the route alternatives; coordination between the Applicants and pipeline owners has been initiated and would continue throughout the design process to ensure the safety of all members of the community. • Effects to cultural or historic resources would be minimized through coordination with the Minnesota State Historic Preservation Officer, the Leech Lake Tribal Historic Preservation Officer and through the Section 106 process under the National Historic Preservations Act. • The Applicants are committed to maximizing the distance between the proposed transmission line and receptors, as practicable, to minimize EMF exposure. • In accordance with RUS regulations implementing NEPA, the Applicants have held several meetings with local, state, and federal agencies, stakeholders and the public. It is expected that public outreach activities would continue through the NEPA process and project initiation.
Cultural Values	• The Proposed Project would include vegetative restoration using native species, to the extent practicable. • Construction within the City of Cass Lake would consider the use of single pole structures in order to minimize visual/aesthetic impacts. • Water quality impacts, that may affect wild rice, are not anticipated and would be minimized through the installation and maintenance of BMPs
Public Services	• No direct or indirect effects to public services from the Project are anticipated; therefore mitigation would not be necessary.
Radio, Television, and Cellular Phone	• Radio: no mitigation is necessary • Television: no mitigation is necessary • The Applicants will work with the tower operators to mitigate any potential impacts.
Electric and Magnetic Fields	• No direct or indirect effects attributed to EMF from the Project are anticipated; therefore mitigation would not be necessary
Archaeological and Historic Resources	• The Applicants would make every effort to avoid impacts to identified archaeological and historic resources by adjusting the 125-foot wide right-of-way alignment within the selected 1000-foot wide route or spanning the resource. • In the event that an impact would occur, the lead federal agency would consult with the SHPO, the appropriate Tribal Historic Preservation Office (THPO) and invited consulting parties (particularly Native American Tribes and other State and Federal permitting or land management agencies) on whether or not the resource is currently listed on or eligible for listing in the NRHP. • If mitigation is required, in consultation with SHPO, THPO, and other consulting parties, treatment plans would be developed to minimize Project impacts on the resource, and/or to develop additional documentation through data recovery.
Geomorphic and Physiographic Environment	• Disturbed areas will be regraded to existing conditions, to the extent practicable. Soil material that has been removed for pole installation will be evenly spread within the right-of-way, in an upland topographic position.
Climate	• No direct or indirect effects to climate from the proposed project are anticipated; therefore mitigation would not be necessary.

Resource	Proposed Mitigation
Soils	• To the extent practical, soil disturbance and excavation activities in steep slope areas would be avoided. Where disturbance and excavation cannot be avoided entirely, it would be minimized using Best Management Practices (BMPs). • Sediment and erosion control plans would be developed that specify the types of BMPs necessary. Depending on the site, BMPs may include installation of silt fencing, straw bales or ditch blocks; and/or covering bare soils with mulch, plastic sheeting or fiber rolls to protect drainage ways and streams from sediment runoff from exposed soils. • BMPs would be inspected during construction, especially during significant precipitation events. • Soil compaction would be treated and restored through tillage operations, using a subsoiler. • All disturbed areas would be revegetated once construction is complete. Seed mixes would be specified based on site characteristics and in accord with regulatory permits.
Air Quality	• No direct or indirect effects to air quality from the proposed project are anticipated; therefore mitigation would not be necessary.
Water Resources	<u>Surface Water</u> • Install sediment and erosion control prior to construction in accord with sediment and erosion control plans and permits • Contain stockpiled material away from stream banks and lake shorelines • Spread topsoil and seed in a timely manner • Locate structures and disturbed areas away from rivers and lakes, where practicable • Use turbidity control methods prior to discharging wastewater from concrete batching or other construction operations to streams or other surface waters • If it is determined that a Section 404 or Public Waters Work permit is necessary, the Applicants would work with the jurisdictional agencies – the U.S. Army Corps of Engineers and the DNR – to determine the best ways to minimize impacts and create appropriate mitigation measures <u>Floodplains</u> • No impacts to floodplains are expected • If floodplain contours are disrupted during construction, they will be returned to their pre-construction profile once construction is complete. <u>Groundwater</u> • If dewatering is necessary, dewatered groundwater will be properly stored and sediments will be settled out and removed before the water is discharged.
Wetlands	• If it is determined that a Section 404 or Public Waters Work permit is necessary, the Applicants would work with the jurisdictional agencies – the U.S. Army Corps of Engineers and the DNR – to determine the best ways to minimize impacts and create appropriate mitigation measures
Flora	• The Applicants would continue to work with the CNF and the Department of Natural Resources (DNR) to minimize and avoid impacts to sensitive flora within the national and state forests. Areas disturbed in national and state forest lands will be reseeded with a seed mix recommended by the appropriate agency's management. • See Sections 8.1 Land Use and 8.26 Forestry for additional mitigation discussion.

Resource	Proposed Mitigation
Fauna	• Habitat conversion and fragmentation would be minimized to the extent practicable by siting the line next to existing corridors. • Right-of-way clearing in forested areas would be minimized to the extent practicable, while maintaining adequate clearance for safety and security of the transmission line in accord with federal regulations and industry standards. • The Applicants would address avian issues by working with the DNR, the CNF, and the U.S. Fish and Wildlife Service (USFWS) to identify any areas that may require marking transmission line shield wires and/or using alternative structures to reduce the likelihood of avian collisions. • An Avian Protection Plan (APP) would be developed that incorporates protection measures for the engineering, design, and construction of the transmission line. The APP would be developed using the *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*. The plan would focus on selecting substation components for insulation and isolation measures to minimize the potential electrocution of bird. The Applicants would incorporate avian collision minimization measures in the APP. • In areas determined to be major flyways or staging areas for migratory waterfowl, the transmission line would be marked to minimize the likelihood of bird collisions. These areas would be identified in cooperation with regulatory agency staff.
Noxious Weeds and Exotic Organisms	• The Applicants' environmental inspector would conduct a field review the right-of-way and construction staging sites prior to construction to identify areas that currently contain noxious weeds. The inspector would also consult with local officials to determine if there are records of contaminated areas. • Construction vehicles would be power-washed, especially the under carriage, prior to construction start if they have been in contact with noxious weed seed, particularly when traveling from an area identified as contaminated by noxious weeds to an uncontaminated area. • The introduction of noxious weeds would be minimized by proper and prompt re-vegetation using regionally native species. Seed mix composition would be coordinated with the CNF, Department of Natural Resources (DNR), Department of Resource Management (DMR) of the Leech Lake Band of Ojibwe (LLBO staff. Seed mixes used for the Project would be certified as weed free. Only clean straw mulch would be used: "meadow hay" would not be allowed as a mulch material.
Rare and Unique Species and Communities	• In the event that impacts to threatened or endangered species are not avoidable, the applicants will work closely with the regulatory agencies to identify appropriate measures to minimize impacts, as well as compensatory mitigation for impacts that cannot be avoided.
Recreation and Tourism	• Constructing the proposed transmission line along existing pipeline and transmission rights-of-way would minimize any impacts to recreational resources and tourism. Locating the right-of-way adjacent to existing utility rights-of-way would minimize impacts to previously undisturbed parks or management areas. The structure locations, right-of-way, and other disturbed areas would be determined with the landowner and land management agency's input. Structures would span existing trails. Permanent disturbance of wildlife habitat would also be minimized by co-locating within existing disturbed corridors, thus impacts to hunting and wildlife observation would be minimized. Since the primary indirect effect is the visual aspect of the line on recreational resources, the mitigation measures will include those as described in Section 8.4 Aesthetics.

Resource	Proposed Mitigation
Agricultural Production	• The Applicants would work with landowners to minimize impacts to farming operations along the route. • The easements would not restrict farming operations once construction is completed, such so the easement area between structures would be available for crop production. • The Applicants would compensate landowners for any crop damage or soil compaction that may occur during construction.
Transportation	• Transmission lines would be designed in accordance with NESC standards, but to minimize impacts to roadways. The Applicants would work with the state and local officials to minimize any impacts during construction and operation of the proposed transmission line. • Potential mitigation methods for railway compatibility and pipeline compatibility are described in Section 8.24 Transportation.
Forestry	• Construction staging areas will be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. The preferred locations are previously disturbed areas such as gravel pits. Unless otherwise agreed upon by the landowner, all storage and construction buildings, including concrete footings and slabs, and all construction materials and debris will be removed from the site once construction is complete. The area will be regraded as required so that all surfaces drain naturally, blend with the natural terrain, and are left in a condition that will facilitate natural revegetation and provide for proper drainage and prevent erosion. • Any clearing required outside the right-of-way for equipment access, would be limited to only those trees necessary to permit the passage of equipment. If temporary access roads outside of the right-of-way corridors are necessary, they will be restored to native vegetation. Native shrubs that will not interfere with the safe operation of the transmission line will be allowed to reestablish in the right-of-way. • The Applicants will coordinate with the appropriate agencies to determine the best avoidance and minimization measures to use in national and state-owned forested parcels along the Route right-of-way.
Mining	• If mining operations cannot be avoided, the Applicants would work with existing mining operations to identify the extent of current and planned mining operations and develop appropriate mitigation measures.

.

8.1 *Land Use*

8.1.1 Existing Conditions

The six 1,000-foot wide routes (Study Area) extend through Beltrami, Cass, Hubbard, and Itasca counties in northern Minnesota. Portions of the routes pass through the Chippewa National Forest (CNF) and the Leech Lake Reservation (LLR). Table 8.1-1 summarizes the approximate acreage of each 1,000-foot-wide route.

Table 8.1-1 Route Acreage

	Entire Route (ac)	CNF Managed[1] (ac)	State Owned (ac)	Leech Lake Reservation[2] (ac)
Route 1	8,382	2,790	1,280	5,232
Alternative 1A	8,842	2,730	1,247	5,149
Alternative 1B	9,091	2,866	1,514	5,941
Alternative 1C	8,907	3,115	1,399	5,714
Route 2	8,200	2,309	1,235	5,174
Alternative 2C	8,725	2,634	1,355	5,656

[1]Refers to land within the borders of the CNF that is managed by the federal government.
[2] Refers to land within the LLR; routes do not cross any Tribal-owned land

Zoning/Use

The Study Area within Hubbard County primarily includes lands of a relatively rural nature. No urban areas are included within the routes. The Study Area within Cass County primarily includes lands of a rural nature. Routes 2 and 2C include two urban areas: the south side of the City of Cass Lake and the north side of the City of Bena. The Itasca County Study Area primarily includes lands of relatively rural nature, except for urban areas within the city of Ball Club and along the south side of the City of Deer River. The Study Area within Beltrami County is primarily low-density residential and commercial development, although it is classified as medium and high-density near and in the City of Bemidji. Outside of the Bemidji urban growth area, land use is generally rural. Routes 1, 1A, 1B, and 1C run along the southwest side of Bemidji, almost completely skirting the existing city limits. Zoning districts crossed by these routes include R1-Rural and R2-Suburban Residential (Unsewered). Routes 2 and 2C include the south and west edges of the current Bemidji city limits. Zoning districts within these routes include C-Conservation, R1-Rural, R2-Suburban Residential (Unsewered), R3-Suburban Residential (Sewered), R4-Moderate Density Residential, R6-Multiple Family, and B1-Low Density Commercial (City of Bemidji, 2008).

Land Cover

The USGS Geographic Analysis Program (GAP) was used to classify the primary land-cover types within the Study Area (Figure 2 and Table 8.1-2). GAP data shows that the routes are primarily forested, ranging from 3,845 acres (46.9 percent) in Route 2, to 5,403 acres (59.4 percent) in Route 1B. While patches of forest area are scattered throughout all of the Proposed Routes, the area between the City of Cass Lake and the City of Deer River (which consists primarily of state-owned and CNF-managed lands) is a nearly continuous forested area. This is reflected in the data provided for the CNF properties and LLR.

In comparison with Routes 2 and 2C, the Route 1 alternatives are composed of lesser areas of shrub land, urban, and transportation land uses, and greater areas of cropland/grassland. The higher areas of transportation and urban land uses within Routes 2 and 2C are due to the proximity of US Highway 2 and the cities of Bemidji, Cass Lake, and Bena to these routes.

Table 8.1-2 GAP Land Cover Types within the 1,000-foot Routes

	Type	Route 1		Route 1A		Route 1B		Route 1C		Route 2		Route 2C	
		Acres	% of Route	Acres	% of Route	Acres	% of Route	Acres	% of Route	Acres	% of Route	Acres	% of Route
Entire Route	Forest	5,026.6	60.0	5,200.0	58.8	5,402.8	59.4	5,312.3	59.6	3,844.8	46.9	4,301.5	49.3
	Shrub Land	1,094.0	13.1	1,397.4	15.8	1,352.4	14.9	1,325.6	14.9	1,828.6	22.3	1,875.0	21.5
	Cropland/Grassland	1,596.1	19.1	1,599.1	18.1	1,642.4	18.1	1,594.0	17.9	1067.3	14.2	1067.5	13.4
	Aquatic Environment	581.8	6.9	584.5	6.6	619.1	6.8	601.7	6.8	552.5	6.7	574.3	6.6
	Urban	37.80	0.5	26.04	0.3	37.80	0.4	37.80	0.4	464.2	5.7	464.2	5.3
	Transportation	34.6	0.4	34.7	0.4	36.9	0.4	35.7	0.4	342.1	4.2	342.1	3.9
	Total	8,370.9	100.0	8,841.8	100.0	9,091.4	100.0	8,907.1	100.0	8,199.5	100.0	8,724.6	100.0
Route within CNF Managed Lands	Forest	2,412.5	87.2	2,313.6	84.7	2,437.9	85.1	2,676.9	85.9	1705.2	73.8	2009.1	76.3
	Shrub Land	226.4	8.2	283.9	10.4	283.9	9.9	302.0	9.7	390.7	16.9	408.5	15.5
	Cropland/Grassland	56.0	2.0	47.6	1.7	55.5	1.9	48.3	1.5	41.4	1.8	41.4	1.6
	Aquatic Environment	72.2	2.6	83.8	3.1	87.0	3.0	86.7	2.8	133.8	5.8	136.7	5.2
	Urban	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.1	0.2	5.1	0.2
	Transportation	0.0	0.0	1.1	0.0	1.4	0.0	1.1	0.0	33.1	1.4	33.1	1.3
	Total	2,767.2	100.0	2,730.0	100.0	2,865.7	100.0	3,115.0	100.0	2,309.2	100.0	2,633.9	100.0
Route within LLR	Forest	3,743.7	71.7	3,419.1	66.4	4,119.8	69.3	4,012.2	70.2	2880.5	55.7	3320.0	58.7
	Shrub Land	722.8	13.8	945.1	18.4	981.2	16.5	943.8	16.5	1317.5	25.5	1353.3	23.9
	Cropland/Grassland	396.2	7.6	427.6	8.3	442.5	7.4	394.2	6.9	371.9	7.2	372.0	6.6
	Aquatic Environment	353.2	6.8	351.4	6.8	390.6	6.6	357.8	6.3	335.6	6.5	342.1	6.0
	Urban	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	154.5	3.0	154.5	2.7
	Transportation	4.6	0.1	5.5	0.1	6.8	0.1	5.7	0.1	114.2	2.2	114.2	2.0
	Total	5,220.4	100.0	5,148.8	100.0	5,940.9	100.0	5,713.7	100.0	5174.3	100.0	5656.2	100.0

Note: See Chapter 7.0, Methods and Regulations*, for the impact calculation methodology*

.

8.1.2 Direct/Indirect Effects

While the routes are 1,000 feet wide, the right-of-way that would be required for a given route is 125 feet wide. Table 8.1-3 provides a summary of the potential temporary and permanent land use impacts for the anticipated rights-of-way within each route.

Table 8.1-3 Acres of Land Affected within the 125-foot ROW Area

Type of Land Use/Cover	Route 1		Route 1A		Route 1B		Route 1C		Route 2		Route 2C	
	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact
Forest	578.8	0.0	599.6	0.0	637.5	0.0	638.7	0.0	438.9	0.0	498.8	0.0
Shrub Land	0.5	174.3	0.6	196.5	0.6	186.0	0.5	177.9	0.8	279.4	0.8	283.0
Cropland/ Grassland	0.7	51.9	0.7	56.7	0.7	54.2	0.7	51.9	0.3	30.6	0.3	30.6
Aquatic Environment	0.20	65.1	0.21	70.1	0.22	71.7	0.21	67.5	0.22	71.3	0.23	73.8
Urban	0.0	3.2	0.0	2.4	0.0	3.2	0.0	3.2	0.2	69.9	0.2	69.9
Transportation	0.0	4.7	0.0	6.0	0.0	5.2	0.0	4.7	0.0	42.1	0.0	42.1
Total	580.2	299.1	601.2	331.7	639.0	320.3	640.1	305.1	440.5	493.4	500.4	499.4
Total Temp. and Perm. Impacts within ROW	879.3		932.9		959.3		945.2		933.9		999..8	
Total ROW	1,046		1,115		1,133		1,112		1,032		1,098	

Note: See Chapter 7.0 Methods and Regulations *for the impact calculation methodology.*
Based on GAP Landcover Data

With one exception, the routes are not expected to permanently impact the land uses within the affected right-of-way. The primary exception is forested lands, which would need to be permanently cleared within the right-of-way to maintain an adequate clear zone along the transmission line. Permanent impacts to forest land would range from 439 acres for Route 2 to 638 acres for Routes 1B and 1C. Shrub land impacts were generally identified as temporary, since shrubs would naturally re-establish once construction is complete. Discussion of impacts to transportation, wetlands, and croplands are provided in Sections 8.24, 8.17 and 8.23, respectively.

It is likely that permanent impacts to land use would occur as a result of the proposed substation configurations in the Cass Lake area. In either case, approximately 4 acres of forested land would be impacted.

8.1.3 Direct/Indirect Effects within the Leech Lake Reservation

Table 8.1-4 summarizes the potential land use/cover impacts to the right-of-way within the LLR for each route.

Table 8.1-4 Acres of LLR Affected within the 125-foot ROW

Type	Route 1		Route 1A		Route 1B		Route 1C		Route 2		Route 2C	
	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact
Forest	433.1	0.0	413.2	0.0	491.8	0.0	491.1	0.0	337.6	0.0	395.6	0.0
Shrub Land	0.4	133.1	0.4	141.2	0.4	144.8	0.4	135.3	0.6	200.5	0.6	202.7
Cropland/ Grassland	0.2	13.2	0.2	13.9	0.2	15.5	0.2	13.2	0.1	8.4	0.1	8.4
Aquatic Environment	0.12	38.9	0.12	38.6	0.14	45.4	0.12	39.0	0.12	38.7	0.12	38.9
Urban	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	26.3	0.1	26.3
Transportation	0.0	0.9	0.0	1.1	0.0	1.5	0.0	0.9	0.0	20.9	0.0	20.9
Total	433.8	186.0	413.9	194.7	492.6	207.2	491.8	188.4	338.5	294.8	396.5	297.1
Total Temp. and Perm. Impacts within LLR Boundary ROW	619.8		608.6		699.8		680.1		633.3		693.6	
Total right-of-way within LLR	662		653		750		722		660		721	

Note: See Chapter 7.0 Methods and Regulations *for the impact calculation methodology.*
Based on GAP Landcover Data

Construction of the Project within the LLR would result in impacts similar to those identified for the entire length of the routes. Forestland impacts within the LLR range from 338 acres for Route 2, to 492 acres for Routes 1B and 1C.

8.1.4 Direct/Indirect Effects within the Chippewa National Forest

Table 8.1-5 summarizes the potential land use/cover impacts of the right-of-way for each route within the CNF.

Table 8.1-5 Acres of CNF-managed Land Affected within the 125-foot ROW

Type	Route 1		Route 1A		Route 1B		Route 1C		Route 2		Route 2C	
	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact
Forest	294.2	0.0	287.6	0.0	295.8	0.0	333.7	0.0	202.2	0.0	241.6	0.0
Shrub Land	0.1	37.2	0.1	37.2	0.1	36.6	0.1	38.7	0.2	57.3	0.2	58.7
Cropland/ Grassland	0.0	1.6	0.0	1.6	0.0	2.0	0.0	1.6	0.0	0.5	0.0	0.5
Aquatic Environment	0.03	8.9	0.03	8.9	0.03	9.7	0.03	8.9	0.06	17.5	0.06	17.5
Urban	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Transportation	0.0	0.2	0.0	0.2	0.0	0.4	0.0	0.2	0.0	4.6	0.0	4.6
Total	294.4	48.0	287.8	47.9	296.0	48.6	333.9	49.4	202.4	79.8	241.9	81.3

Type	Route 1		Route 1A		Route 1B		Route 1C		Route 2		Route 2C	
	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact	Perm. Impact	Temp. Impact
Total Temp. and Perm. Impacts within CNF managed ROW	342.4		335.7		344.6		383.3		282.2		323.2	
Total ROW within CNF managed land	348		341		351		389		284		325	

Note: See Chapter 7.0 Methods and Regulations *for the impact calculation methodology.*
Based on GAP Landcover Data

Construction of the Project within the CNF would result in impacts similar to those identified for the entire length of the routes. Forestland impacts within the CNF range from 202 acres for Route 2 to 334 acres for Route 1C.

8.1.5 Mitigation

Through the initial siting process, the Applicants have tried to minimize potential impacts by avoiding urban/residential areas and by co-locating the routes along existing rights-of-way, such as highways, railways, existing transmission lines, and pipelines. The identification of a 1,000-foot wide route provides additional opportunities to avoid sensitive areas. Minor shifts to the intended right-of-way would be evaluated once a preferred route is chosen to further minimize impacts. The following mitigation measures are applicable to all of the Proposed Routes evaluated:

- The exact location of structure sites, right-of-way, and other disturbed areas would be determined with landowners' or agencies' input.
- The Applicants would work with the DNR and the CNF to minimize and avoid impacts to sensitive forested areas within the state and national forests. Areas disturbed in state and national forest land would be reseeded with a seed mix recommended by the appropriate agency's management.
- The minimum area necessary would be used for access roads to the transmission line.
- Conductor spans would be adjusted such that power line structures, where practicable, would avoid sensitive land uses. Likewise, construction and maintenance access roads would be located to avoid sensitive conditions.
- Construction activities would be limited to the right-of-way, unless access permission is obtained from adjacent landowners.
- Fences, gates, and similar improvements that are removed or damaged would be promptly repaired or replaced.

8.2 *Human Settlement*

8.2.1 Existing Conditions

Residences in the Study Area tend to be concentrated in the vicinity of municipal areas, such as Bemidji, Cass Lake, Bena, Ball Club, Deer River, and Zemple. Groupings of residences are also common in privately owned lands along US Highway 2 (US 2) and near lakeshore areas.

Table 8.2-1 provides an estimate of the right-of-way requirements as well as the number of residences located within the 1,000-foot routes. Routes 2 and 2C have the highest number of residences within their routes. See Figure 1 for the locations of Municipalities in the vicinity of the project and Figures 4 and 5 for demographic information pertaining to Census Block groups in the project area.

Table 8.2-1 Residences within the 1,000-foot Routes

Proximity	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
ROW Required (ac)	1,046	1,115	1,133	1,112	1,032	1,098
Within 125-foot ROW	3	2	4	3	15	15
Within 200 feet of ROW Center	23	25	23	23	54	54
Within 200 to 500 feet of ROW Center	86	108	86	86	227	227
Total Residences within 1,000-foot Route	112	135	113	112	296	296

Note: See Chapter 7 for methodology.

8.2.2 Direct/Indirect Effects

Two to 15 residences are located within the right-of-way of the six routes, with Routes 2 and 2C having the highest number (Table 8.2-1). Although these residences are within the initial Project right-of-way alignment, the intent would be to shift the right-of-way in a manner such that no person would be displaced from their residence or business. However, it is likely that the Project would attempt to purchase an easement from these landowners. In addition, people using land for economic purposes, such as farming, may have some of their land removed from production. Impacts to agricultural production are discussed in Section 8.23.

Indirect effects to residential properties may occur and would include construction related noise, potential interruptions of traffic during construction, temporary impacts to properties, and possible changes to home or property values. By having the highest number of residences within the defined route boundaries, Routes 2 and 2C would have the greatest potential for indirect impacts.

St. Cloud State University conducted a survey in Minnesota finding that homeowners near power lines and appraisers estimated that the average negative impacts to property values were approximately 4.1 percent (REC, 1999). Based on this research, a small undesirable impact could be experienced by residences if a new transmission line were constructed adjacent to their property. In the vast majority of the route areas, however, residences that

are already located adjacent to existing transmission lines or pipelines anticipated no change in property values. No information is readily available on the effect of substation modifications on property values, but since no additional land is required for the proposed expansions at the existing substation sites, there would be no additional impacts.

The Project would require the purchase of easements or property from private landowners. There may be instances where property is purchased pursuant Minn. Stat. § 216E.12, subd 4, sometimes referred to as the "Buy the Farm" option. Under certain circumstances defined by the statute, the property owner has the option of requiring a utility to purchase the contiguous property crossed by a right-of-way it acquires from the landowner at the fair market value of the land.

8.2.3 Direct/Indirect Effects within the Leech Lake Reservation

Within the LLR boundaries, Route 2 and 2C contain substantially higher numbers of residences than Route 1 and its alternatives (Table 8.2-2). There are nine residences within the right-of-way of Routes 2 and 2C, compared to zero or one within Routes 1 and its alternatives. None of the properties that may be impacted are tribal lands.

Table 8.2-2 Residences within the 1,000-foot Routes in the Leech Lake Reservation

Proximity	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
ROW required (ac)	662	653	750	723	660	721
Within 125-foot ROW	0	0	1	0	9	9
Within 200 feet of ROW Center	8	6	8	8	27	27
Within 200 to 500 feet of ROW Center	19	13	19	19	79	79
Total Residences within 1,000-foot Route	27	19	28	27	115	115

8.2.4 Direct/Indirect Effects within the Chippewa National Forest

Very few residences would be directly affected by the Project if it is located on the CNF-managed parcels (Table 8.2-3), with Routes 2 and 2C containing a substantially higher number of residences. The Project would require a Special Use Permit from the CNF for the amount of CNF land affected, ranging from 284 acres to 389 acres of land depending on the route chosen.

Table 8.2-3 Residences within the 1,000-foot Routes on Chippewa National Forest-managed Lands

Proximity	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
ROW required (ac)	348	341	351	389	284	325
Within 125-foot ROW	0	0	1	0	0	0
Within 200 feet of ROW Center	0	0	0	0	0	0
Within 200 to 500 feet of ROW Center	1	1	1	1	2	2
Total Residences within 1,000-foot Route	1	1	1	1	2	2

8.2.5 Mitigation

The Project intends to be routed such that no person would be displaced from their residence or business. Property or easement acquisition would be conducted in accordance with state and federal regulations. The location of individual structures would be coordinated with property owners, to the extent practicable.

Indirect effects would be primarily related to construction activities. The construction crews would follow local, state, and federal regulations with regard to construction noise, dust, and timing. Construction activities generally would take place during normal daylight hours, or in accord with local government requirements.

The Applicants may use single pole structures in urban areas to reduce encroachment with existing residences or buildings. The Applicants would ensure that safety requirements are met during the construction and operation of the facility.

The Project would be designed with local, state, Rural Utilities Service (RUS), and National Electric Safety Corporation (NESC) standards regarding clearance to ground, clearance to crossing utilities, clearance to buildings, strength of materials and right-of-way widths. Construction crews and/or contract crews would comply with local, state, RUS and NESC standards regarding installation of facilities and standard construction practices. Established Applicant and industry safety procedures would be followed during and after installation of the transmission line, including clear signage during all construction activities.

The proposed transmission line would be equipped with protective devices to safeguard the public if an accident occurs, such as a structure or conductor falling to the ground. The protective devices are breakers and relays located where the transmission line connects to the substation. The protective equipment would de-energize the transmission line should such an event occur. In addition, the substation facilities would be fenced and access limited to authorized personnel.

8.3 *Noise*

8.3.1 Existing Conditions

Noise is defined as unwanted sound. It may be comprised of a variety of sounds of different intensities across the entire frequency spectrum.

Noise is measured in units of decibels (dB) on a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight." The A-weighted decibel (dBA) scale corresponds to the sensitivity range for human hearing. Noise levels capable of being heard by humans are measured in dBA. A noise level change of 3 dBA is barely perceptible to average human hearing. A 5 dBA change in noise level, however, is clearly noticeable. A 10 dBA change in noise levels is perceived as a doubling or halving of noise loudness. For reference, Table 8.3-1 shows noise levels associated with common, everyday sources and places the magnitude of noise levels discussed here in context.

Table 8.3-1 Common Noise Sources and Levels

Sound Pressure Level (dBA)	Typical Sources
120	Jet aircraft takeoff at 100 feet
110	Same aircraft at 400 feet
90	Motorcycle at 25 feet
80	Garbage disposal
70	City street corner
60	Conversational speech
50	Typical office
40	Living room (without TV)
30	Quiet bedroom at night

Source: Environmental Impact Analysis Handbook, ed. by Rau and Wooten, 1980

The Minnesota Pollution Control Agency (MPCA) has established standards for the regulation of noise levels. The land use activities associated with residential, commercial, and industrial land have been grouped together into Noise Area Classifications (NAC). See Minn. R. 7030.0050. Each NAC is then assigned both daytime (7 a.m. to 10 p.m.) and nighttime (10 p.m. to 7 a.m.) limits for land use activities within the NAC. See Minn. R. 7030.0040. Table 8.3-2 shows the MPCA daytime and nighttime limits in dBA for each NAC. The limits are expressed as a range of permissible dBA within a one hour period; L50 is the dBA that may be exceeded 50 percent of the time within an hour. L10 is defined as the dBA that may be exceeded 10 percent of the time within an hour. Residences, which are typically considered sensitive to noise, are classified as NAC 1.

Note that the utility industry typically reports audible noise emissions at L5 and L50, rather than those at L10. L5 is the noise level exceeded five percent of the time, or for three minutes in an hour.

Table 8.3-2 MPCA Noise Limits by Noise Area Classification (dBA)

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

Audible noise associated with electrical transmission systems may be generated by both the transmission line conductors and substation equipment. The level of noise generated by the conductors depends on conductor conditions, voltage level, and weather conditions. Noise emission from a transmission line occurs during heavy rain and wet conductor conditions. In foggy, damp, or rainy weather conditions, transmission lines can create a subtle crackling sound due to the small amount of electricity ionizing the moist air near the wires. During heavy rain, the general background noise level is usually greater than the noise from a transmission line. In addition, very few people are near the transmission line during rainstorms. For these reasons, audible noise is not noticeable during heavy rain. During fair weather audible noise from a transmission line is nearly inaudible.

Audible noise may also be generated by substation equipment, with the main source of noise from a substation due to the operation of the transformers. Noise from a transformer is present whenever it is energized and is nearly constant with only a slight variation associated with the operation of the cooling fans or pumps. There are no transformer additions included with the proposed modifications at the Wilton or Boswell substation or, if needed, at the Nary Breaker Station. The new or upgraded substation in the Cass Lake area would include the addition of a new 230/115 kV transformer with a capacity of approximately 187 MVA

The primary land use in the Study Area is forestland, with rural agricultural land and moderately dense, populated urban areas. Typical noise sensitive receptors in the route would include residences, churches, schools, and parks where either sleep or outdoor activities occur. Current average noise levels in these areas are typically in the 30 to 40 dBA range and are considered acceptable for residential land use activities. Ambient noise in rural areas is commonly made up of rustling vegetation and infrequent vehicle pass-bys. Higher ambient noise levels, typically 50 to 60 dBA, would be expected near roadways, urban areas, and commercial and industrial properties in the Study Area.

8.3.2 Direct/Indirect Effects

Transmission Line Noise

Noise concerns for the route may be associated with both the construction and operation of the energy transmission system. The proposed transmission line was modeled using the Bonneville Power Administration CFI8X model to evaluate audible noise from a high voltage transmission line. Model assumptions are located in Chapter 7.0 – Methods and Regulations. Model results are located in Appendix F.

The transmission line is anticipated to be essentially inaudible at the edge of the right-of-way during fair weather conditions. The expected noise levels at the edge of the right-of-way during typical fair weather conditions would be less than 20 dBA, which is comparable to the level of a whisper. Under wet conditions, the maximum L5 noise level directly under the transmission line is less than 50 dBA, which is below the most restrictive permissible noise level for NAC (1) (Table 8.3-2). Anticipated noise levels for the route in fair weather conditions and at the L5 and L50 levels for wet conditions are shown in graphs in Appendix F.

In summary, during light rain, dense fog, snow, and other times when there is moisture in the air, the proposed transmission lines may produce an audible noise higher than rural background levels, but similar to household background levels. During dry weather, audible noise from transmission lines is anticipated to be nearly inaudible.

Substation Noise

The main source of audible noise at a substation is the transformers. Transformers produce noise whenever they are energized, with the level of the noise depending on transformer size, and voltage level. Substation noise is nearly constant with only a slight change because of operating conditions (transformer cooling fans on or off, etc.).

The proposed modifications at the existing Wilton and Boswell substations as well as at Nary Junction if Route 1A is selected substations consist of transmission line exits, circuit breakers, and associated facilities. These proposed modifications do not include the addition of transformers; therefore, the noise levels would not change because of this Project.

The new or upgraded substation additions in the Cass Lake area do include installation of a 230/115 kV transformer with a capacity of approximately 187 MVA. The noise produced by this transformer addition would be taken into account during the design phase of the substation to insure that noise levels would comply with MPCA noise rules. Design options include purchase of adequate land to provide a buffer, purchase of a lower noise transformer or a combination of both a buffer and a lower noise transformer.

8.4 *Aesthetics*

8.4.1 Existing Conditions

The area in northern Minnesota that the routes cross tends to be positively valued for the "scenic" quality of its forests, lakes, and unique natural resources. While residents have the opportunity to view these areas from the comfort of their own home, most people experience these landscapes from the vantage point of a road, trail, or body of water. US highways, state highways, large bodies of water, and municipal areas are often the most frequently used vantage points within the routes.

The Chippewa National Forest (CNF), as seen from US 2, is generally considered one of the more highly valued scenic resources in the area. Within the CNF, the Mississippi River crossing near Ball Club and the landscapes surrounding bodies of water such as Cass Lake, Pike Bay, and Lake Winnibigoshish, offer views the CNF considers to be of high scenic integrity. Outside the CNF, many of the forests have been fragmented by development and may not offer a landscape that is as visually "complete" as the CNF. However, even though the Study Area outside of CNF-managed lands tends to be more densely populated than the CNF Study Area, the frequently used corridors in the Study Area are still considered to be areas that should be managed for high scenic integrity for the purposes of this application. Also for the purposes of this application, a transmission line is considered to be a negative visual impact on the surrounding viewshed. Photo-simulations showing typical "before and after" illustrations of the proposed 230 kV transmission line are provided in Appendix H.

Table 8.4-1 summarizes the visual quality of all routes within the Study Area based on the 2004 CNF *Land and Resource Management Plan* Scenic Integrity Objective (SIO) model. This model was extrapolated and applied to the Study Area outside of CNF-managed lands. See Figure 3 for the locations of the SIO areas.

Table 8.4-1 Scenic Integrity Objective Areas within 1,000-foot Routes

SIO Rating	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
	% of Route					
High	33.0	31.3	28.9	32.4	88.3	84.3
Moderate	20.7	16.8	22.3	22.0	3.5	5.8
Low	46.3	52.0	48.8	45.6	8.3	9.8
Total	100.0	100.0	100.0	100.0	100.0	100.0

Note: See Chapter 7 for methods.

8.4.2 Direct/Indirect Effects

Frequently used vantage points include, from west to east, the Mississippi River, US 71, Paul Bunyan State Trail, TH 371, the Heartland Trail, the Pike Bay area, Forest Service Road (FSR) 2102, FSR 2127, US 2, another vantage point at the Mississippi River, and TH 6. The primary visual intrusion of the transmission line at these vantage points would occur at the location where the transmission line crosses each feature. If a feature is parallel to the vantage point such that the transmission line would be viewed for a longer time, then the

impact is considered higher than if the transmission line runs perpendicular to the vantage point. A perpendicular crossing of a vantage point minimizes the effects of the transmission line for the viewer. For example, erecting the transmission line within the Pike Bay area along the corridor viewable from US 2 would likely cause a greater visual intrusion than crossing the corridor because the transmission line would be continually visible from many vantage points. Table 8.4-2 summarizes the SIO rating of each scenic resource by route.

Table 8.4-2 Scenic Integrity Objective Rating of Scenic Resources within Routes

Scenic Resource	SIO Rating					
	Route 1	Route. 1A	Route 1B	Route 1C	Route 2	Route 2C
Vantage Point - Water Resources						
Mississippi River[1]	High	High	High	High	High	High
Cass Lake[1]	None	None	None	None	High	High
Pike Bay[1]	High	High	None	High	High	High
Portage Lake[1]	None	None	None	None	High	High
Lake Winnibigoshish[1]	None	None	None	None	High	High
Ball Club Lake[1]	None	None	None	None	Moderate	Moderate
Leech Lake River[1]	None	None	None	Moderate	None	Moderate
Vantage Point - Roads						
Ladyslipper NF/MN Scenic Byway[1,2]	None	None	None	None	High	High
Great River Road Scenic Byway[1,2]	High	High	High	High	High	High
TH 6	High	High	High	High	High	High
FS 2102 and 2127 (Winnie Dam Rd)[1,2]	High	High	High	High	High	High
TH 371	High	High	High	High	High	High
US Highway 71	High	High	High	High	High	High
Vantage Point - Trails						
Lake 13/Pike Bay bike route[1,2]	High	High	None	High	None	None
Mi-Ge-Zi Trail[1,2]	High	High	High	High	High	High
Moss Lake/South Bndry bike route[1,2]	Moderate	Moderate	None	Moderate	None	None
Norway Beach Interpretive Trail[1,2]	None	None	None	None	High	High
Pipeline Snowmobile Trail[1,2]	Moderate	Moderate	Moderate	Moderate	None	None
Winnie Snowmobile Trail[1,2]	None	None	None	None	Low	Low
North Country Trail (GIA)[1]	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Blue Ox Trail (GIA)	None	None	None	None	Moderate	Moderate
Cass County Trail(GIA)[1]	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Becida Trail (GIA)	None	Moderate	None	None	None	None
Paul Bunyon State Trail	High	High	High	High	None	None
Heartland State Trail	High	High	High	High	High	High
Soo Line North State Trail (ATV)[1]	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Vantage Point - Municipal Area						
Bemidji	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Cass Lake	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Bena	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate
Deer River/Zemple	Moderate	Moderate	Moderate	Moderate	Moderate	Moderate

[1] *Resource occurs within the LLR.*
[2] *Resource occurs on CNF-managed lands.*

The major scenic difference between the routes is that Routes 2 and 2C parallel US 2, located in a high SIO area, for the majority of their alignment. Routes 1, 1A, 1B, and 1C would introduce new visual intrusions in areas where the proposed transmission line follows the existing pipeline and add additional visual intrusions where the routes follow existing transmission lines. However, new visual intrusions along the pipeline alignment would be

buffered by forest areas throughout much of Route 1 and its alternatives. In open areas with a clear line of view, the transmission line would be most noticeable from vantage points located within one-quarter mile of the line. The majority of the open areas occur near river crossings and east of the City of Zemple.

While partially buffered from US 2 by forested areas, erecting a transmission line within Routes 2 and 2C would likely create a noticeable visual impact along much of these routes. The transmission line would be seen from open vantage points along US 2 between the cities of Bemidji and Cass Lake, and between the City of Ball Club and the Boswell Substation. However, human development already dominates the scenic character of many of these areas. The route between the cities of Cass Lake and Ball Club would likely be considered the area of greatest visual impact, because the transmission line would be located in a relatively "complete" natural landscape. The transmission line would introduce a new visual impact between the cities of Cass Lake and Bena, where the routes follow the existing pipeline corridor. This area includes the landscape just east of the City of Cass Lake, which offers a viewshed between the Cass Lake and Pike Bay water bodies. The impact would not be as great between Bena and Ball Club, where Routes 2 and 2C follow an already existing 69 kV line.

8.4.3 Direct/Indirect Effects within the Leech Lake Reservation

Table 8.4-3 summarizes the visual quality of the Leech Lake Reservation (LLR), based on the 2004 CNF *Land and Resource Management Plan* SIO model. The visual effects of routes within this portion of the Study Area would be similar to those discussed above. Specific scenic resources located within the LLR are shown in Table 8.4-2.

Table 8.4-3 Scenic Integrity Objective Areas within LLR Boundaries within Routes

SIO Rating	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
	% of Route					
High	33.4	32.2	27.1	32.5	91.6	85.8
Moderate	15.4	15.1	18.4	17.5	1.9	5.2
Low	51.3	52.7	54.5	50.0	6.5	9.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

8.4.4 Direct/Indirect Effects within the Chippewa National Forest

Table 8.4-4 summarizes the visual quality of CNF-managed land within the Study Area based on the 2004 CNF *Land and Resource Management Plan* SIO model. The visual effects of the routes would be similar to those discussed above. Specific scenic resources located within the CNF are shown in Table 8.4-2. As noted previously, Routes 2 and 2C have higher potential to affect scenic resources because the transmission line would be visible for a considerable length along US 2. New visual intrusions along the pipeline alignment would be buffered by forest areas throughout much of Route 1 and its alternatives, especially in the heavily wooded CNF and state forest areas.

Table 8.4-4 Scenic Integrity Objective Areas within CNF-managed Land within Routes

SIO Rating	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
	% of Route					
High	31.2	29.9	25.4	29.9	98.5	88.7
Moderate	17.9	18.1	14.8	21.7	0.9	7.4
Low	50.9	52.0	59.8	48.4	0.6	3.9
Total	100.0	100.0	100.0	100.0	100.0	100.0

The proposed configurations for a substation in the area would be in a low scenic integrity area outside the CNF.

8.4.5 Mitigation

Although the transmission line may be a contrast to surrounding land uses, the Applicants would work with landowners and the CNF to identify aesthetics concerns. In general, mitigation includes enhancing positive effects as well as minimizing or eliminating negative effects. Potential mitigation measures include:

- The location of structures, rights-of-way, and other disturbed areas would be determined by considering input from landowners and the CNF to minimize visual impacts.
- Structure types (designs) would be uniform, to the extent practical. The Project proposes to primarily use wood poles, which tend to blend into the surrounding wooded landscape.
- Structures would be placed at the maximum feasible distance from highway, waterway, and trail crossings, within the limits of the structures' design.
- The height of structures may be reduced, as feasible, to minimize impacts within areas of high scenic importance. Use of H-frame structures for the Mississippi River crossing would have a lower profile than single pole structures.
- Care would be given to preserving the natural landscape; construction and operation would be conducted to prevent any unnecessary destruction, scarring, or defacing of the natural surroundings in the vicinity of the work.
- To the extent practicable, waterways would be crossed in the same location as existing utility lines.
- Existing transmission lines would be double-circuited to the extent practicable and consistent with sound engineering principles or system reliability criteria.
- New transmission lines would parallel existing transmission line, pipeline, and other rights-of-way to the extent practicable and consistent with sound engineering principles or system reliability criteria.

8.5 *Socioeconomic Factors*

8.5.1 Existing Conditions

The routes are located in Beltrami, Hubbard, Cass, and Itasca counties. There are five incorporated cities located wholly or partially within at least one of the routes: Bemidji (pop. 13,059); Bena (pop. 109); Cass Lake (pop. 833); Deer River (pop. 924); and Zemple (pop. 74). The routes pass across the boundaries of the Leech Lake Reservation (LLR) and Chippewa National Forest (CNF).

Beltrami and Cass counties experienced population growth rates between 2000 and 2006 of 8.9 percent and 6.9 percent (respectively) that exceeded the Minnesota state average of 5.0 percent (US Census 2007). Hubbard and Itasca are growing at 2.8 percent and 1.7 percent, respectively. Demographic characteristics of the routes are contained in the Environmental Justice section, Section 8.6. Table 8.6-3 within Section 8.6 lists the specific U.S. Census block groups that the route crosses, and Figures 4 and 5 show the locations of the block groups. Population and economic data are analyzed at the block group level, the most detailed level for which economic data is available.

According to the Minnesota Department of Trade and Economic Development, the top-employing industries within the four counties include government; trade, transportation and utilities; education and health services; leisure and hospitality; and manufacturing. Unemployment rates in the four counties are slightly above the Minnesota state average.

Table 8.5-1 identifies the top three leading industries in each county (MNPRO 2008).

Table 8.5-1 Leading County Industries

Geographic Area	Industry	Percent of Workforce
Beltrami County	Government	27
	Trade, Transportation and Utilities	21
	Education and Health Services	16
Hubbard County	Manufacturing	18
	Trade, Transportation and Utilities	17
	Government	16
Cass County	Government	40
	Leisure and Hospitality	18
	Trade, Transportation and Utilities	14
Itasca County	Trade, Transportation and Utilities	21
	Government	21
	Education and Health Services	14

8.5.2 Direct/Indirect Effects

In general, increasing transmission outlet capability and reliability would benefit the surrounding communities. The Project would not directly impact any businesses and is not expected to have any negative economic impacts. The construction, operation, and maintenance of the transmission line would not negatively impact the socioeconomic resources in the four-county area.

Short-term positive economic impacts would result from the activities associated with construction. In the short-term, revenue would likely increase for some local businesses, such as hotels, restaurants, gas stations, and grocery stores, due to increased spending from workers associated with construction of the Project. It is not anticipated that the Project would create new permanent jobs, but it will create temporary construction jobs that will provide a one-time influx of income to the area.

The proposed project would require approximately 75 employees during transmission line construction. Additional workers would be required for substation modifications. Opportunities for part-time personnel may also be available during the construction of this Project.

If local contractors are used for portions of the construction, total wages and salaries paid to contractors and workers in surrounding counties would contribute to the total personal income of the region. Additional personal income would be generated for residents in the region and the State by circulation and recirculation of dollars paid out by the Applicants as business expenditures and State and local taxes.

Expenditures made for equipment, energy, fuel, operating supplies, and other products and services would benefit businesses in the local communities. Indirectly, the increased capability and reliability of the electric system to supply energy to commercial and industrial users may contribute to the economic growth of the region.

Long-term positive economic impacts would result from the new utility infrastructure and would include improved, more reliable utility service. These benefits include an increase to the counties' tax base resulting from the incremental increase in revenue from utility property taxes. The availability of reliable power in the area would have a positive effect on local businesses and the quality of services provided to the public and increase opportunity for expanding the local economic base.

Economic impacts resulting from the Project would primarily be positive, with increased tax revenue and an influx of wages and expenditures made at local businesses during construction.

Agricultural land that is located within the right-of-way would be temporarily removed from production during construction, as discussed in the Section 8.24. Landowner compensation would be established by individual easements. Project construction would not cause additional impacts to leading industries within the area.

8.5.3 Direct/Indirect Effects within the Leech Lake Reservation

Socioeconomic impacts to the Leech Lake Reservation (LLR) would be similar to those discussed above. Specifically, the project would have potential short-term employment opportunities and would increase expenditures to local businesses, including the casino.

8.5.4 Direct/Indirect effects within Chippewa National Forest-managed Property

Short-term positive or negative socioeconomic impacts to the Chippewa National Forest (CNF) are not anticipated. The project would require permanent clearing of some forest land, taking it out of production. However, the amount of forestland taken out of production would be minor in comparison to the amount of forestland available. Additionally, the timber removed within the right-of-way would be offered to the landowner, made available for local residents, or removed. See Section 8.25 for discussion of forest impacts.

Construction activities may have a minor negative impact to CNF visitors, particularly when construction activities occur in proximity to campgrounds or other intensely used areas during the summer tourist season.

8.5.5 Mitigation

Because impacts to socioeconomic factors generally would be short-term and beneficial, no mitigation is necessary or proposed.

8.6 *Environmental Justice*

8.6.1 Existing Conditions

Regional Definition

An environmental justice analysis considers disproportionate adverse environmental and human health impacts on low income and minority populations. The analysis involves comparing the impacts in the area actually affected by a project to the impacts in the regional area in which the affected area is located. The larger regional area including the affected area is called the Region of Comparison (ROC). For the purpose of this analysis, the ROC is the four-county area made up of Beltrami, Hubbard, Cass, and Itasca counties.

The affected area, referred to in this report as the Study Area, contains the census block groups within the ROC that would be impacted by the Project. For purposes of this analysis, the affected area encompasses the 14 census block groups that intersect the route alternatives for the Project.

Demographic Overview

The demographic analysis provides information on the approximate locations of low-income and minority populations in the Study Area. The 2000 Census was used to extract data on low-income and minority populations within the census block groups. In order to determine whether an individual block group contains a disproportionately high minority or low-income population, data for each tract was compared to data for the ROC.

Minority Populations

Approximately 23 percent of the Study Area residents are members of a racial minority. The largest minority group in the Study Area is American Indian (Native American). As shown in Table 8.6-1, minorities constitute a larger percentage of the population within the Study Area compared to that in the ROC and the state. The white population is the largest group within all three geographic areas – 76.7 percent in the Study Area, 87.6 percent in the four-county region, and 89.4 percent in the state.

Table 8.6-1 Racial Composition

		White	Native American	Asian	Other Races	Total
Study Area	Number of People	13,049	3,388	48	531	17,016
	Percent	76.7	19.9	0.3	3.1	
ROC	Number of People	113,214	13,069	471	2,414	129,168
	Percent	87.6	10.1	0.4	1.9	
State of Minnesota	Number of People	4,400,282	54,967	141,968	322,262	4,919,479
	Percent	89.4	1.1	2.9	6.6	

Source: USCB, 2001.

At 19.9 percent, the percentage of Native Americans is higher in the Study Area than in the ROC (10.1 percent) and the State (1.1 percent). The Asian population in the Study Area is 0.3 percent, while the Asian populations measured at the ROC and state levels represent 0.4 percent and 2.9 percent of the total population, respectively.

The remaining population within the three geographic areas is defined as "other races," which includes the following federally designated categories: African-American, Native Hawaiian, and other Pacific Islander, two or more races, and other race. These racial groups constitute approximately 3.1 percent of the total population in the affected area.

Hispanic is an ethnic classification rather than a racial one in the 2000 U.S. Census and is treated as such in this document. Individuals identifying themselves as of Hispanic origin account for approximately 1.2 percent of the total population in the affected area, 0.8 percent in the ROC, and 2.9 percent in the state.

Overall, Native Americans constitute a greater percentage of the population within the Study Area than in the ROC or the state. Asians account for a smaller percentage of the population within the Study Area than the ROC or state. The percentage of the population comprised of other racial groups is slightly higher in the Study Area than in the ROC, and slightly lower than in the state population

Poverty and Low-Income Concentrations

Based on the 2000 U.S. Census, approximately 14.5 percent of the Study Area is comprised of low-income individuals (Table 8.6-2). In comparison, 13.2 percent of the four-county ROC and 7.9 percent of the State of Minnesota's population is below the poverty level (USCB, 2001). As shown in Table 8.6-2, the median household income was higher for the state than the ROC or Study Area, $47,111, $34,819, and $34,505, respectively.

Table 8.6-2 Poverty Level and Income in 2000

Characteristic	Study Area	ROC	State of Minnesota
Individuals			
Number of Persons Below Poverty Level (1999)	2,419	16,647	380,476
Percent of Persons Below Poverty Level (1999)	14.5	13.2	7.9
Households			
Median Household Income (1999)	$34,505[1]	$34,819[2]	$47,111

Source: USCB, 2002
[1]Average of 14 census block group median household income. Values ranged from $22,546 to $47,596.
[2]Average of four counties median household income. Values ranged from $33,392 to $36,234.

Table 8.6-3 provides a summary of the racial make-up and poverty status by census block group. Figure 4 in the Figures Appendix shows the percent of minority population, primarily composed of Native Americans, within each census block group vicinity of the proposed routes. Figure 5 in the Figures Appendix illustrates the percentage of low-income population by census block group in the vicinity of the proposed routes.

Table 8.6-3 Racial and Poverty Status by Block Group in the Study Area

Census Block Group ID*	Population (2000)											Economic Profile (1999)
	Number of People	Race and Ethnicity									Total Minority (%)	Individuals Below Poverty Level (%)
		White	White %	Amer. Indian	Amer. Indian %	Asian	Asian %	Other	Other %			
22	1280	1109	86.6	117	9.1	1	0.1	53	4.1		13.4	16.5
30	898	815	90.7	40	4.5	7	0.8	36	4.0		9.3	11.8
33	1070	944	88.2	101	9.4	2	0.2	23	2.1		11.8	15.1
42	1843	1553	84.3	200	10.9	7	0.4	83	4.5		15.7	14.6
45	905	846	93.5	25	2.8	9	1.0	25	2.8		6.5	5.5
37	1125	998	88.7	80	7.1	4	0.4	43	3.8		11.3	6.9
51	1476	1423	96.4	34	2.3	4	0.3	15	1.0		3.6	7.9
52	1466	1298	88.5	125	8.5	3	0.2	40	2.7		11.5	10.0
50	1198	374	31.2	785	65.5	2	0.2	37	3.1		68.8	22.6
48	1265	315	24.9	895	70.8	1	0.1	54	4.3		75.1	28.4
39	706	325	46.0	358	50.7	1	0.1	22	3.1		54.0	25.9
47	1276	754	59.1	489	38.3	2	0.2	31	2.4		40.9	16.4
57	1229	1063	86.5	124	10.1	3	0.2	39	3.2		13.5	19.3
64	1279	1232	96.3	15	1.2	2	0.2	30	2.3		3.7	5.2

** Census block group IDs correspond to numbers on the figures and represent the following census block groups: 30 – 270079501003, 33 – 270079507002, 42 – 270079501003, 45 – 270079501004, 37 – 270079501005, 51 – 270579701002, 52 – 270579701001, 50 – 270219612001, 48 – 270219612004, 39 – 270219612002, 47 – 270619802002, 57 – 270619803002, 64 – 270619807005, and 22 – 270079501002.*

Limited English Proficiency

Limited English Proficiency (LEP) populations were identified using block group data from the 2000 Census. For the population five years and older, persons who speak English "not well" or "not at all" are considered to have a limited English proficiency. Table 8.6-4 shows the LEP characteristics of the Study Area, ROC, and state. In this comparison, the State of Minnesota has the highest percentage of LEP individuals at 1.8 percent, followed by the ROC with 0.45 percent and the Study Area with 0.36 percent.

Table 8.6-4 Limited English Proficiency

Characteristic	Study Area	ROC	State of Minnesota
Population 5 years and over	17,047	121,664	4,591,491
Limited English Proficiency (individuals)	62	548	80,991
Limited English Proficiency (percent)	0.36	0.45	1.8

Source: USCB, 2002

8.6.2 Direct/Indirect Effects

Routes 1, 1A, 1B and 1C

Minority Concentrations

Of the 10 census block groups that intersect the alignment of the Routes 1, 1A, 1B, and 1C, two of the block groups have minority populations that exceed 50 percent. These block groups (Map ID Nos. 39 and 50) occur in the area surrounding Cass Lake (Figure 4). Additionally, three other census block groups have minority populations that are higher than the ROC (Map ID Nos. 42, 47, and 57). These census block groups are found south of Bemidji and in the Grand Rapids area. Table 8.6-5 lists the percentage of minority persons in each census block group in the affected area for Route 1 and its alternatives.

Table 8.6-5 Routes 1, 1A, 1B, and 1C - Minority Persons by Census Block Group

Region or Census Block Group	Block Group / Map ID Number	Percent Minority	High than ROC? Yes or No
Minnesota	Not applicable	10.6	Not applicable
ROC	Not applicable	12.4	Not applicable
270079501003	30	9.2	No
270079501003	42	15.7	Yes
270079501004	45	6.5	No
270579701002	51	3.6	No
270579701001	52	11.5	No
270219612001	50	68.8	Yes
270219612002	39	54.0	Yes
270619802002	47	40.9	Yes
270619803002	57	13.5	Yes
270619807005	64	3.7	No

Poverty and Low-Income Concentrations

Five census block groups intersected by Route 1 and its alternatives have a greater percentage of low-income residents than the ROC (Table 8.6-6 and Figure 5). Four of these census block groups also have higher than average minority populations.

Table 8.6-6 Routes 1, 1A, 1B, and 1C - Poverty Level by Census Block Group

Region or Census Block Group	Block Group / Map ID Number	Percent Below Poverty Level (1999)	Higher than ROC? Yes or No
Minnesota	Not applicable	7.9	Not applicable
Four County Region	Not applicable	13.2	Not applicable
270079501003	30	11.8	No
270079501003	42	14.6	Yes
270079501004	45	5.5	No
270579701002	51	7.9	No
270579701001	52	10.0	No
270219612001	50	22.6	Yes
270219612002	39	25.9	Yes
270619802002	47	16.4	Yes
270619803002	57	19.3	Yes
270619807005	64	5.2	No

Routes 2 and 2C

Minority Concentrations

Of the 12 census block groups that intersect the alignment of the Routes 2 and 2C, three of them have minority populations that exceed 50 percent; additionally, three other census block groups have minority populations that are higher than the ROC (Table 8.6-7). The three block groups with greater than 50 percent minority populations occur in the area surrounding Cass Lake (Figure 4). Of the other three census block groups with higher than average minority populations, two of them are located in the Bemidji area the other two are in the greater Grand Rapids area.

Table 8.6-7 Routes 2 and 2C - Minority Persons by Census Block Group

Region or Census Block Group	Block Group / Map ID Number	Percent Minority	Higher than ROC? Yes or No
Minnesota	Not applicable	10.6	Not applicable
ROC	Not applicable	12.4	Not applicable
270079501002	22	13.4	Yes
270079507002	33	11.8	No

Region or Census Block Group	Block Group / Map ID Number	Percent Minority	Higher than ROC? Yes or No
270079507003	42	15.7	Yes
270079501004	45	6.5	No
270079501005	37	11.3	No
270579701001	52	11.5	No
270219612001	50	68.8	Yes
270219612004	48	75.1	Yes
270219612002	39	54.0	Yes
270619802002	47	40.9	Yes
270619803002	57	13.5	Yes
270619807005	64	3.7	No

Poverty and Low-Income Concentrations

Eight census block groups intersected by Routes 2 and 2C have a greater percentage of low-income residents than the ROC as shown on Figure 5 and Table 8.6-8. These consist of the seven census block groups that also have higher than average minority populations, and an additional census block group west of Bemidji.

Table 8.6-8 Routes 2 and 2C - Poverty Level by Census Block Group

Region or Census Block Groups	Census Block Group ID	Percent Below Poverty Level (1999)	Higher than ROC? Yes or No
Minnesota	Not applicable	7.9	Not applicable
Four County Region	Not applicable	13.2	Not applicable
270079501002	22	16.5	Yes
270079507002	33	15.1	Yes
270079507003	42	14.6	Yes
270079501004	45	5.5	No
270079501005	37	6.9	No
270579701001	52	10.0	No
270219612001	50	22.6	Yes
270219612004	48	28.4	Yes
270219612002	39	25.9	Yes
270619802002	47	16.4	Yes
270619803002	57	19.3	Yes
270619807005	64	5.2	No

Limited English Proficiency

The LEP population in census block groups intersecting the routes range from 0.3 percent to 0.5 percent of the population. These numbers are similar to the ROC average and well below the state average.

8.6.3 Comparison of Alternatives

Table 8.6-9 summarizes and compares the overall percentages of minority, low-income and LEP populations affected by each of the routes. All of the routes have the potential to impact minority populations. Routes 2 and 2C have potential to affect slightly more individuals living below the poverty level. The Study Area does not have a concentration of persons with limited English proficiency.

Table 8.6-9 Summary of Affected Environmental Justice Communities

Alternative	Minority Population (%)	Low Income Population (%)	LEP Population (%)
Routes 1, 1A, 1B, and 1C	21.1	13.5	0.32
Routes 2 and 2C	26.2	15.4	0.46
ROC	12.4	13.2	0.45

Residents in the affected area would be primarily affected by temporary construction and permanent aesthetic changes. Neither of these activities is considered to result in a disproportionate adverse impact since construction is temporary and the aesthetic impacts would affect everyone who travels through the area, not just the local residents. As discussed previously in Section 8.4, the Applicants would work with landowners to identify aesthetic concerns and would attempt to minimize visual impacts related to the Project.

As stated in Section 8.5 Socioeconomics, the Project would not cause the displacement of any individuals from their homes or businesses where property or easement acquisition is necessary. Federal, state, and local regulations dictate property acquisition requirements. Affected landowners would be compensated for their property at fair market value.

It is anticipated that during its construction, the proposed Project would provide an opportunity for temporary employment for members of the minority and low-income communities in the area. In addition, the Project would have a long-term positive impact by providing a more reliable electrical system. Residents not only of the Bemidji area, but also all of north central Minnesota would benefit from the increased voltage support and regional transmission reliability provided by the proposed 230 kV transmission line.

As stated in Section 8.10, there would be no adverse human health impacts.

8.6.4 Public Involvement and Mitigation

Meetings with various local, state, and federal agencies as well as the Leech Lake Band of Ojibwe (LLBO) and its Department of Resource Management staff were held as part of the Macrocorridor Study for this proposed Project. Several issues relevant to this environmental justice analysis were identified during these meetings. The Applicants are working to address

the concerns raised by agency and stakeholder groups. Environmental justice concerns include ensuring safety in the proposed right-of-way and avoiding cultural and historic properties on tribal lands.

All of the routes for the Project would, at some locations, be adjacent to existing petroleum pipelines. Local residents are concerned this may result in an increased risk of a petroleum release from the pipeline. Pipeline safety would be one of the design criteria for all route alternatives. Coordination between the Applicants and pipeline owners has been initiated and would continue throughout the design process to ensure the Project posed no safety risk.

Concerns about the potential health effects due to exposure to electric and magnetic fields (EMF) have also been raised. Section 8.10 details potential health effects of EMFs and concludes that there are no public health concerns regarding EMF. EMFs are known to decrease rapidly with distance from the source and evidence of health risks due to EMFs is low. However, the Applicants are committed to maximizing the distance between the proposed transmission line and receptors, as practicable, to minimize EMF exposure.

Impacts on cultural or historic resources would be minimized through coordination with the Minnesota State Historic Preservation Officer, the Leech Lake Tribal Historic Preservation Office, and through the Section 106 consultation process under the National Historic Preservations Act. The Section 106 consultation process with LLBO and all other interested tribes is being coordinated by USACE. Section 8.11 provides a more detailed discussion of the consultation process.

The Applicants have held many meetings and open houses with local, state, and federal agencies, stakeholders, and the public. From April 2006 to the present, more than 50 meetings have been held. Comments from the agencies and the public have been compiled and addressed by the Applicants, as appropriate. A summary of public outreach efforts to date is included in Section 11 of this Application. It is expected that public outreach activities would continue through the NEPA process and Project initiation.

8.7 *Cultural Values*

8.7.1 Existing Conditions

Cultural values include those perceived community beliefs or attitudes in a given area that provide a framework for that community's unity. The communities in the vicinity of the proposed Project (for example, Bemidji, Cass Lake, Bena, Deer River, and the Leech Lake Reservation (LLR)) appear to have cultural values corresponding to the economic activities of forestry, tourism, agriculture, mining, and manufacturing. In addition, many residents hold the traditional values associated with the Ojibwe or Anishinaabe people. The major values within the region include appreciation and use of natural resources, individualism, pride in their community, and economic well-being.

The routes run through parts of Hubbard, Beltrami, Cass, and Itasca counties. The greatest length of the routes run through Cass County, whose residents predominantly associate themselves with German, Norwegian, and American Indian (Ojibwe or Anishinaabe) heritage. Traditional attitudes and uses of local resources have been changing as recreational tourism has grown in importance. For example, accommodation and food services now ranks as the largest of 20 economic sectors in Cass County. Other economic sectors include construction, agriculture, education, health services, and tourism. The communities within the Study Area also value their heritage, either as native peoples or as pioneer settlers of the rivers and lakes of the vicinity. Community and county historical societies have embraced heritage tourism as an industry. Local museums provide excellent opportunities for recreation related to interests in heritage. Traditional Anishinaabe values incorporate a respect for the natural environment, and consider plants and animals important to traditional cultural and spiritual values. Most residents, regardless of heritage, appear to value the natural environment and the opportunities that natural resource-based industries bring to the region.

Wild rice, which grows naturally within the Study Area, is of particular importance to the Ojibwe people. According to the DNR:

> *"No other native Minnesota plant approaches the level of cultural, ecological, and economic values embodied by this species. Natural wild rice has been hand harvested as a source of food in the Great Lakes region for thousands of years. Many Native American groups have a special cultural and spiritual tie to wild rice. Although stands of natural wild rice occur most commonly in central and north-central Minnesota, the historic range of wild rice included all of the state."(DNR 2008)*

Based on the DNR inventory, the range of natural wild rice today includes 55 counties in Minnesota. These areas support a minimum of 64,328 acres of natural wild rice when growing conditions are favorable.

According to the DNR: "The greatest concentration of lakes supporting natural wild rice is in Aitkin (4,859 acres), Cass (8,323 acres), Crow Wing (3,751 acres), Itasca (8,448 acres), and St. Louis (8,939 acres) counties. These counties contain more than 60 percent of the inventoried natural wild rice acreage in Minnesota. These counties also account for more than 70 percent of the harvesting trips for natural wild rice" (DNR, 2008). The DNR states

that "despite its rich history and abundance in Minnesota, natural wild rice faces many current and potential threats in this region. In general, any factor that can affect water quality, seasonal water levels, lakebed conditions, regional climate, aquatic vegetation, or wild rice's natural genetic makeup could potentially threaten stands of natural wild rice," (DNR, 2008).

8.7.2 Direct/Indirect Effects

Potential effects for the routes and route segments located within the LLR and Chippewa National Forest (CNF) would be consistent with those discussed below and are not discussed separately.

Natural Resource Appreciation and Use

As indicated in other sections of this Route Permit Application, the proposed Project would impact a number of natural resources to varying degrees, depending on the route selected. Impacts to the visual aesthetics of the area depend on the location of the transmission line in relation to observers and the immediate characteristics of the surrounding area. For example, visual impacts would be more pronounced in an area that has high visibility (would be seen by many persons) and few existing human-made intrusions. In contrast, visual impacts would be less pronounced in an area that has low visibility or in an area where there are many existing human-made intrusions, such as existing roads, buildings, and utility lines.

Impacts on natural resource use, such as wild rice harvesting or berry picking, would depend on the requirements of the resource, and the route that is selected. In particular, opportunities for berry picking would likely increase due to conversion of forest lands to grasslands and shrub lands within the transmission line right-of-way. Impacts to existing wild rice resources are not anticipated, as the proposed Project would span rivers and deep-water wetlands.

Game animal populations are not expected to be affected by the Project. The Project is not therefore expected to have any negative impacts on hunting opportunities within the Study Area.

No indirect effects to natural resource appreciation and use are anticipated.

Individualism and Community Pride

The values of individualism and community pride are tied to the overall quality of life experienced by the area's residents. The basic elements of the community that are sources of community pride include access to the natural environment and tourism. Since the Project would supply a stable power supply to the area, it would allow local residents to continue their overall individual economic and social activities, and access to the natural environment and tourism are not expected to be negatively affected by the Project.

The construction of a new transmission line within a community setting has the potential to impact the aesthetics of the area. Route 2 and its alternatives in particular have the potential to impact the aesthetics of Cass Lake. The level of impact would be less pronounced since the route has extensive existing human-made intrusions already. Additionally, the Project would consider using single pole construction through the Cass Lake community due to the

limited space available for construction. The Applicants' preferred route, Route 1, does not have the potential to impact the aesthetics of Cass Lake since it would bypass the town.

Overall, the Project is not expected to have impacts to the values of individualism and community pride.

Economic Well-being

Construction of the proposed transmission facilities would serve the residential and business communities of the region with a reliable and stable power supply. As the urban centers of the North Central Minnesota region continue to grow, and the diverse economic base continues to expand, the available power supplied by improved facilities would support this continued development and afford the residents a stable economic environment in which to live and work. As discussed in Section 8.5 Socioeconomics, the proposed Project would have a positive short-term affect on the local economy during construction.

No indirect effects to economic well-being are anticipated.

8.7.3 Mitigation

The proposed Project would include vegetative restoration using native species, to the extent practicable. Construction within the City of Cass Lake would consider the use of single pole structures in order to minimize visual/aesthetic impacts. Water quality impacts that may affect wild rice are not anticipated and would be minimized through the installation and maintenance of BMPs.

8.8 *Public Services*

8.8.1 Existing Conditions

"Public Services" generally denotes services provided by government entities to its citizens. Public services are often those services that are used to benefit public health and safety, such as education, emergency services (fire, ambulance, and police), potable water, waste management (sanitary sewer), and utilities. Most of the public services are located near the urban areas within the Study Area. Outside of urban areas, landowners are typically serviced with privately-owned septic systems and wells. Most of the emergency services are located in the vicinity of the cities of Bemidji, Cass Lake, and Deer River. Table 8.8-1 provides a summary of the public services available in the Study Area.

Table 8.8-1 Public Services Located in Proximity to the Study Area

Hospitals	Fire Services	Police Departments	Sheriff Departments
North Country Regional Hospital (Bemidji)	Bemidji Fire Department	Bemidji Police	Beltrami County Sheriff
PHS Indian Hospital (Cass Lake)	Cass Lake Volunteer Fire Department	Leech Lake Tribal Police	Hubbard County Sheriff
Deer River Health Care Center	Deer River Volunteer Fire Department	Cass Lake Police	Cass County Sheriff
—	—	Deer River Police	Itasca County Sheriff

8.8.2 Direct/Indirect Effects

Potential impacts to public services, mainly emergency services, would be related to construction activities that may disrupt roadways and access. Generally, construction activities would be staged such that public roads would not be closed for any substantial period. Emergency access for local residents, should they need emergency services, would be provided by halting construction and relocating equipment so emergency vehicles could access the residence. Once construction is complete, the transmission line would span all roads and therefore would not impede emergency services.

The Applicants would utilize the Gopher One-Call system to identify and avoid impacts to existing utilities. The routes are not expected to have any long-term negative direct or indirect effects to public services.

The Project would have a positive effect upon public services by providing improved reliability and capacity to meet the growing demands for electrical service within the Study Area. The added transmission would reduce the risk of brownouts (leading to potential blackouts) by providing redundancy within the Study Area.

Potential effects for the routes and for route segments located within the Leech Lake Reservation (LLR) and Chippewa National Forest (CNF) would be consistent with those discussed below and are not discussed.

8.8.3 Mitigation

No direct or indirect effects to public services from the Project are anticipated; therefore mitigation would not be necessary.

8.9 *Radio, Television, and Cellular Phone*

8.9.1 Existing Conditions

Communications technologies identified within the Study Area can be divided into two broad categories: omnidirectional and unidirectional signals. Omnidirectional refers to those antennae that are able to transmit or receive signals in any direction, whereas unidirectional refers to those antennae that are able to transmit or receive signals in one direction. Microwave signals are unidirectional and all others (radio, TV, communications, and cellular phone) are omnidirectional. See Appendix A for the locations of towers in the project vicinity.

Omnidirectional Signals

Generally, transmission lines do not cause interference with omnidirectional radio, television, or other communication antenna reception. However, four potential interference sources do exist: gap discharges, corona discharges, and shadowing and reflection effects.

Gap discharge interference is the most commonly noticed form of transmission line interference with omnidirectional signals. Gap discharges may occur on transmission lines and distribution lines where small gaps (spaces) develop between mechanically connected metal parts. As sparks discharge across a gap, they create the potential for electrical noise, which can occur at any electrical line voltage. The degree of interference depends on the quality and strength of the transmitted communication signal, the quality of the antenna system, and the distance between the receiver and the electrical line. Gap discharges are typically not a design issue, but tend to be associated with equipment maintenance, occurring at areas where gaps have formed due to broken or ill fitted hardware (clamps, insulators, brackets). Because gap discharges are a hardware issue, they can be repaired when they occur. While gap discharges and their effects can happen on any electrical line, they typically occur on lower voltage distribution lines. The gap discharge potential of larger transmission lines (like the Project) tends to be minimized because there are fewer structures and a higher mechanical load on hardware.

Corona discharges can also generate radio frequency electrical interference. Corona discharges are a potential issue with all transmission lines. They are caused when localized electric fields near an energized conductor produce small electric discharges ionizing nearby air. Most often, the reasons for corona discharge are related to irregularities on conductors, including scratches or nicks, dust buildup, or water drops. The air ionization caused by corona results in energy loss and generates audible noise, radio noise, light, heat, and small amounts of ozone. The energy loss from corona is minimized largely through the design process by selecting conductors properly sized for the operating voltage of the line. The potential for radio and television signal interference relates to the magnitude of the transmission line-induced radio frequency noise compared to the strength of the broadcast signals. Very few interference problems occur with existing 230 kV transmission lines because the strength of the radio and/or television broadcast signal within a broadcaster's primary coverage area is great enough to maintain a signal to noise ratio that prevents interference.

Shadowing and reflection effects are typically associated with large structures, such as high buildings, that may cause reception problems by disturbing broadcast links and leading to poor radio and television reception. Although the occurrence is rare, a transmission structure or the conductor can create a "shadow" on adjoining properties that obstructs or reduces the transmitted signal. Or the structure may case a "reflection" or scattering of the signal. Reflected signals from a structure result in the original signal "breaking" into two or more signals. Multipath reflection or "scattering" interference can be caused by the combination of a signal that travels directly to the receiver, and a signal reflected from the structure that travels a slightly longer distance, and thus may be received slightly later by the receiver. If one signal arrives with a significant delay relative to the other, a second image can appear on the receiver's screen and displace the other. This type of interference reception is known as "ghosting" or "delayed image." The most significant factors affecting the potential for signal shadow and multipath reflection are structure height above the surrounding landscape and the presence of large flat metallic facades (including metallic coated glazing).

Potential shadow and reflection effects from the Project tend to be minimized because there are spaces (about 20 feet) between the poles of each H-Frame structure, about 800 feet between each structure, and the structures are about the same height as the trees in the surrounding landscape. Due to the spaces between poles, the structures do not create one large obstacle; signals travel through the structures.

Microwave (Unidirectional) Signals

Microwave antennas are operated as high-frequency, directional, point-to-point systems and depend on line-of-sight between antenna receivers. These systems are unlikely to be affected negatively by electrical noise, but could potentially be affected by infrastructure located directly between two microwave signal points.

Existing Tower Locations

All of the licensed communications towers identified within the Study Area are located along the US 2 corridor. They are primarily clustered within or near the communities of Bemidji, Cass Lake, Bena, and Deer River/Zemple (See detailed route segment maps in Appendix A).

Routes 1, 1A, 1B, and 1C

There are two registered telecommunications antennas within Route 1 and its alternatives, between the City of Zemple and White Oak Lake. One is an Antenna Structure Registration (ASR) tower, registered to AAT Communications Corporation, and the second antenna is a cellular tower, registered to American Cellular Corporation. There are three microwave towers located within one mile of Route 1 and its alternatives. Two are located near Bemidji—one about 0.5 mile south of the routes and the second located about 0.8 mile north of the routes. The third is located near Bena, about 600 feet north of the routes.

Routes 2 and 2C

There are four registered telecommunications antennas within Routes 2 and 2C. Three of the four antennas within Routes 2 and 2C are located on the west side of the City of Cass Lake. Regarding the three antennas near Cass Lake, one is an Antenna Structure Registration (ASR) tower, registered to the State of Minnesota, and the remaining two are land mobile towers, registered to the State of Minnesota and Burlington Northern railway. The fourth antenna within the routes is located between the cities of Cass Lake and Bena along the railway. The tower is an ASR tower that is registered to the Burlington Northern railway. There are five microwave towers within one mile of Routes 2 and 2C. The five microwave towers are located from west to east as follows: one tower is located about 0.8 mile north of the routes north of Bemidji; the second tower is located about 0.4 mile north of the routes south of Bemidji; the third tower is located about 0.9 mile south of the routes south of Bemidji; the fourth tower is located about 225 feet north of the routes within Cass Lake; and the fifth tower is located about 0.7 mile south of the routes south of Bena.

8.9.2 Direct/Indirect Effects

Potential effects for the routes and route segments located within the Leech Lake Reservation (LLR) and Chippewa National Forest (CNF) would be consistent with those discussed below and are not discussed separately.

No direct or indirect impacts to omnidirectional communication towers are anticipated as the transmission line hardware would be designed to reduce gap and corona discharges. The transmission lines will also be properly maintained to minimize gap and corona discharges. Typically microwave towers are taller than the proposed pole structures for the Project, therefore no direct or indirect impacts are anticipated.

8.9.3 Mitigation

Omnidirectional Signals

The Applicants are not aware of any complaints related to radio or television interference resulting from the operation of existing 230 kV transmission lines located near the Study Area, and do not expect that such interference will be an issue along the Project's route. The following discusses potential mitigation measures that could be applied if interference occurs.

Radio Interference

If interference from transmission line corona does occur for an AM radio station within a station's primary coverage area with good reception before the Project was built, satisfactory reception can be obtained by appropriate modification of the receiving antenna system. Interference with FM broadcast reception is generally not a problem for two reasons. First, corona-generated radio frequency (RF) noise decreases in magnitude with increasing frequency and is quite small in the FM broadcast band (88-108 Megahertz). Second, the excellent interference rejection properties inherent in FM broadcast systems make them virtually immune to amplitude type disturbances.

A two-way mobile radio located immediately adjacent to and behind a large metallic structure (such as a steel transmission line structure) may experience interference because of

the signal blocking effects of the structure. Moving either mobile unit by less than 50 feet so that the metallic structure is no longer immediately between the two units should restore communications. RF noise is not an issue for cellular phones because it is almost non-existent in the frequency range for cellular type phones, and the technology used by cell phones is superior to that used in two-way mobile radio units.

Television Interference

Corona-generated RF noise and transmission line structure placement could cause interference with TV broadcast signals. The transition to digital TV broadcasts will be complete by the time the Project is constructed. Digital reception is in most cases considerably more tolerant of noise and somewhat less resistant to multipath reflections (i.e., reflections from structures) than analog broadcasts. So although digital reception is more tolerant of RF noise, if the noise level or reflections are great enough it will impact digital television reception.

Due to the higher frequencies of television broadcast signals (54 Megahertz and above), a 230 kV transmission line seldom causes reception problems within a station's primary coverage area. In the rare situation where the construction of the Project may cause interference within a television station's primary coverage area, the Applicants would work with the affected viewers to correct the problem. Usually any reception problem can be corrected with the addition of an outside antenna.

Loose and/or damaged transmission line hardware may also cause television or radio interference. If interference is caused by the operation of the Project, the Applicants would inspect and repair any loose or damaged hardware in the transmission line or take other necessary action to restore reception to the present level.

Microwave (Unidirectional) Signals

The Applicants would work with tower operators to resolve any issues directly related to the Project. Mitigation may include shorter structures near the signal direction.

8.10 *Electric and Magnetic Fields*

8.10.1 Existing Conditions

Electric Fields

Voltage on any wire (conductor) produces an electric field in the area surrounding the wire. The electric field associated with a high-voltage power line (HVTL) extends from the energized conductors to other nearby objects, such as the ground, towers, vegetation, buildings and vehicles. The electric field from a power line gets weaker with increasing distance from the line. Nearby trees and building material also greatly reduce the strength of transmission line electric fields.

The intensity of electric fields is associated with the voltage of the transmission line and is measured in kilovolts per meter (kV/m). Transmission line electric fields are typically measured approximately one meter above the ground.

The predicted electric fields for each line design option for the Project are provided in Appendix I.

Magnetic Fields

Current passing through any conductive material, including a wire, produces a magnetic field in the area around that material. The magnetic field associated with a HVTL surrounds the conductor and decreases rapidly with increasing distance from the conductor. The magnetic field is expressed in units of magnetic flux density, expressed as gauss (G).

The predicted magnetic fields for each line design option for the Project are provided in Appendix I. The predictions were calculated using the line amperage maximum capacities. This conservatively over-predicts the magnetic fields that would be generated under normal operation.

Electric and Magnetic Field Research

The question of whether exposure to power-frequency (60 Hertz (Hz)) magnetic fields can cause biological responses or even health effects has been the subject of considerable research for the past three decades. The most recent and exhaustive reviews of the health effects from power-frequency fields conclude that the evidence of health risk is weak. The National Institute of Environmental Health Sciences (NIEHS) issued its final report, *NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields,* on June 15, 1999, following six years of intensive research. NIEHS concluded that there is little scientific evidence correlating extra low frequency electric and magnetic field (EMF) exposures with health risk.

The Minnesota Environmental Quality Board (EQB) (now the Department of Commerce (DOC)) has addressed the matter of EMF with respect to new transmission lines in a number of separate dockets over the past few years. See e.g., Docket Nos. 03-64-TR-Xcel (the Lakefield 161 kV transmission line); 03-73-TR-Xcel (the Buffalo Ridge 345 kV transmission line); 04-84-Tr-Xcel (the Buffalo to White 115 kV transmission line); and 04-81-TR-Air Lake-Empire (a 115 kV transmission line in Dakota County). The findings of the

EQB and the discussion in the Environmental Assessments prepared on each of those projects are pertinent to this issue with respect to this Project. Documents from those matters are available on the PUC webpage.

Most recently, in June 2005, in Docket No. 03-73-TR-Xcel for the Buffalo Ridge 345 kV transmission line, the EQB made the following findings with regard to EMF:

> *118. No significant impacts on human health and safety are anticipated from the project. There is at present insufficient evidence to demonstrate a cause and effect relationship between EMF exposure and any adverse health effects. The EQB has not established limits on magnetic field exposure and there are no Federal or Minnesota health-based exposure standards for magnetic fields. There is uncertainty; however, concerning long-term health impacts, and the Minnesota Department of Health, the EQB and Xcel all recommend a "prudent avoidance" policy in which exposure is minimized.*
>
> *119. In previous routing proceedings, the EQB has imposed a permit condition on HVTL permits limiting electric field exposure to 8 kV/m at one meter above ground. This permit condition was designed to prevent serious hazard from shocks when touching large objects, such as semi trailers or large farm equipment under extra high voltage transmission lines of 500 kV or greater. Predicted electric field densities are less than half of the 8 kV/m permit condition for both the 345 kV transmission line and the 115 kV transmission line.*

While the general consensus is that electric fields pose no risk to humans, the question of whether exposure to magnetic fields potentially can cause biological responses or even health effects continues to be the subject of research and debate.

Stray Voltage

Stray voltage is a condition that can occur on the electric service entrances to structures from distribution lines – not transmission lines. More precisely, stray voltage is a voltage that exists between the neutral wire of the service entrance and grounded objects in buildings such as barns and milking parlors.

Transmission lines do not, by themselves, create stray voltage because they do not connect to businesses or residences. However, transmission lines, can induce stray voltage on a distribution circuit that is parallel and immediately under the transmission line. Appropriate measures would be taken to prevent stray voltage problems when the proposed Project parallels or crosses distribution lines.

8.10.2 Direct/Indirect Effects

Potential effects for the routes and route segments located within the Leech Lake Reservation (LLR) and Chippewa National Forest (CNF)-managed properties would be consistent with those discussed below and are not discussed separately.

Electric Fields

The Project would have a peak magnitude of electric field density of approximately 2.6 kV/m underneath the conductors, one meter above ground level. The predicted levels are significantly less than the maximum limit of 8.0 kV/m that has been a permit condition

imposed by the Office of Energy Security (OES) in other transmission line applications. The standard was designed to prevent serious hazard from shocks when touching large objects, such as tractors, parked under HVTLs of 500 kV or greater. Therefore, the Project would not have direct or indirect effects associated with electric fields.

Magnetic Fields

The Project would have a peak magnitude of magnetic field density of approximately 260 mG underneath the conductors. The magnetic field densities drop to less than 50 mG within 100 feet of the center line of the transmission structure. According to the EPA, these densities represent smaller magnetic fields than those associated with many household appliances. Therefore, the Project would not have direct or indirect effects associated with magnetic fields.

Stray Voltage

No stray voltage issues are anticipated with this Project.

8.10.3 Mitigation

No direct or indirect effects attributed to EMF from the Project are anticipated; therefore, mitigation would not be necessary

8.11 *Archaeological and Historic Resources*

8.11.1 Existing Conditions

Previously-recorded archaeological and historic resource data were obtained through archival review. General information on the methodology applied to the archival review is presented in Chapter 7.

Typically, the greatest density of cultural resources occurs along the margins of lakes and rivers. The resources include prehistoric and historic-period archaeological findings that have been reported and formally investigated since the late 1800s. Some of the resources were reported to the State Historic Preservation Office (SHPO), but have not been formally investigated by a professional archaeologist. The nature and significance of such sites remains unknown. The prehistoric archaeological resources include earthworks, burial areas, surface, and subsurface scatters of cultural materials, and single artifacts. The absolute time periods and probable activities represented by these resources run through the entire range of documented occupations in the region. Historic-period archaeological sites include abandoned farmsteads, resorts, and logging camps. In addition, standing structure inventories have been conducted for many of the counties, with the rural population centers as the focus of these investigations. These investigations documented structures from the early Euro-American settlement into the 20th Century.

Many of the resources recorded in the Study Area were identified through evaluations conducted for transportation projects, transmission line and pipeline corridors, and surveys conducted on state and federally-owned management areas. Table 8.11-1 summarizes the density of cultural resources by route. The archival review identified 54 archaeological resources and 13 inventoried architectural properties within the 1,000-foot-wide routes. Of those aforementioned resources, no archaeological sites and one architectural property is listed or certified eligible for listing on the National Register of Historic Properties (NRHP).

Table 8.11-1 Cultural Resources Identified within the Study Area

Alternatives	Archaeological Sites	Cemetery or Burial Sites[1]	Architectural Sites	NRHP Sites	Total
Route 1	37	2	0	0	37
Route 1A	26	0	0	0	26
Route 1B	31	2	0	0	31
Route 1C	37	2	0	0	37
Route 2	17	1	13	3	30
Route 2C	17	1	13	3	30
Total number of sites in the Study Area[2]	54	3	13	3	na

1The data presented does not necessarily distinguish between historic and pre-contact era cemeteries or burial grounds.

2 The total does not equal the row sum because there is an overlap of the 1,000-foot-wide routes. Due to this overlap some of the sites would be double-counted if the column was summed.

Appendix J lists the individual properties by route. It is important to note that most of the identified sites have not been evaluated as to their historical significance and that there may be other resources along the proposed routes that have not yet been identified. However, the existence of the sites and resources listed here demonstrates that people throughout history used and were attracted to the Study Area. The archaeological sites listed range from the Archaic Period (6000 - 800 B.C.) to the Historic Period, with most falling within the Woodland Period (1000 B.C. – 1700 A.D.). See Figure 7.

8.11.2 Direct/Indirect Effects

The construction of new transmission line facilities could affect recorded and currently unknown historic and archaeological resources. The transmission line, with its pole installation and substation modification, has the potential to disturb archaeological sites, and could alter the setting and viewsheds of historic structures or landscapes, the setting and access to Traditional Cultural Properties, or traditional resources. In areas not previously disturbed and where archaeological resource potential is assessed to be high, such as near large lakes and river crossings, unrecorded archaeological sites or traditional cultural use areas may be affected during construction of transmission structures, substations and substation modifications, or access roads. Historic buildings or other sites may be impacted as well, in that construction of modern transmission structures may impact historic viewshed in which above-ground archaeological and historic resources are located. Possible impacts to archaeological resources common to all routes include:

- Disturbance to surface soils throughout the route from heavy construction vehicle equipment operation
- Subsurface excavations necessary to install structures
- Disturbance to surface soils from dragging heavy objects (e.g., power poles)
- Disturbance to surface soils through grubbing, stump removal, and grading

Further evaluation is required to determine the potential extent of cultural resource impacts. Routes 1, 1A, 1B, and 1C have greater numbers of known archaeological sites. Routes 2 and 2C have greater numbers of known architectural sites. Overall, the 1,000-foot-wide routes contain 28 to 38 cultural resource sites. The realized potential impacts would be determined once the route is selected; the alignment refined, and detailed field surveys completed.

8.11.3 Direct/Indirect Effects within the Leech Lake Reservation

Data on traditional cultural properties and traditional use areas was not provided by the Leech Lake Band of the Ojibwe (LLBO). According to SHPO data, there are 16 to 22 archaeological sites recorded within Route 1 and its alternatives, and five archaeological sites recorded within Routes 2 and 2C. There are no historic archaeological sites identified by SHPO within the portions of the routes in the Leech Lake Reservation (LLR). The realized potential impacts would be determined once the route is selected; the alignment refined, and detailed field surveys completed. Table 8.11-2 summarizes the type of cultural resources found within the LLR portion of the Study Area.

Table 8.11-2 Cultural Resources Identified within the LLR Portion of the Study Area

Alternatives	Archaeological Sites	Architectural Sites
Route 1	22	0
Route 1A	17	0
Route 1B	16	0
Route 1C	22	0
Route 2	5	0
Route 2C	5	0

Note: Data on traditional cultural properties and traditional use areas were not provided by the LLBO.

8.11.4 Direct/Indirect Effects within the Chippewa National Forest

The Chippewa National Forest (CNF) portion of the Study Area contains both archaeological and architectural sites (Table 8.11-3). As indicated above, these sites require further evaluation to identify potential impacts. The realized potential impacts would be determined once the route is selected, the alignment refined, and detailed field surveys completed.

Table 8.11-3 Cultural Resources Identified within the CNF-managed Portion of the Study Area

Alternatives	Archaeological Sites	Architectural Sites
Route 1	14	0
Route 1A	12	0
Route 1B	8	0
Route 1C	14	0
Route 2	3	13
Route 2C	3	13

8.11.5 Mitigation

The process for dealing with effects to identified historic properties would be guided by the steps outlined in a Plan of Action for NHPA Compliance prepared by the USACE (Appendix K), or other agreement document should it become advisable. The Applicants would make every effort to avoid impacts to identified archaeological and historic resources by adjusting the 125-foot wide right-of-way alignment within the selected 1,000-foot wide route or spanning the resource. In the event that an impact would occur, the lead federal agency would consult with the SHPO, the appropriate THPO and invited consulting parties (particularly Native American Tribes and state and federal permitting or land management agencies) on whether or not the resource is currently listed on or eligible for listing in the NRHP. While avoidance of the resource would be a preferred action, mitigation for Project-related impacts on NRHP-eligible archaeological and historic resources (including

Traditional Cultural Properties and Traditional Use Areas) may be required. In consultation with SHPO, THPO, and other consulting parties, treatment plans would be developed to minimize Project impacts on the resource, and/or to develop additional documentation of NRHP eligible properties through data recovery.

8.12 *Geomorphic and Physiographic Environment*

8.12.1 Existing Conditions

The Study Area is located within the Northern Minnesota Drift and Lake Plains ecological section and consists primarily of deciduous and coniferous forest (DNR, 2008). Much of this region is managed as state and national forest. Pockets of shrubland and cropland are scattered throughout the area. Waterbodies, including large lakes and numerous streams and creeks, are common throughout the Study Area. Large bodies of water in the vicinity of the routes include the Mississippi River, Pike Bay, Portage Lake, and portions of Cass Lake, Lake Winnibigoshish, and Ball Club Lake.

Topography

Surface topography is flat to gently rolling, with slopes generally ranging from 4 to 8 percent. Infrequently, slopes may be as steep as 16 percent. The Study Area is characterized by low relief, where undulating plains are marked by gently sloping swells, sags, and depressions (Carney and Mooers, 1998). Surface elevations range from 1,250 to 1,450 feet above sea level. The area includes many streams, marshes, and lakes, which are typical of terrain subjected to geologically recent glacial occupation. The Mississippi River generally parallels the routes to the north, running through Lake Bemidji, Cass Lake, and Lake Winnibigoshish.

Geology

The Study Area is located within the Chippewa Plains subsection of the Northern Minnesota Drift and Lake Plains section (DNR 2008b). This subsection is characterized by ground moraines, stagnation moraines, a lake plain, and an outwash plain. Moraines are topographically diverse deposits of mixed glacial till, left behind by retreating glaciers. Glacial outwash and lake plains are typically flat, comprised of finer sediments deposited by flowing or standing glacial meltwater. Approximately 200 to 600 feet of glacially derived sediments overlie the bedrock within this area (DNR, 2008). Approximately half of the Study Area is covered with glacial outwash, sands, and gravels deposited during glacial melting, with approximately 40 percent covered by ground moraine, sandy loam till deposits that were deposited at the base of a glacier. Discontinuous sand lenses may also be present.

The Study Area is located within the Pre-Cambrian granite-greenstone belt that formed 2.5 to 2.9 billion years ago. The dominant bedrock type is of granitic composition, occupying 67 percent of the Study Area. Bedrock in the remainder of the Study Area is composed of equal amounts of basalt and monzonite, with minor greywacke sandstone. These remaining lithologies occupy a band that runs from in a northeast to southwest direction, between Bemidji and Grand Rapids (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).

8.12.2 Direct/Indirect Effects

Potential effects for the routes and route segments located within the Leech Lake Reservation (LLR) and Chippewa National Forest (CNF)-managed properties would be consistent with those discussed on the next page and are not discussed separately.

Topography

The Project would not require substantive excavation or earth moving since transmission lines are constructed to conform to the local topography. Local soil disturbance would be required and is discussed in Section 8.14. Small areas would be excavated to install pole structures. No impacts to regional topography would result from the Project.

Geology

The Project would not require substantive excavation or earth moving since transmission lines are constructed to conform to the local topography. Surficial deposits are more than 100 feet deep, thus conflicts with bedrock are not anticipated. The Project would not impact the geology of the Study Area.

8.12.3 Mitigation

Topography

Disturbed areas would be regraded to existing conditions, to the extent practicable. Soil material that has been removed for pole installation would be evenly spread within the right-of-way, in an upland topographic position.

Geology

Because no impacts would occur, no mitigation is necessary or proposed.

8.13 *Climate*

8.13.1 Existing Conditions

The average temperature for the region ranges from approximately 80 degrees Fahrenheit (ºF) in July to approximately 0ºF in January, although individual locations in the region can have average low temperatures several degrees cooler due to local effects. Extreme summer temperature can routinely top 90ºF, while winter temperatures can routinely drop below -20ºF.

Typical summers provide abundant rainfall, with annual average rainfall totals being in the mid to upper 20-inch range. Average snowfall totals are more than 40 inches annually and can result in high moisture content in the soil. However, weather patterns can deviate from these averages resulting in drought conditions during periods of limited precipitation, and lowland flooding and extreme blizzards during periods of heavy precipitation.

Temperature inversions can occur any time of the year due to nighttime radiational cooling or large-scale weather systems, causing cool air to get trapped near the ground. This can cause some discomfort among individuals who are sensitive to air emissions, since pollutants are not dispersed effectively during these conditions. However, long-lived temperature inversions are not frequent occurrences and typically do not last more than a day or two in the area. Given the low density of existing emissions sources in the region, pollutant levels during inversions do not typically approach levels that pose a health risk. See Section 8.15 for detailed air quality analysis.

8.13.2 Direct/Indirect Effects

The potential effects of the routes and route segments on climate within the Leech Lake Reservation (LLR) and Chippewa National Forest (CNF) would be consistent with those discussed below and are not discussed separately.

Potential direct and indirect effects on climate are primarily related to concerns about emission of greenhouse gasses (GHG). The Project does not include activities, such as new power generation, that have the potential to substantively increase GHG emissions. Minor activities, such as the operation of construction equipment, are expected to emit small amounts of GHG. Analyses of the Project included in the AES and MCS show that the Project would help reduce GHC. The Project is not expected to have any long-term direct or indirect effects to climate.

8.13.3 Mitigation

Construction equipment would be properly operated and maintained in good working order. No direct or indirect effects to climate from the Proposed Project are anticipated, and therefore mitigation would not be necessary.

8.14 *Soils*

8.14.1 Existing Conditions

U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) Soil Survey data was reviewed to describe the soil resources within the Study Area. Soils are generally grouped into categories known as associations. A soil association has a distinctive pattern of soils, relief and drainage, and is a unique natural landscape. Typically, an association consists of one or more major soils and some minor soils. The soils in the Study Area are grouped into 11 soil associations, as shown in Table 8.14-1. Generally, the soils found along the routes are moderately well-drained to excessively well-drained sandy loams or loamy sands on uplands, with poorly-drained muck soils found in the large wetland depressions, peatlands, and bogs (Figure 10).

This Space Intentionally Left Blank

Table 8.14-1 Soil Associations within the Study Area

Soil Associations	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C	General Description
	% of Route						
Andrusia-Graycalm-Marquette (MN027)	3.7	3.3	3.4	3.7	0.0	0.0	The Association consists of very deep, well drained and somewhat excessively drained soils. They formed in sandy and gravelly sediments and deposits on glacial outwash plains, glacial lake beaches, outwash plains, glacial stream terraces, and moraines, kames, and stream terraces.
Cathro-Seelyeville-Markey (MN065)	1.2	1.3	1.1	1.2	0.0	0.0	The Association consists of very deep; very poorly drained organic soils moderately deep to loamy materials. They formed in organic material 16 to 51 inches thick overlying loamy glacial or sandy deposits on ground moraines, end moraines, outwash plains, lake plains, stream/river terraces, flood plains, and valley trains.
Cutaway-Sandwick-Greenwood (MN279)	0.2	0.2	0.2	0.2	0.0	0.0	The Cutaway-Sandwick series consists of very deep, moderately well to poorly drained soils formed in a sandy glacial outwash or eolian mantle and underlying calcareous, loamy till. These soils are on moraines, lake washed till plains and glacial beach ridges. The Greenwood series consists of very deep, very poorly drained soils formed in organic deposits more than 51 inches thick on outwash plains, till floored lake plains, or lake plains.
Greenwood-Rifle-Cathro (MN473)	10.2	9.1	9.4	10.0	6.8	6.4	The Association consists of very deep, very poorly drained soils formed in organic deposits more than 51 inches thick on outwash plains, till floored lake plains, lake plains, ground moraines, end moraines, or in bogs and depressional areas.
Indus-Taylor-Dalbo (MN277)	3.0	2.7	2.8	3.0	6.3	5.9	The Association consists of deep, poorly and somewhat poorly to moderately well drained soils formed in clayey calcareous, glacial lacustrine sediment on lake plains.
Menahga-Graycalm-Mooselake (MN026)	16.6	12.8	19.5	16.4	42.5	40.0	The Association consists of very deep, excessively drained to well drained soils that formed in sandy glacial outwash sediments on outwash plains, valley trains, and some moraines, drumlins, kames, and stream terraces. Some components consist of very poorly drained organic soils that formed mostly in hemic organic soil material with woody fiber.
Nebish-Shooker-Beltrami (MN045)	8.1	15.4	7.4	8.0	2.3	2.1	The Association consists of very deep, well drained to poorly drained soils formed in calcareous loamy glacial till on glacial moraines and till plains.
Rifle-Tacoosh-Seelyeville (MN066)	3.7	3.3	3.3	4.8	1.4	1.3	The Association consists of very deep, very poorly drained soils formed in organic deposits more than 51 inches thick in bogs and depressional areas within ground moraines, end moraines, outwash plains, lake plains, till plains, valley trains, and flood plains.
Sol-Nary-Stuntz (MN055)	0.0	0.0	0.0	0.0	0.3	0.3	The Association consists of very deep, well drained to somewhat-poorly drained soils that formed in loamy or calcareous glacial till on moraines. They are on glaciated ground moraines and end moraines.

Soil Associations	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C	General Description
	% of Route						
Warba-Cutaway-Stuntz (MN015)	20.6	22.3	22.7	20.3	6.9	6.4	The Association consists of very deep, moderately well and well drained soils formed in loamy calcareous glacial till on moraines, sandy glacial outwash or eolian mantle, lake washed till plains, and glacial beach ridges.
Zimmerman-Cowhorn-Mooselake (MN272)	32.7	29.6	30.3	32.5	33.6	37.6	The Association consists of very deep, excessively drained soils that formed in sandy glacial outwash or eolian sediments on glacial outwash plains, stream terraces, deltas, lake terraces, dunes, beach deposits and valley trains. Some components consist of very poorly drained organic soils that formed mostly in hemic organic soil material with woody fiber.

Source: U.S. Department of Agriculture, NRCS. 2003. State Soil Survey Geographic (SSURGO) Data Base for Minnesota.
Note: Totals for any given route may not add up to 100 percent because of rounding errors.

8.14.2 Direct/Indirect Effects

Surface soils would be disturbed by site clearing, grading, and excavation activities at structure locations, pulling and tensioning sites, setup areas, and during the transport of crews, machinery, materials, and equipment over access routes (primarily along transmission right-of-way). This disturbance is minimal, and is generally less invasive than typical agricultural practices such as plowing and tilling. Soil compaction would occur on access paths/roads. Construction of the transmission line is expected to disturb between 879 and 1,000 acres of soil, depending on the route. Approximately 3 acres would undergo more permanent impacts due to the installation of pole structures (Table 8.14-2). The Applicants would attempt to utilize existing, disturbed areas for setup and staging sites to the extent practical. Therefore, no temporary or permanent impacts are anticipated due to setup and staging areas.

Wet organic soils pose a challenge for construction. The location of organic soils would be identified for the approved route using mapping and, if necessary, on-site investigations and borings. To the extent practicable, construction in organic soils would be completed when the ground is frozen.

Table 8.14-2 Effects upon Soils within the Right-of-way

	Acres of Permanent Impacts	Acres of Temporary Impacts	Total Impact Acres	Total ROW Acres
Route 1	3	876	879	1,046
Route 1A	3	930	933	1,115
Route 1B	3	956	959	1,133
Route 1C	3	942	945	1,112
Route 2	3	931	934	1,032
Route 2C	3	997	1,000	1,098

Note: Calculation methodology is contained in Chapter 7 Methods and Regulations.

8.14.3 Direct/Indirect Effects within the Leech Lake Reservation

Soil types within the Leech Lake Reservation (LLR) are consistent with those found throughout the Study Area. Table 8.14-3 summarizes potential soil impacts for the right-of-way within each route.

Table 8.14-3 Effects upon Soils within the LLR Portion of the Right-of-way

	Acres of Permanent Impacts	Acres of Temporary Impacts	Total Impact Acres	Total ROW Acres
Route 1	2	618	620	662
Route 1A	2	607	609	653
Route 1B	2	698	700	750
Route 1C	2	678	680	722
Route 2	2	631	633	660
Route 2C	2	692	694	721

8.14.4 Direct/Indirect Effects within the Chippewa National Forest

Soil types within the Chippewa National Forest (CNF) are consistent with those found throughout the Study Area. Table 8.14-4 summarizes potential soil impacts for the right-of-way within each Route.

Table 8.14-4 Effects upon Soils within Chippewa National Forest-managed Right-of-way

	Acres of Permanent Impacts	Acres of Temporary Impacts	Total Impact Acres	Total ROW Acres
Route 1	1	341	342	348
Route 1A	1	335	336	341
Route 1B	1	344	345	351
Route 1C	1	382	383	389
Route 2	1	281	282	284
Route 2C	1	322	323	325

8.14.5 Mitigation

To the extent practicable, soil disturbance and excavation activities in steep slope areas would be avoided. Where disturbance and excavation cannot be avoided entirely, it would be minimized using Best Management Practices (BMPs). Sediment and erosion control plans would be developed that specify the types of BMPs necessary. Depending on the site, BMPs may include installation of silt fencing, straw bales or ditch blocks and/or covering bare soils with mulch, plastic sheeting, or fiber rolls to protect drainage ways and streams from sediment runoff from exposed soils. BMPs would be inspected during construction, especially during significant precipitation events. Soil compaction would be treated and restored through tillage operations, using a subsoiler.

All disturbed areas would be revegetated once construction is complete. Seed mixes would be specified based on site characteristics and in accordance with regulatory permits.

8.15 *Air Quality*

8.15.1 Existing Conditions

The Study Area is currently in attainment with National and Minnesota Ambient Air Quality Standards (NAAQS and MAAQS), which are shown in Table 8.15-1, for all criteria pollutants.

The primary air quality concerns related to transmission lines are ozone and nitrogen oxide emissions surrounding the conductor due to corona. Corona consists of the breakdown or ionization of air within a few centimeters or less of the conductors. It occurs when the electric field intensity, or surface gradient, on the conductor exceeds breakdown strength of air. Usually some imperfection, such as a scratch on the conductor or a water droplet, is necessary to cause corona. Monitored concentrations of ozone due to corona show no significant incremental ozone concentrations at ground level, and minimal (0-8 parts per billion (ppb)) concentrations at an elevation nearer to the transmission line. These concentrations were only detected during heavy corona in foul weather. Additional testing showed that production of nitrogen oxides due to corona is approximately one-fourth of the production of ozone due to corona.

Ozone is a very reactive form of oxygen and combines readily with other elements and compounds in the atmosphere. Ozone forms naturally in the lower atmosphere from lightning discharges and from reactions between solar ultraviolet radiation and air pollutants, such as hydrocarbons, from auto emissions. The natural production rate of ozone is directly proportional to temperature and sunlight and inversely proportional to humidity. Humidity (or moisture), the same factor that increases corona discharges from transmission lines, inhibits the production of ozone.

The Environmental Protection Agency (EPA) has promulgated regulations on the permissible concentrations of ozone and oxides of nitrogen (62 Federal Register 38856). The national standard is 0.08 parts per million (ppm) on an 8-hour averaging period (40 CFR Part 50). The Minnesota State Ambient Standard is 0.08 ppm based upon the fourth highest 8-hour daily maximum average in one year (Minn. R. 7009.0080). As discussed above, incremental concentrations of ozone due to corona would be expected to be on the order of one-tenth of the standard near the transmission line, and insignificant at ground level.

Table 8.15-1 National and Minnesota Ambient Air Quality Standards

Averaging		NAAQS	
Emission Type	Period	Primary micrograms/m3 (ppm)	Secondary micrograms/m3 (ppm)
Carbon Monoxide (CO)	8-hour [a]	10,000 (9)	10,000
	1-hour [a]	40,000 (35)	40,000
Sulfur Dioxide (SO_2)	Annual	80 (0.03)	--
	24-hour [a]	365 (0.14)	--
	3-hour [a]	--	1,300 (0.5)
	1-hour [a,e]	1,300 (0.5)	
Nitrogen Dioxide (NO_2)	Annual	100 (0.05)	100
Ozone (O_3)	8-hour [b]	-- (0.08)	-- (0.08)
PM_{10}	Annual [e]	50	50
	24-hour [a]	150	150
$PM_{2.5}$[d]	Annual [d]	15	15
	24-hour [c]	35 65 [e]	35 65 [e]
Lead (Pb)	Three-month (Calendar quarter)	1.5	--

Source: EPA, National Primary and Secondary Ambient Air Quality Standards (40 CFR 50).

[a] Not to exceed more than once per year, per monitor location, averaged over a three-year period.

[b] The 8-hour ozone standard is met if the fourth highest 8-hour ozone concentration, averaged over 3 years, is not greater than 0.08 ppm.

[c] In September 2006 EPA revised the 24-hour PM2.5 standard from 65 µg/m3 to 35 µg/m3, but the previous standard is currently applicable until EPA completes the attainment designation and implementation process. During any 12 consecutive months, 98 percent of the values shall not exceed 35 $\mu g/m^3$ under the new standard, and 65 $\mu g/m^3$ under the currently applicable standard. Minnesota has retained the 65 $\mu g/m^3$ standard.

[d] Spatial average standard, applied by EPA over a neighborhood scale.

[e] Standard is only a Minnesota standard.

8.15.2 Direct/Indirect Effects

The potential effects of the routes and route segments within the Leech Lake Reservation (LLR) and Chippewa National Forest (CNF) would be consistent with those discussed below and are not discussed separately.

Temporary and localized impacts to air quality may occur during construction due to the disturbance of topsoil, which raises fugitive dust particles. Temporary impacts from fugitive dust would be minimized or avoided by using BMPs. Oil and other petroleum derivatives would not be used for dust control. Equipment and vehicles that show excessive emissions of exhaust gases due to poor engine adjustments, or other inefficient operating conditions, would not be operated until repairs or adjustments have been made.

The proposed routes are not expected to have any long-term direct or indirect effects on air quality.

8.15.3 Mitigation

No direct or indirect effects on air quality from the proposed Project are anticipated. Therefore, mitigation would not be necessary.

8.16 *Water Resources*

Hydrologic features, such as wetlands, lakes, rivers, and floodplains perform important functions within a landscape, including flood attenuation, ground water recharge, water quality protection, and wildlife habitat production.

The following sections provide a summary of surface water, water quality, floodplain, and groundwater resources present in the Study Area.

8.16.1 Existing Conditions

The Study Area lies within the Mississippi River Headwaters and the Leech Lake River watersheds of the Upper Mississippi River Basin (MPCA, 2008). Surface waters within the Mississippi River-Headwaters watershed flow towards the Mississippi River, and surface waters within the Leech Lake River watershed flow towards the Leech Lake River. The Leech Lake River generally flows in an easterly direction, reaching a confluence with the Mississippi River at the Itasca-Cass County line, about 1.5 miles south of Ball Club Lake.

Numerous streams and rivers are present within the Study Area, including the Mississippi River, Schoolcraft River, Bungashing Creek, Necktie River, Sucker Creek, Portage Creek, Leech Lake River, Ball Club River, Deer River, and Blackwater Creek. Large lakes within or adjacent to the Study Area include Cass Lake, Pike Bay, Leech Lake, Lake Winnibigoshish and Ball Club Lake. Smaller lakes include Lake Irving, Lake Marquette, Grace Lake, Midge Lake, Little Wolf Lake, Moss Lake, Twin Lake, Sucker Lake, Portage Lake, Sixmile Lake, White Oak Lake, and Blackwater Lake. Most of these lakes are hydrologically connected to nearby streams and rivers. Figure 6 illustrates the locations of water resources identified within the Study Area.

Public Waters

Public Waters are water basins and watercourses in Minnesota with significant recreational or natural resource value as defined in Minnesota Statutes § 103G.005. The Minnesota Department of Natural Resources (DNR) has regulatory jurisdiction over these waters.

The Study Area includes 71 Public Water Inventory (PWI) basins and 15 PWI watercourses (MNDNR, 2007). The locations of the PWI waterbodies in the Study Area are summarized by county in Table 8.16-1.

Table 8.16-1 PWI Waterbodies within the Study Area

PWI Type	Beltrami	Cass	Hubbard	Itasca
Basins*	11	37	9	16
Watercourses**	3	4	5	4

Note: Two of these basins overlap county boundaries
*** The Mississippi River forms the Cass County and Itasca County border*

Water Quality

The Minnesota Pollution Control Agency (MPCA) oversees water quality studies and regulations in Minnesota. Table 8.16-2 displays the waterbodies within the Study Area that the MPCA has identified as impaired.

Table 8.16-2 Water Resources with Designated Impairments in the Study Area

Water Resource	Type of Impairment
Mississippi River, south of Bemidji	Dissolved Oxygen
Carr Lake, located about 1 mile south of Bemidji)	Mercury
Blackwater Lake	Mercury
Leech River, south of Ball Club Lake	Dissolved Oxygen
Pike Bay	Mercury
Ball Club Lake	Mercury

Source: MPCA 2008

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.

Federal Emergency Management Agency (FEMA) Floodplain data have not been fully developed for the routes. Identified FEMA floodplains include (FEMA, 2003):

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

Other floodplain areas are likely present within the Study Area, but have not been included in the FEMA GIS dataset. These areas include, but may not be limited to, the Mississippi River and other tributaries, Ball Club Lake, Lake Winnibigoshish, Cass Lake, and Sucker Lake.

Groundwater

Groundwater resources in the Study Area include a buried Quaternary aquifer (comprised of glacial outwash deposits) and to a much lesser extent, Cretaceous and Precambrian bedrock aquifers that are scattered throughout. In general, groundwater quantity and/or accessibility is not a problem in the Study Area. Groundwater resources may be encountered during excavations for transmission line structures in low-lying and/or wet areas. Depth to water table varies throughout the Study Area, from less than 5 feet to over 50 feet, but generally is found within 25 feet of the surface. In general, groundwater in the Study Area is relatively good, with chemical levels similar or lower than those found in similar aquifers elsewhere in Minnesota (MPCA, 1998).

8.16.2 Direct/Indirect Effects

Public Waters

Table 8.16-3 and Table 8.16-4 summarize the PWI basins and PWI watercourses that are located within the 125-foot right-of-way for each route.

Table 8.16-3 PWI Basins Identified within the 125-foot Right-of-way

PWI Basin	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2A
Unnamed Basin at Bemidji	X	-	X	X	-	-
Moss Lake	X	X	-	X	-	-
Twin Lake	X	X	-	X	-	-
Unnamed Basin at 143rd St.	-	X	-	-	-	-
Unnamed Basin at Cub Hill Rd.	-	-	X	-	-	-
Unnamed Basin at Bena	-	-	-	-	X	X
Unnamed Oxbow at Mississippi River I	X	X	X	X	-	-
Unnamed Oxbow at Mississippi River II	X	X	X	X	-	-
Unnamed Oxbow at Mississippi River III	X	X	X	X	-	-
Unnamed Oxbow at Mississippi River IV	-	-	-	-	X	X
Unnamed Oxbow at Mississippi River V	-	-	-	-	X	X
Unnamed Oxbow at Mississippi River VI	-	-	-	-	X	X
Unnamed Oxbow at Leech Lake River I	-	-	-	X	-	X
Unnamed Oxbow at Leech Lake River II	-	-	-	X	-	X
Unnamed Basin at Boswell	X	X	X	X	X	X
Total Crossings	7	7	6	9	5	7

Source: MNDNR, 2007
Note: X indicates that part of thePWI basin is within the right-of-way.

Direct impacts to surface water resources are not likely to occur to PWI basins or watercourses because of construction of the Project. The Applicants anticipate that the surface water features would be avoided by spanning the transmission line over the waterbodies or redirecting the route to avoid these areas entirely. There are no waterbodies that are wider than the maximum span along the proposed routes, such that complete avoidance would not be feasible. It is anticipated that no structures would be placed in PWI waterbodies, resulting in no temporary or permanent impacts.

Table 8.16-4 PWI Watercourses Crossed by the 125-foot Right-of-way

PWI Watercourses	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2A
Mississippi River	X	X	X	X	X	X
Schoolcraft River	X	X	X	X	-	-
Necktie River	X	X	X	X	-	-
Unnamed Necktie Tributary	X	-	X	X	-	-
Bungashing Creek		X	-	-	-	-
Unnamed Tributary at Pike Bay/Cass Lake	X	X	-	X	X	X
Sucker Creek	X	X	X	X	-	-
Portage Creek	X	X	X	X	-	-
Leech Lake River	-	-	-	X	-	X
Ball Club River	X	X	X	X	X	X
Deer River	X	X	X	X	X	X
Blackwater Creek	X	X	X	X	X	X
Total Crossings	12	11	11	13	7	8

Source: MNDNR, 2007

Note: X indicates that part of the PWI watercourse is crossed by the right-of-way.

Floodplains

Routes 1, 1A, 1B and 1C

A review of digital floodplain data shows that eight transmission structures may be placed in floodplains adjacent to the Mississippi River (two structures) and White Oak Lake (six structures), assuming an average spacing of 800 feet between structures (FEMA, 2003). The estimated permanent impact would be 113 square feet (0.002 acres). Since floodplain impacts are, generally, regulated based on changes to floodplain storage (volume), the overall storage impact would correspond to approximately 0.5 cubic yard of displaced water for every foot of inundation, for each structure. Overall impacts would depend on the elevation of the poles as compared to the floodplain elevation. Storage volume impacts would be determined during final design, once pole locations have been identified.

Routes 2 and 2C

The direct and indirect effects of Routes 2 and 2C would be similar to those described for Route 1 and its alternatives above. These routes would have four transmission structures placed in the floodplains adjacent to the Mississippi River (two structures) and White Oak Lake (two structures) (FEMA, 2003). Under this configuration, 56.52 square feet (0.001 acres) of impact is anticipated.

Groundwater

Permanent impacts to groundwater resources would not occur as a result of this Project. Temporary impacts during construction may occur if dewatering is necessary to install the transmission structures. Any dewatering effects on water tables would be localized and short-term. The Project would not impact municipal or private water uses in the Study Area. No water storage, reprocessing, or cooling is required for the construction or operation of

the transmission line or substations. Therefore, the Project would not result in violations of groundwater quality standards.

8.16.3 Direct/Indirect Effects within the Leech Lake Reservation

None of the routes would impact FEMA floodplains within the Leech Lake Reservation (LLR). No poles would be placed in floodplains, resulting in no impacts to floodplains in the LLR. Likewise, no impacts to groundwater are anticipated.

8.16.4 Direct/Indirect Effects within the Chippewa National Forest

None of the routes would impact FEMA floodplains within the Chippewa National Forest (CNF). No poles would be placed in floodplains, resulting in no impacts to floodplains in the CNF. Likewise, no impacts to groundwater are anticipated.

8.16.5 Mitigation

Surface Water

The project would likely require a number of water resource permits, including a Stormwater Pollution Prevention Plan, National Pollution Discharge Elimination System Permit, License to Cross Public Waters, Public Waters Work Permit, and Section 10 Permit. The Applicants would maintain sound soil and water conservation practices during construction and operation of the Project to protect topsoil and adjacent water resources, and to minimize soil erosion. BMPs may include:

- Locate structures and disturbed areas away from rivers and lakes, where practicable
- Contain stockpiled material away from stream banks and lake shorelines
- Install sediment and erosion control prior to construction in accord with sediment and erosion control plans and permits
- Use turbidity control methods prior to discharging wastewater from concrete batching or other construction operations to streams or other surface waters
- Spread topsoil and seed in a timely manner
- The Applicants would work with the jurisdictional agencies – MPCA, DNR, and US Army Corps of Engineers (USACE) – to determine the best ways to minimize impacts and create appropriate mitigation measures

Floodplains

The Project would locate structures outside of floodplains to the extent practicable. The Applicants would work with the jurisdictional agencies to determine the best ways to minimize impacts and create appropriate mitigation measures.

Construction of the transmission line is not expected to alter existing drainage patterns or floodplain elevations due to the small footprint of the poles and their relatively wide spacing. The transmission structures placed in floodplains have a small cross section, resulting in negligible fill. No change in floodplain functions would occur due to construction of the

Project. If floodplain contours are disrupted during construction, they would be returned to their pre-construction profile once construction is complete.

Groundwater

If dewatering is necessary, a dewatering permit would be obtained from the DNR. If the dewatered groundwater contains substantial quantities of suspended sediments, then the water would be filtered though silt fence or bio-rolls prior to discharge.

8.17 *Wetlands*

8.17.1 Existing Conditions

National Wetland Inventory Wetlands

Existing conditions are described for National Wetland Inventory (NWI) wetlands mapped within the 1,000-foot-wide routes. Wetlands are common within the Study Area, making up approximately 25 to 28 percent of the area within the routes. Table 8.17-1 details NWI wetland acreages within each route.

Routes 1B and 1C have the greatest areas of NWI wetlands, at 2,499 acres and 2,505 acres respectively, as well as the largest areas of NWI wetlands within the Chippewa National Forest (CNF) and the Leech Lake Reservation (LLR). Route 2 has the least area of NWI wetlands (2,014 acres), as well as the least amount of NWI wetland areas in the CNF and LLR. Figure 6 displays the NWI wetlands in the project area.

This space left intentionally blank

Table 8.17-1 NWI Wetlands Identified within the 1,000-foot Routes

NWI Type		Route 1		Route 1A		Route 1B		Route 1C		Route 2		Route 2C	
		Acres	% of Route	Acres	% of Route	Acres	% of Route	Acres	% of Route	Acres	% of Route	Acres	% of Route
Entire Route	Freshwater Emergent	643.9	7.7	725.8	8.2	702.3	7.7	674.9	7.6	453.5	5.5	484.5	5.5
	Freshwater Forested/Scrub Shrub	1,664.5	19.9	1,672.6	18.9	1,765.6	19.4	1,776.0	19.9	1521.6	18.5	1633.1	18.7
	Freshwater Pond	20.4	0.2	24.3	0.3	15.3	0.2	22.5	0.3	17.6	0.2	19.7	0.2
	Lacustrine	14.4	0.2	14.4	0.2	3.2	0.0	14.4	0.2	12.8	0.2	12.8	0.1
	Riverine	13.0	0.2	13.0	0.1	13.0	0.1	17.4	0.2	8.6	0.1	13.0	0.1
	All NWI Wetlands	2,356.1	28.1	2,450.2	27.7	2,499.3	27.5	2,505.3	28.1	2014.1	24.5	2163.2	24.7
Chippewa National Forest Managed Land	Freshwater Emergent	174.2	2.1	174.0	2.0	175.6	1.9	192.8	2.2	137.2	1.7	155.8	1.8
	Freshwater Forested/Scrub Shrub	342.4	4.1	342.2	3.9	351.7	3.9	390.3	4.4	246.9	3.0	294.8	3.4
	Freshwater Pond	6.8	0.1	6.8	0.1	9.8	0.1	6.8	0.1	3.3	0.0	3.3	0.0
	Lacustrine	--	--	--	--	--	--	--	--	--	--	--	--
	Riverine	2.6	0.0	2.6	0.0	2.6	0.0	2.6	0.0	4.8	0.1	4.8	0.1
	All NWI Wetlands	529.1	6.3	528.7	6.0	539.7	5.9	595.6	6.7	400.9	4.9	467.4	5.4
Leech Lake Reservation	Freshwater Emergent	469.1	5.6	470.5	5.3	527.5	5.8	491.4	5.5	322.4	3.7	344.8	3.9
	Freshwater Forested/Scrub Shrub	1,235.6	14.7	1,275.6	14.4	1,336.8	14.7	1,337.9	15.0	1080.5	12.4	1224.7	13.5
	Freshwater Pond	15.7	0.2	18.1	0.2	10.6	0.1	15.7	0.2	15.6	0.2	15.6	0.2
	Lacustrine	11.2	0.1	11.2	0.1	0.0	0.0	11.2	0.1	12.8	0.2	12.8	0.1
	Riverine	8.2	0.1	8.2	0.1	8.2	0.1	10.3	0.1	6.2	0.1	8.4	0.1
	All NWI Wetlands	1,739.8	20.8	1,783.6	20.2	1,883.0	20.7	1,866.6	21.0	1437.6	16.4	1564.4	17.9

Source: USFWS, 2005

Public Water Inventory Wetlands

Table 8.17-2 shows the number of Department of Natural Resources (DNR) Public Water Inventory (PWI) wetlands located within each route. Section 8.16 Water Resources, provides a more detailed discussion of PWI streams and basins.

Table 8.17-2 PWI Wetlands Identified within the 1,000-foot Routes

	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Number of PWI Crossings	8	8	8	11	5	8
Number of PWI Crossings on the LLR	3	3	3	6	4	7
Number of PWI Crossings on CNF Managed Land	2	2	2	3	4	7

8.17.2 Direct/Indirect Effects

Potential effects to wetland areas are described for the 125-foot-wide right-of-way. Three types of impacts to wetland areas would result from the Project: permanent impacts, conversion impacts, and temporary impacts.

Permanent wetland impacts would occur where dredging or filling is required for structure installation. The area of permanent impact is anticipated to equal 40 square feet per H-frame structure. Permanent impacts would only occur if a wetland cannot be spanned.

Permanent conversion of wetland type would occur where the clearing of forested wetland areas would be required within the right-of-way. Removal of woody vegetation within a wetland area would not require dredging or filling, but would convert the forested wetland area to a different vegetative class and thus a different wetland type.

Temporary wetland impacts due to construction activities may occur to wetland areas that are not permanently impacted or permanently converted to another wetland type. For example, if a wetland area is traversed by construction equipment it may cause soil compaction or vegetation removal.

Table 8.17-3 shows the estimated temporary, permanent, and conversion impacts to NWI wetlands within the right-of-way. Permanent impacts for all routes would be 0.11 acres or less. Wetland type conversion would range from 166 acres for Route 2 to 224 acres for Route 1C. Temporary impacts would range from 58 acres for Route 2 to 102 acres for Route 1A.

Table 8.17-3 Estimated Wetland Impacts within the 125-foot Right-of-way

NWI Wetland Impact Type	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Temporary Impacts (ac)	82.6	101.7	89.3	85.4	59.2	62.0
Wetland Type Conversion (ac)	209.1	197.7	222.7	223.6	166.0	180.5
Permanent Impacts (ac)	0.10	0.11	0.11	0.11	0.08	0.09
Total (ac)	291.8	299.51	312.11	309.11	225.28	242.59

Note: See Chapter 7 for details on the calculation methods.

Table 8.17-4 provides a preliminary estimate of the number of wetlands that would have permanent impacts from the placement of structures.

Table 8.17-4 NWI Wetland Complexes that Cannot be Spanned

Description	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Number of NWI wetland complexes greater that 800-foot-long that cannot be spanned	29	35	33	31	30	32
Estimated number of structures that would be placed in an NWI wetland	113	115	119	117	93	96
Estimated percent of route structures that would be placed in an NWI wetland	24.8	23.7	24.1	24.1	20.7	20.8

8.17.3 Direct/Indirect Effects within the Leech Lake Reservation

Table 8.17-5 shows the estimated temporary impacts, permanent wetland type conversion, and permanent impacts to NWI wetlands located within right-of-way areas within the LLR. Overall, impact proportions would be similar to those described above for the entire route lengths.

Table 8.17-5 Estimated Wetland Impacts within the LLR Portion of the Right-of-way

NWI Wetland Impact Type	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Temporary NWI Impacts (ac)	63.1	62.7	69.9	64.1	43.2	44.2
NWI Wetland Type Conversion (ac)	161.5	165.7	175.1	174.3	121.3	134.1
Permanent NWI Impacts (ac)	0.08	0.08	0.09	0.09	0.06	0.07
Total	224.68	228.48	245.09	238.49	164.56	178.37

Table 8.17-6 provides a preliminary estimate of the number of LLR wetlands that would have permanent impacts from the placement of structures.

Table 8.17-6 NWI Wetland Complexes that Cannot be Spanned within the LLR

Description	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Number of NWI wetland complexes greater that 800-foot-long that cannot be spanned	23	23	27	25	23	25
Estimated number of structures that would be placed in an NWI wetland	92	92	97	94	67	69
Estimated percent of route structures that would be placed in an NWI wetland	20.0	18.9	19.6	19.3	14.9	14.4

8.17.4 Mitigation

Best Management Practices ("BMPs") for sediment and erosion control would be implemented to minimize impacts to water resources. These BMPs would protect topsoil and adjacent water resources by trapping sediments; this would avoid contributing sediment to wetlands, the Mississippi River, and its tributaries. In order to minimize contamination of wetlands due to accidental spilling of fuels or other hazardous substances, the Applicants would develop and implement spill prevention procedures to aid in the prevention of potential contamination due to a fuel or hazardous substance spill. Refueling would occur at sites away from wetlands and waters. The Applicants would avoid major disturbance of individual wetlands and drainage systems during construction. This would be done by spanning wetlands and drainage systems, where possible. When it is not possible to span the wetland, the Applicants would draw on several options during construction to minimize impacts:

- When possible, construction would be scheduled during frozen ground conditions.
- Crews would attempt to access the wetland with the least amount of physical impact to the wetland (i.e., shortest route).
- The structures would be assembled on upland areas before they are brought to the site for installation, when practical.
- When construction during winter is not possible, construction mats would be used where wetlands would be impacted. Additionally, the Applicants have access to an all-terrain construction vehicle that may be used, which is designed to minimize soil impact in damp areas.
- Wetlands temporarily impacted would be restored as required by the USACE and responsible local government unit (LGU) under the Wetland Conservation Act.

- Unavoidable impacts would be permitted through the USACE and LGU, and any required mitigation plans would be submitted for approval by the appropriate agencies.

8.18 *Flora*

8.18.1 Existing Conditions

The Study Area is located within the Chippewa Plains Subsection of the Northern Minnesota Drift and Lakes Plains Ecoregion. Historically, the Study Area was composed of a diverse mix of pine (red, white, and jack), hardwoods (oak, maple, and basswood), aspen, birch, and wetland communities (Marschner, 1974). Since settlement, many of these vegetative communities have been altered and fragmented, especially in areas outside of national and state forest land.

Geographic Analysis Program (GAP) landcover data indicates that the Study Area is primarily composed of forested areas (See Section 8.1 Land Use). GAP level 4 data indicates that aspen/white birch is the most common landcover with other prevalent cover types including cropland, upland deciduous, and lowland deciduous shrub (Table 8.18-1). Red/white pine, broadleaf sedge/cattail, lowland deciduous, and lowland black spruce are also present within the Study Area. Figure 2 displays general land cover types found throughout the project area.

Table 8.18-1 Landcover Types within the Study Area (acres)

Landcover Type	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Aspen/White Birch	1,942.9	2,067.0	2,269.7	2,223.4	1,706.1	1,986.6
Cropland	1,511.6	1,539.7	1,556.6	1,511.6	1,097.8	1,097.8
Upland Deciduous	957.2	1,132.8	1,102.7	988.0	409.1	439.8
Lowland Deciduous Shrub	957.4	1,020.9	993.1	999.1	895.2	936.8
Red/White Pine	405.1	414.0	338.8	432.7	365.3	392.7
Broadleaf Sedge/Cattail	399.9	390.8	454.7	417.7	420.3	438.0
Lowland Deciduous	291.7	325.2	302.5	316.3	273.9	298.5
Upland Shrub	263.4	325.0	300.9	268.0	803.9	808.5
Lowland Black Spruce	197.1	165.6	211.5	206.9	123.9	133.7
All Other Types	1,455.9	1,460.8	1,560.9	1,543.5	2,014.0	2,101.6
Total	8,382.3	8,841.8	9,091.4	8,907.1	8,163.5	8,688.4

Source: DNR GAP Level 4 Landcover Data

8.18.2 Direct/Indirect Effects

Please refer to Section 8.1 Land Use for right-of-way effects on broad landcover types. See Section 8.26 for impacts to specific forest resources.

Table 8.18-2 summarizes vegetative communities within the right-of-way of the Project. The aspen/white birch community would have the most impacts from all routes, followed

generally by cropland along Routes 1, 1A, 1B, and 1C, and lowland deciduous shrub for Routes 2 and 2C.

Table 8.18-2 Landcover Types within the 125-foot Right-of-way (acres)

Landcover Type	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Aspen/White Birch	248.9	242.7	290.0	286.4	205.6	243.1
Cropland	210.6	233.2	220.4	210.6	117.7	117.7
Lowland Deciduous Shrub	143.5	146.9	147.9	146.6	112.0	115.1
Upland Deciduous	132.6	164.7	140.7	136.4	36.0	39.8
Lowland Deciduous	44.4	44.2	45.0	49.0	24.9	29.6
Broadleaf Sedge/Cattail	43.0	44.6	48.7	45.4	56.7	59.1
Red/White Pine	40.7	39.7	31.1	42.3	46.6	48.3
Jack Pine	26.8	24.8	25.3	28.2	26.7	28.1
Upland Shrub	24.0	44.5	31.3	24.4	162.2	162.7
Sedge Meadow	21.6	25.1	21.6	21.7	14.2	14.3
Maple/Basswood	21.2	23.9	29.7	21.2	8.3	8.3
Lowland Black Spruce	20.3	16.6	22.3	21.7	9.4	10.8
Upland Conifer	6.2	7.8	8.0	7.6	55.1	56.5
All Other Types	61.8	56.2	71.0	69.9	156.6	164.5
Total	1,045.6	1,114.8	1,133.2	1,111.5	1,032.0	1,097.9

Source: DNR GAP Level 4 Landcover Data

8.18.3 Direct/Indirect Effects within Leech Lake Reservation

Table 8.18-3 summarizes vegetative communities within the right-of-way for the Leech Lake Reservation (LLR) portion of the Project. Similar to the previous discussion, the aspen/white birch community would have the most impact from all routes, followed generally by lowland deciduous shrub along Routes 1, 1A, 1B, and 1C and upland shrub for Routes 2 and 2C.

Table 8.18-3 Landcover Types within LLR Right-of-way (acres)

Landcover Type	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Aspen/White Birch	175.6	160.6	216.7	211.2	157.7	193.2
Lowland Deciduous Shrub	114.1	113.9	118.5	116.2	83.2	85.4
Upland Deciduous	98.1	94.2	106.2	101.9	27.7	31.5
Cropland	54.8	57.3	64.6	54.8	31.6	31.6
Red/White Pine	38.5	37.7	28.9	40.1	44.7	46.4
Lowland Deciduous	35.7	36.3	36.3	40.4	11.7	16.3
Broadleaf Sedge/Cattail	24.4	23.3	30.1	24.6	32.5	32.6
Jack Pine	19.4	19.4	17.9	20.8	12.0	13.4
Maple/Basswood	16.6	16.2	25.1	16.6	3.0	3.0
Lowland Black Spruce	15.0	14.9	17.0	16.4	8.8	10.1
Sedge Meadow	13.9	14.7	13.9	13.9	5.7	5.7
Upland Shrub	13.7	21.9	20.9	13.7	109.4	109.4
All Other Types	42.2	42.8	53.3	51.7	127.2	136.7
Total	662.0	653.2	749.6	722.3	660.4	720.7

Source: DNR GAP Level 4 Landcover Data

Refer to Section 8.1 Land Use for right-of-way effects on broad landcover types. See Section 8.25 for impacts to specific forest resources.

8.18.4 Forestry Direct/Indirect Effects within the Chippewa National Forest

The Chippewa National Forest (CNF) has mapped out the land that it manages at a more detailed level than is available through GAP landcover analysis. Hence, forest stand information that has been mapped by the CNF, rather than GAP data, was used to identify potential vegetative impacts to areas within the CNF (Table 8.18-4).

Table 8.18-4 CNF-managed Forest Stands within the Right-of-way (acres)

Landcover Type	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Aspen/White Spruce/Balsam Fir	21.3	21.3	34.2	21.9	19.3	19.8
Balsam Fir/Aspen/Paper Birch	8.9	8.9	12.0	12.0	1.9	4.9
Bigtooth Aspen	8.2	1.6	8.0	8.2	0.0	0.0
Black Ash/American Elm/Red Maple	3.2	3.2	3.2	10.0	0.5	7.4
Black Spruce	4.4	4.4	5.3	5.8	0.9	2.3
Burr Oak	0.0	0.0	0.0	0.3	0.0	0.3
Jack Pine	17.4	17.4	7.7	18.3	13.2	14.2
Lowland Shrubs	13.3	13.3	10.7	14.1	8.5	9.3
Mixed Hardwoods (Maple/Elm/Basswood)	20.3	20.3	21.9	20.3	26.0	26.0
Mixed Conifer Swamp	4.4	4.4	4.8	5.8	14.9	16.3
Northern Red Oak	0.0	0.0	0.0	0.0	0.0	0.0
Northern White Cedar	5.5	5.5	5.5	5.5	1.6	1.6
Open	41.2	41.0	46.4	43.0	62.3	64.1
Paper Birch	11.9	11.9	6.5	13.3	17.4	18.7
Quaking Aspen	61.8	61.8	55.1	79.3	31.1	48.7
Red Pine	58.2	58.2	47.9	62.4	48.2	52.4
Sugar Maple/Basswood	34.6	34.6	48.5	34.6	5.1	5.1
Tamarack	6.9	6.9	7.2	7.6	7.7	8.4
Upland Shrubs	17.9	17.9	17.9	17.9	2.2	2.2
White Pine	6.9	6.9	6.9	6.9	19.6	19.6
White Spruce/Balsam Fir	1.3	1.3	1.3	1.3	2.9	2.9
Total	347.7	340.8	350.9	388.6	283.3	324.3

Source: USDA Forest Service. 2007. Chippewa National Forest Stand Data.

As part of the 2004 *Chippewa National Forest Land and Resource Management Plan*, the CNF has been delineated into Landscape Ecosystem (LE) areas that serve as a resource for ecological management. These LE areas help to direct the CNF's decisions as it seeks to move vegetation from existing conditions toward long-term desired conditions. According to the 2004 Management Plan:

> *"LEs are ecological areas derived from a combination of individual or groupings of native plant communities, ecological systems, and Terrestrial Ecological Unit Inventories at the Landtype and Ecological Landtype scales. Each LE is characterized by its dominant vegetation communities and patterns."*

Table 8.18-5 summarizes the LE areas that fall within the rights-of-way located in the CNF. Dry-mesic pine/oak is the dominant LE type that would be impacted by the Project, for all routes.

Table 8.18-5 CNF Landscape Ecosystems within in the Right-of-way (acres)

Ecosystem Type	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Boreal Hardwood/Conifer	79.1	79.1	74.9	79.1	7.2	7.2
Dry Pine	0.0	0.0	4.2	0.0	16.1	16.1
Dry-mesic Pine	21.3	21.3	16.3	21.3	22.5	22.5
Dry-mesic Pine/Oak	148.2	141.4	110.5	187.5	191.9	231.1
Mesic Northern Hardwood and Rich Hardwood	30.3	30.3	74.5	30.3	0.0	0.0
Tamarack Swamp, Forested Bog and Forested Poor Fen	54.5	54.5	54.5	56.2	37.5	39.2
Wet Sedge Meadow	14.1	14.1	14.1	14.1	8.6	8.6
Total	347.5	340.8	348.9	388.5	283.8	324.7

Source: USDA Forest Service. 2004. CNF, Chippewa National Forest Land and Resource Management Plan

8.18.5 Mitigation

The Applicants would continue to work with the CNF and the Department of Natural Resources (DNR) to minimize and avoid impacts to sensitive flora within the national and state forests. Areas disturbed in national and state forestlands would be reseeded with a seed mix recommended by the appropriate agency's management.

See Sections 8.1 Land Use and 8.25 Forestry for additional mitigation discussion.

8.19 *Fauna*

8.19.1 Existing Conditions

Habitat for small mammals, such as voles, shrews, mice, and rabbits; larger mammals, such as beaver, bobcat, coyote, gray wolf, river otter, fox, white tailed deer, and black bear; as well as waterfowl and songbirds (both forest, wetland, and grassland species) is present within the Study Area. Fish, reptiles, and amphibians, such as snakes, turtles, toads, and frogs inhabit wetlands and open water areas.

This wildlife, which includes both resident and migratory species, uses the habitat within the routes for forage, shelter, breeding habitat, and/or stopover during migration. Many of the species present are closely associated with riparian, wetland, and forest habitats.

Portions of the Chippewa National Forest (CNF) and the Bowstring State Forest are located within the Study Area. These lands are managed for multiple uses, including wildlife habitat. Within the CNF there is habitat for at least 239 species of birds, of which more than 100 species are known to breed in the CNF (CNF, 2008). The CNF provides habitat for one of the largest breeding populations of bald eagles in the lower 48 states. Bald eagles most commonly inhabit forested areas near lakes and rivers. Known bald eagle nesting sites within the CNF include large red and white pines, and occasionally aspen (USFS, 2008).

Several nesting locations have been documented within the Study Area. A great blue heron rookery is located near Portage Lake along Route 1 and its alternatives (NHIS, 2007). NHIS and CNF records indicate that there are four to five known bald eagle nesting areas within each of the routes.

Bemidji Slough Wildlife Management Area (WMA), which is primarily a wetland complex, is crossed by Routes 1, 1B, and 1C. These routes, however, are broad enough to avoid constructing a portion of the Project within the WMA. The routes do not include any part of a Scientific and Natural Area (SNA). Hole-in-the Bog SNA is just south of the Study Area.

8.19.2 Direct/Indirect Effects

The potential effects of the routes and the route segments on fauna located within the Leech Lake Reservation (LLR) and CNF would be consistent with those discussed below and are not discussed separately.

Potential impacts to wildlife species include the loss or alteration of breeding and foraging habitats, and increased habitat fragmentation. Because the Project would convert woodland habitat to grasslands or shrub lands, species that favor forests would tend to be displaced while species that favor grasslands or shrub lands would increase. Overall, the routes would convert 460 to 640 acres (Route 2 and Route 1C, respectively) of woodland to grasslands and shrub lands (See Section 8.1 Land Use).

Habitat fragmentation occurs when a large intact habitat is broken into separate parts because of development. The Project would convert a narrow (125-foot) strip of forest to grassland and shrubland. In most areas, this would not substantially increase fragmentation because the Project would be adjacent to existing utility/road/rail rights-of-way. However,

construction of the transmission line on new "cross country" routes within forested habitats does have the potential for fragmentation (Wisconsin Division of Energy, 2004). There is data indicating that such corridors provide the opportunity for unwanted species, such as cowbirds, to become established because of the creation of a travel corridor and more "edge" between the two habitats. Creation of edge tends to benefit commonplace species at the expense of those species that have either very large home ranges or very specific habitat requirements, such as deep woods songbirds. Undesirable species can have a localized effect on surrounding populations. Studies show that nest predation may extend from the edge as far as 2,000 feet into the forest (University of Connecticut 2008). In addition to the immediate habitat change within the right-of-way, vegetation changes within the adjacent forest may be detectable for 30 to 100 feet. Table 8.19-1 provides a summary of the cross-country segments for each route.

Table 8.19-1 Length of Cross-country Segments Included in Each Route

Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
5.2 Miles	5.4 Miles	9.7 Miles	9.3 Miles	1.8 Miles	6.0 Miles

Wildlife could be impacted in the short-term within the immediate area of construction. Mortality could also occur during construction to less mobile or burrowing species. Regarding bird species, abandonment of a nest site and the loss of eggs and/or young may occur as a result of construction.

Avian collisions, especially of raptor and waterfowl species, are a possibility after the completion of the transmission line. Of these species, waterfowl are the most susceptible to transmission line collision, particularly if the transmission line is placed between agricultural fields that serve as feeding areas, or between wetlands and open water. There are numerous water bodies within the Study Area that may serve as habitat for waterfowl species. In particular, the Department of Natural Resources (DNR) and CNF have expressed concerns about the Mississippi River crossing, as this is considered a primary flyway.

Electrocution of large birds, such as raptors, is a concern typically related to distribution lines. Electrocution occurs when birds with large wingspans come in contact with either two conductors or a conductor and a grounding device. The Applicants' transmission line design standards would provide adequate spacing to eliminate the risk of raptor electrocution. Electrocution, therefore, is not a concern related to the transmission line.

Additional avian impacts may occur if raptor species or other bird species build nests on the transmission line structures.

8.19.3 Mitigation

Habitat conversion and fragmentation would be minimized to the extent practicable by siting the line next to existing corridors. Right-of-way clearing in forested areas would be minimized to the extent practicable, while maintaining adequate clearance for safety and security of the transmission line in accord with federal regulations and industry standards.

The Applicants would address avian issues by working with the DNR, the CNF, and the U.S. Fish and Wildlife Service (USFWS) to identify any areas that may require marking transmission line shield wires and/or using alternative structures to reduce the likelihood of avian collisions.

An Avian Protection Plan (APP) would be developed that incorporates protection measures for the engineering, design, and construction of the transmission line. The APP would be developed using the *Suggested Practices for Avian Protection on Power Lines: The State of the Art in 2006*. The plan would focus on selecting substation components for insulation and isolation measures to minimize the potential electrocution of birds.

The Applicants would incorporate avian collision minimization measures in the APP. Additionally, in areas determined to be major flyways or staging areas for migratory waterfowl, the transmission line would be marked to minimize the likelihood of bird collisions. These areas would be identified in cooperation with regulatory agency staff.

8.20 *Noxious Weeds and Exotic Organisms*

8.20.1 Existing Conditions

There are 11 primary and 52 secondary classified noxious weeds in Minnesota (Appendix L). Primary noxious weeds must be controlled or eradicated, according to Minn. Stat. § 18.78. Secondary noxious weeds are not regulated unless a county chooses to place a secondary noxious weed on its prohibited or restricted weed list. There are nine secondary species that are regulated by counties within the Study Area (Table 8.20-1).

Table 8.20-1 MN Primary and County-Selected Secondary Noxious Weeds

Primary Noxious Weeds		
Scientific	Common	Regulatory List
Alliaria petiolata	Mustard, Garlic	Minnesota
Cannabis sativa	Hemp	Minnesota
Carduus acanthoides	Thistle, plumeless	Minnesota
Carduus nutans	Thistle, musk	Minnesota
Cirsium arvense	Thistle, Canada	Minnesota
Cirsium vulgare	Thistle, bull	Minnesota
Convolvulus arvensis	Field bindweed	Minnesota
Euphorbia esula	Spurge, leafy	Minnesota
Lythrum salicaria	Loosestrife, purple	Minnesota
Sonchus arvensis	Sowthistle, perennial	Minnesota
Toxicodendron radicans	Poison ivy	Minnesota
County Selected Secondary Noxious Weeds		
Ambrosia artemisifolia	Ragweed, Common	Cass
Arctium minus	Burdock	Cass
Artemisia absinthium	Wormwood	Cass
Berteroa incana	Hoary Alyssum	Beltrami, Cass, Hubbard
Centaurea maculosa	Spotted Knapweed	Beltrami, Cass, Hubbard
Chrysanthemum leucanthemum	Oxeye Daisy	Cass, Hubbard, Itasca
Hieracium aurantiacum	Orange Hawkweed	Cass, Itasca
Ranunculus acris	Buttercup, Tall	Cass, Hubbard, Itasca
Tanacetum vulgare	Tansey	Beltrami, Cass, Itasca

The Minnesota Department of Agriculture Weed Integrated Pest Management Project (WIPM) has documented spotted knapweed (*Centaurea maculosa*) and leafy spurge (*Euphorbia esula*) within the routes (MDA, 2007). WIPM leafy spurge records occur in clusters near

Cohasset and near Bena. Spotted knapweed records occur in clusters near the cities of Cass Lake and Bemidji.

The U.S. Forest Service (USFS) has a list of noxious weeds that are being tracked within the Chippewa National Forest (CNF) as shown on Table 8.20-2. Additionally, the CNF has concerns about non-native invasive animals, specifically the earthworm (*Lumbricidae* sp.) and the rusty crayfish (*Orconectes rusticus*).

Table 8.20-2 Noxious Weeds Tracked within Chippewa National Forest

CNF Identified Noxious Weeds		
Scientific	Common	Status
Centaurea maculosa	Spotted knapweed	Primary weed
Euphorbia esula	Leafy spurge	Primary weed
Lythrum salicaria	Purple loosestrife	Primary weed
Rhamnus cathartica/frangula	Buckthorn	Primary weed
Alliaria petiolata	Garlic mustard	Primary weed
Berteroa incana	Hoary alyssum	Secondary weed
Carduus acanthoides	Plumeless thistle	Secondary weed
Tanacetum vulgare	Common tansy	Secondary weed
Potamogeton crispus	Curlyleaf pondweed	Secondary weed
Cirsium arvense	Canada thistle	Secondary weed
Cirsium vulgare	Bull thistle	Secondary weed
Convolvulus arvensis	Field bindweed	Secondary weed
Sonchus arvensis, S. uliginosus	Sowthistle	Secondary weed
Cenchrus longispinus	Field sandspur	Native noxious weed
Toxicodendron radicans	Poison ivy	Native noxious weed
Prhagmites australis	Common reed	Monitored noxious weed
Typha angustifolia	Narrow-leaved cattail	Monitored noxious weed
Melilotus alba/officinalis	White/yellow sweet clover	Monitored (not official)

Source: Chippewa National Forest Noxious Weeds List

8.20.2 Direct and Indirect Effects

Potential effects for the routes and route segments located within the Leech Lake Reservation (LLR) and CNF-managed properties would be consistent with those discussed below and are not discussed separately.

Construction of any of the routes could lead to the introduction or spread of noxious weeds and/or earthworms in an area, due to ground disturbance, introduction of contaminated topsoil, and/or vehicles importing weed seed from a contaminated site to an

uncontaminated site. The potential for the Project to spread the rusty crayfish is low since there would be minimal work within waterbodies.

8.20.3 Mitigation

The Applicants' environmental inspector would conduct a field review of the right-of-way and construction staging sites prior to construction to identify areas that currently contain noxious weeds. The inspector would also consult with local officials to determine if there are records of contaminated areas. Construction vehicles, especially the under carriage, would be power-washed prior to construction start if they have been in contact with noxious weed seed, particularly when traveling from an area identified as contaminated by noxious weeds to an uncontaminated area.

The introduction of noxious weeds would be minimized by proper and prompt re-vegetation using regionally native species. Seed mix composition would be coordinated with the CNF, Department of Natural Resources (DNR), and Department of Resource Management (DRM) of the Leech Lake Band of Ojibwe (LLBO) staff. Seed mixes used for the Project would be certified as weed free. Only clean straw mulch would be used; "meadow hay" would not be allowed as a mulch material.

8.21 *Rare and Unique Species and Communities*

8.21.1 Existing Conditions

There are no records for federally listed species within the proposed routes or route Study Areas. There are no Scientific and Natural Areas (SNAs) within the proposed routes, although Route 1 and its alternatives come within approximately 0.25 miles of Hole-In-The-Bog SNA.

There are six bird species and ten plants species within the routes that have been placed on one or all of the sensitive species lists for the state of Minnesota, the US Forest Service (USFS), and the Leech Lake Band of Ojibwe (LLBO). Tables 8.21-1 through 8.21-4 summarize the sensitive species according to state, USFS, and LLBO classifications.

Unique records of species documented within the overall Study Area (routes plus a 1-mile buffer) are provided in Appendix L. As indicated in Section 7.21, the data for the Study Area provide a more comprehensive review of potential species distribution, since the routes have not been field surveyed in detail.

According to the DNR Natural Heritage Information System (NHIS) and USFS databases, Route 1 and its alternatives contain a greater variety of documented rare and unique species than Routes 2 and 2C (12 to 13 species compared to 9 species, respectively). When considering the overall study area, however, Routes 1, 2, and their alternatives have similar numbers of documented species (25 to 26 species). Figure 7 displays NHIS and USFS observations near the project.

This space intentionally left blank

Table 8.21-1 Number of Occurrences of Rare and Unique Species within Each 1,000-foot Route

Name[1]		Route 1		Route 1A		Route 1B		Route 1C		Route 2		Route 2C		Status[2]		
Common	Scientific	NHIS	USFS	NHIS	USFS	NHIS	USFS	NHIS	USFS	NHIS	USFS	NHIS	USFS	State	USFS	LLBO
Birds																
Le Conte's Sparrow	*Ammodramus leconteii*	0	1	0	1	0	1	0	1	0	0	0	0	--	RFSS	S
Olive-sided Flycatcher	*Contopus cooperi*	0	6	0	6	0	6	0	6	0	0	0	0	--	RFSS	--
Bald Eagle[3] Nesting Area	*Haliaeetus leucocephalus*	0	5	0	4	0	5	0	5	2	2	2	2	SC	--	T
Connecticut Warbler	*Oporornis agilis*	0	1	0	1	0	1	0	1	0	0	0	0	--	RFSS	S
Osprey	*Pandion haliaetus*	0	2	0	0	0	2	0	2	0	2	0	2	--	--	S
Black-backed Woodpecker	*Picoides arcticus*	0	1	0	1	0	1	0	1	0	1	0	1	--	RFSS	T
Plants																
Dissected Grapefern	*Botrychium dissectum*	0	0	0	0	0	0	0	0	0	1	0	1	--	--	T
Triangle Moonwort	*Botrychium lanceolatum*	1	1	1	1	1	1	1	1	0	0	0	0	T	RFSS	T
Mingan Moonwort	*Botrychium minganense*	2	2	2	2	3	3	2	2	0	0	0	0	SC	WL	T
Goblin Fern	*Botrychium mormo*	3	3	3	3	3	3	3	3	1	1	1	1	SC	RFSS	E
Pale Moonwort	*Botrychium pallidum*	0	0	0	0	0	0	0	0	0	7	0	7	E	RFSS	T
St. Lawrence Grapefern	*Botrychium rugulosum*	2	1	2	1	2	1	2	1	2	2	2	2	T	RFSS	T

Name[1]		Route 1		Route 1A		Route 1B		Route 1C		Route 2		Route 2C		Status[2]		
Common	Scientific	NHIS	USFS	NHIS	USFS	NHIS	USFS	NHIS	USFS	NHIS	USFS	NHIS	USFS	State	USFS	LLBO
Least Grapefern	*Botrychium simplex*	0	0	0	0	0	0	0	0	0	3	0	3	SC	RFSS	T
White Adder's-mouth	*Malaxis monophyllos var. brachypoda*	1	1	1	1	1	1	1	1	0	0	0	0	SC	RFSS	S
Clustered Bur-reed	*Sparganium glomeratum*	2	2	2	2	2	2	2	2	0	0	0	0	SC	RFSS	T
Canada Yew	*Taxus canadensis*	0	2	0	2	0	2	0	2	0	1	0	1	--	RFSS	S
Total Number of Species Present		13		12		13		13		9		9		--	--	--
Other Non-Listed																
Colonial Waterbird Nesting Site Great Blue Heron		1	0	1	0	1	0	1	0	0	0	0	0	--	--	--
Native Plant Community Old Growth White Pine		0	0	0	0	0	0	0	0	1	0	1	0	--	--	--

[1] The NHIS and USFS databases, in many cases, appear to be documenting the same occurrences. Thus, adding the number of occurrences would likely result in an overestimation species frequency.
[2] State: E = Endangered; T = Threatened; SC = Special Concern
USFS: RFSS = Regional Forester Sensitive Species; WL = Watch List
LLBO: E = Endangered; T = Threatened, S = Sensitive
[3] Receives federal protection through the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act.

Table 8.21-2 Number of State Listed Species Recorded within each Route

State Listed	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Birds						
Special Concern	1	1	1	1	1	1
Plants						
Endangered	0	0	0	0	1	1
Threatened	2	2	2	2	1	1
Special Concern	4	4	4	4	2	2
Total Species	7	7	7	7	5	5

Source: DNR NHIS and USFS CNF, 2007

Table 8.21-3 Number of LLBO Listed Species Recorded within each Route

LLBO Listed	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Birds						
Threatened	2	2	2	2	2	2
Sensitive	3	3	3	3	1	1
Plants						
Endangered	1	1	1	1	1	1
Threatened	4	4	4	4	4	4
Sensitive	2	2	2	2	1	1
Total Species	12	12	12	12	9	9

Source: DNR NHIS and USFS CNF, 2007

Table 8.21-4 Number of USFS RFSS Listed Species Recorded within each Route

USFS Listed	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Birds	4	4	4	4	1	1
Plants	6	6	6	6	5	5
Total Species	10	10	10	10	6	6

Source: DNR NHIS and USFS CNF, 2007

The following summarizes the listed status, as well as the habitat requirements, for the six bird and 10 plant species recorded within the proposed routes in order of state, USFS, and LLBO classification. Additionally, discussions of Canada lynx and gray wolf are included as part of this summary.

Birds

Le Conte's Sparrow (*Ammodramus leconteii*)

State - Not listed, CNF - Regional Forest Sensitive Species (RFSS), LLBO - Sensitive (S)

Le Conte's Sparrow is a secretive bird that tends to favor tall dense vegetation in wet meadows and wetland edges. Le Conte's Sparrow is also known to regularly breed in upland grass habitats, including pasture, hayland, and retired cropland (Igl, 1999).

Olive-sided Flycatcher *(Contopus cooperi)*

State - Not listed, CNF - RFSS, LLBO - Not listed

Olive-sided Flycatchers typically breed near natural openings and edges of coniferous forests, especially along streams, lakes, rivers, ponds, and bogs where snags and dead trees are present (Cornell, 2008).

Bald Eagle (*Haliaeetus leucocephalus*)

State - Special Concern (SC), CNF - Not listed, LLBO - Threatened (T)

The CNF provides habitat for one of the largest breeding populations of bald eagles in the lower 48 states. Bald eagles most commonly inhabit forested areas near lakes and rivers. Known bald eagle nesting sites within the CNF include large red and white pines, and occasionally aspen (USFS, 2008).

Connecticut Warbler *(Oporornis agilis)*

State - Not Listed, CNF - RFSS, LLBO - S

Within the CNF, the Connecticut Warbler is known to most frequently inhabit open, mature lowland conifer forests, including tamarack, sphagnum, and jack pine areas. (Kudell-Ekstrum, 2002).

Osprey (*Pandion haliaetus*)

State - Not listed, CNF - Not listed, LLBO - S

Ospreys typically inhabit forested areas near lakes and rivers that offer adequate supplies of fish (U of M, 2005).

Black-backed Woodpecker *(Picoides arcticus)*

State - Not listed, CNF - RFSS, LLBO - T

The Black-backed Woodpecker is a secretive bird that is primarily confined to mature, fire regulated, boreal, and coniferous forests that contain snags, fallen logs, and dying trees that host the larvae of wood boring beetles (Corace, 2001).

Plants

Dissected Grapefern (*Botrychium dissectum*)

State - Not listed, CNF - Not listed, LLBO - S

B. dissectum is known to occupy a variety of habitats ranging from grassy openings and roadsides to dry, mesic, or wet forests. *B. dissectum* is often found in sites that are somewhat disturbed by human activities. Specimens have been collected within the CNF in mesic hardwood forests of sugar maple and basswood. Much of this species' life cycle occurs underground and the number of aboveground plants may vary from year to year (Chadde et al., 2001).

Triangle Moonwort (*Botrychium lanceolatum*)

State - Not listed, CNF - RFSS, LLBO - Not listed

B. lanceolatum occurs in a variety of habitats, which include dry, but more often damp, partially shaded areas in coniferous or rich deciduous forests, or in moist grassy or rocky areas. In Minnesota, it most typically grows in northern hardwoods habitats. Much of this species' life cycle occurs underground and individual plants do not appear aboveground every year (Chadde et al., 2001)

Mingan Moonwort (*Botrychium minganense*)

State - SC, CNF - Watch List, LLBO - T

B. minganense is known to occupy a variety of habitats, but in Minnesota it is most commonly associated with maple/basswood forests. Minnesota populations also have been documented in transition areas between uplands and wetlands, along fluctuating sandy shorelines, in dry-mesic woods, and in moist-wet woods under white cedar. Much of this species' life cycle occurs underground and individual plants do not appear aboveground every year (Chadde et al., 2001).

Goblin Fern (*Botrychium mormo*)

State - SC, CNF - RFSS, LLBO – Endangered (E)

In Minnesota, *B. mormo* is usually associated with mid-age or older northern hardwood forests with a deep leaf or duff layer that is sometimes greater than 3 inches thick. *B. mormo* most often occurs under a relatively closed forest canopy that provides dense shade. *B. mormo* does not appear aboveground every year, especially during years of drought (Chadde et al., 2001).

Pale Moonwort (*Botrychium pallidum*)

State - E, CNF - RFSS, LLBO - T

The known habitat of *B. pallidum* is variable, occurring most often in open areas, but sometimes where shaded. *B. pallidum* is often associated with habitats that have regular disturbance regimes. In Minnesota, reported habitats include maple/basswood forests, red and jack pine forests, sandy ridges, wetlands, ephemeral ponds, pine needles, oak leaves, open lots with weedy species, open fields, log landings, and open tailing ponds. Much of this species' life cycle occurs underground and individual plants do not appear aboveground every year (Chadde et al., 2003).

St. Lawrence Grapefern (*Botrychium rugulosum*)

State - T, CNF - RFSS, LLBO - T

The habitat of *B. rugulosum* is variable, with plants occurring most often in open areas, although sometimes in shade. *B. rugulosum* is most frequently found in areas that have been disturbed. In Minnesota, listed habitat preferences include dry areas with short grasses, jack pine, red pine, and aspen/balsam-fir, and openings within these types. Others habitats include the margins of ephemeral pools in forests dominated by pines, spruce, and paper birch/aspen. Much of this species life cycle occurs underground and individual plants do not always occur aboveground every year (Chadde et al., 2003).

Least Grapefern (*Botrychium simplex*)

State - SC, CNF - RFSS, LLBO - T

In Minnesota, *B. simplex* has been found in a variety of habitats including northern hardwood forests of sugar maple and basswood, black ash and cedar swamps, jack pine woods, and disturbed areas such as borrow pits, tailings ponds, and road shoulders. In CNF, *B. simplex* has been found in habitats such as depressions in an open area dominated by reed canary grass, open fields with non-native grass, and northern hardwood stands. A population study reported that *B. simplex* appeared aboveground in less than half of the years studied, and appeared to be sensitive to drought conditions (Chadde et al., 2003).

Table 8.21-5 summarizes broad habitat requirements and potential threats to the *Botrychium* species that have been recorded within the routes.

Table 8.21-5 USFS List of Major Threats to *Botrychium* Species and Habitat Features

	Major Threats[1]				Habitat Features[2]	
Species	Canopy Thinning	Succession To Closed Canopy	Major Disturbance	Minor Disturbance	Habitat Amplitude	Vulnerability
B. dissectum	medium	low	high	medium	broad	low
B. lanceolatum	medium	low	medium	low	intermediate	low
B. minganense	medium	low	medium	medium	broad	low
B. mormo	high	low	high	medium	narrow	high
B. pallidum	low	high	medium	low	broad	low
B. rugulosum	low	high	high	medium	intermediate	low
B. simplex	low	medium	medium	low	broad	low

Source: Chadde et al., 2001

[1]Major Threats Key: High, medium, or low are used to indicate the estimated degree of impact of a specific threat to a Botrychium population

[2]Habitat Features Key: Habitat Amplitude: broad (tolerates a variety of habitats and conditions), intermediate, narrow (very specific requirements); Vulnerability: high (populations generally not resilient or are intolerant of habitat changes), low (populations resilient and/or resistant to change)

White Adder's-mouth (*Malaxis monophyllos* var. *brachypoda*)

State - SC, CNF - RFSS, LLBO - T

In Minnesota, *M. brachypoda* typically is found on *Sphagnum* hummocks in coniferous swamps, often in shaded areas under white cedar, black spruce, or tamarack. It has also been found growing in peat soil in hardwood swamps (Schultz, 2003).

Clustered Bur-reed (*Sparganium glomeratum*)

State - SC, CNF - RFSS, LLBO - T

S. glomeratum is an emergent wetland species that most commonly occurs in shallow water with a substrate of fine textured organic soils. It often occurs with associations of grass and sedge species (DNR 1996).

Canada Yew (*Taxus canadensis*)

State - Non-listed, CNF - RFSS, LLBO - S

T. canadensis is a shrub-layer component of forest associations that include spruce-fir, mixed conifer-northern hardwoods, and northern hardwoods (Sullivan, 1993).

Other Rare and Unique Species

Canada lynx (*Lynx canadensis*)

Federal - T, State - Non-listed, CNF - Non-listed, LLBO - E

According to DNR's Natural Heritage and Nongame Research Program, there have been "Probable" and "Unverified" sightings of Canada lynx (*Lynx canadensis*) in the vicinity of the proposed routes in all four project counties (DNR, 2006). Records of lynx sitings that are classified as "Verified," however, suggest the proposed routes are located at the fringe of the current lynx range, as most of the DNR's lynx records are concentrated in northeastern Minnesota. The Project is located west of US 53, and is outside of the proposed Critical Habitat for the Canada lynx (Appendix L).

Gray Wolf (*Canis lupus*)

State - SC, CNF - Non-listed, LLBO - S

Minnesota's wolf population was officially removed from the federal endangered species list in March 2007, and is currently being managed by the DNR. According to the 2001 *Minnesota Wolf Management Plan,* gray wolves have been recorded in the general vicinity of the proposed routes in all four project counties (DNR, 2001). Gray wolves are generalists and are not dependent on a specific vegetative cover. Rather, quality wolf habitat includes places where human-sources of mortality are low and where sources of prey (especially deer) are abundant (DNR, 2001).

8.21.2 Direct/Indirect Effects

The following is a summary of the species listed in Table 8.21-1 that have also been documented within the 125-foot right-of-way area. These species tables represent an analysis of species records based upon classifications assigned by the state, the LLBO, and the USFS. Species that have been assigned classifications by more than one entity may appear in more

than one summary table and do not represent a higher known frequency of that particular species.

Federal Species

There are no federally listed threatened or endangered species that have been recorded within the proposed right-of-way.

State Species

Two state listed species of special concern that have been recorded within the 125-foot rights-of-way (Table 8.21-6).

Table 8.21-6 Records of State Listed Species within the 125-foot Right-of-Way

Common	Scientific	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C	Potential Impacts
Special Concern								
Mingan Moonwort	*Botrychium minganense*	1	1	1	1	--	--	Canopy thinning is a 'medium' threat to this species. While maple-basswood forests are the most common habitat in MN, it is thought that *B. minganense* may benefit from slight to moderate disturbances associated with partial timber removal.[1]
Clustered Bur-reed	*Sparganium glomeratum*	1	1	1	1	--	--	Direct impacts are unlikely as this species is associated with emergent wetland habitat, most of which would be spanned by the project.
Total Number of Different Species Affected		**2**	**2**	**2**	**2**	**0**	**0**	

[1]Chadde, Steve and Kudray, Greg.. USDA Forest Service, Eastern Region. 2001. Conservation Assessment for Botrychium minganense (Mingan moonwort).

Potential impacts to these species would depend on the final design and location of the 125-foot right-of-way within each route. Additional state listed species that have been documented within the route areas (Table 8.21-2) include the following.

Birds

Special Concern—Bald eagle (*Haliaeetus leucocephalus*)

Plants

Endangered— Pale moonwort (*Botrychium pallidum*)

Threatened—Triangle moonwort (*Botrychium lanceolatum*), St. Lawrence grapefern (*Botrychium rugulosum*)

Special Concern—Goblin fern (*Botrychium mormo*), Least grapefern (*Botrychium simplex*), and White adder's-mouth (*Malaxis brachypoda*)

8.21.3 LLBO Species

Three LLBO listed species of special concern that have been recorded within the 125-foot right-of-way (Table 8.21-7).

Table 8.21-7 Records of LLBO Listed Species within the 125-foot Right-of-Way

Common	Scientific	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C	Potential Impacts
Threatened								
Mingan Moonwort	*Botrychium minganense*	1	1	1	1	--	--	Canopy thinning is a 'medium' threat to this species. While maple-basswood forests are the most common habitat in MN, it is thought that *B. minganense* may benefit from slight to moderate disturbances associated with partial timber removal.[1]
Clustered Bur-reed	*Sparganium glomeratum*	1	1	1	1	--	--	Direct impacts are unlikely as this species is associated with emergent wetland habitat, most of which would be spanned by the project.
Sensitive								
Canada Yew	*Taxus canadensis*	1	1	1	1	--	--	As a shrub-layer component of forest communities, unavoidable populations of *T. canadensis* would likely be indirectly impacted as a result of the permanent removal of the forest canopy.
Total Number of Different Species Affected		**3**	**3**	**3**	**3**	**0**	**0**	

[1]Chadde, Steve and Kudray, Greg.. USDA Forest Service, Eastern Region. 2001. *Conservation Assessment for Botrychium minganense* (Mingan moonwort).

Potential impacts to these species would depend on the final design and location of the 125-foot right-of-way within each route. Additional LLBO listed species that have been documented within the route areas (Table 8.21-3) include the following.

Birds

Threatened—Bald eagle (*Haliaeetus leucocephalus*), Black-backed woodpecker (*Picoides arcticus*)

Sensitive—Le Conte's sparrow (*Ammodramus leconteii*), Connecticut warbler (*Oporornis agilis*), Osprey (*Pandion haliaetus*)

Plants

Endangered— Goblin fern (*Botrychium mormo*)

Threatened—Dissected grapefern (*Botrychium dissectum*), Triangle moonwort (*Botrychium lanceolatum*), Pale moonwort (*Botrychium pallidum*), St. Lawrence grapefern (*Botrychium rugulosum*), Least grapefern (*Botrychium simplex*),

Sensitive—White adder's-mouth (*Malaxis brachypoda*), Canada yew (*Taxus canadensis*)

CNF Species

There are three USFS RFSS listed species and one Watch List species recorded within the 125-foot right-of-way (Table 8.21-8).

Table 8.21-8 Records of USFS RFSS Listed Species within the 125-foot Right-of-way

Common	Scientific	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C	Potential Impacts
Birds								
Olive-sided Flycatcher	Ammodramus leconteii	1	1	1	1	--	--	Direct impacts to this species are unlikely so long as nesting areas are avoided during breeding season.
Plants								
Mingan Moonwort*	*Botrychium minganense*	1	1	1	1	--	--	Canopy thinning is a 'medium' threat to this species. While maple-basswood forests are the most common habitat in MN, it is thought that *B. minganense* may benefit from slight to moderate disturbances associated with partial timber removal.[1]
Clustered Bur-reed	*Sparganium glomeratum*	1	1	1	1	--	--	Direct impacts are unlikely as this species is associated with emergent wetland habitat, most of which would be spanned by the project.
Canada Yew	*Taxus canadensis*	1	1	1	1	--	--	As a shrub-layer component of forest communities, unavoidable populations of *T. canadensis* would likely be indirectly impacted as a result of the permanent removal of the forest canopy.
Total Number of Different Species Affected		**4**	**4**	**4**	**4**	**0**	**0**	

[1]*Placed on Watch List, may be designated RFSS in the future.*

Potential impacts to these species would depend on the final design and location of the 125-foot rights-of-way within each route. Additional USFS RFSS listed species that have been documented within the route areas (Table 8.21-5) include the following.

Birds

RFSS—Black-backed woodpecker (*Picoides arcticus*), Le Conte's sparrow (*Ammodramus leconteii*), Connecticut warbler (*Oporornis agilis*)

Plants

RFSS—Triangle moonwort (*Botrychium lanceolatum*), Goblin fern (*Botrychium mormo*), Pale moonwort (*Botrychium pallidum*), St. Lawrence grapefern (*Botrychium rugulosum*), least grapefern (*Botrychium simplex*), White adder's-mouth (*Malaxis brachypoda*), Canada yew (*Taxus canadensis*)

8.21.4 Mitigation

Impacts to threatened, endangered and sensitive species and communities would be avoided to the extent practicable. The proposed routes provide a 1,000-foot-wide corridor within which to route the 125-foot rights-of-way. Detailed field review of the approved route would be conducted prior to final design of the project.

In the event that avoiding impacts to threatened or endangered species is not feasible, the Applicants would work closely with the regulatory agencies to identify appropriate measures to minimize impacts, as well as compensatory mitigation for impacts that cannot be avoided.

8.22 *Recreation and Tourism*

8.22.1 Existing Conditions

There are many existing recreational resources and tourist destinations within the Study Area, including trails, rivers, lakes, national forest lands, and state lands. Popular activities include camping, fishing, hunting, wild rice harvesting, bird watching, canoeing, boating, swimming, biking, hiking, riding all-terrain vehicles (ATVs) and snowmobiles, and nature observation. The Department of Natural Resources (DNR) Wildlife Management Areas (WMAs) and Scientific and Natural Areas (SNAs), and the Chippewa National Forest (CNF) provide opportunities for viewing wildlife and intact ecosystems. Table 8.22-1 provides a summary of the recreational resources located in the Study Area. Figure 9 displays the location of recreation areas in the vicinity of the proposed routes.

A historic logging camp in Cass Lake, the Forest History Center in Grand Rapids, and the Itasca County Historical Center in Grand Rapids provide an opportunity to learn about the regional and local history. The Headwaters Science Center is located in Bemidji near the western terminus of the Study Area. The Bemidji High School contains tennis courts and soccer fields that are directly adjacent to Routes 2 and 2C. The tennis courts and soccer fields are open to the public when not in school use. Routes 2 and 2C, south of the BNSF railway and west of Trunk Highway (TH) 371, in Cass Lake, cross Sandtrap Golf Course.

County Road 10/39 within Routes 2 and 2C is designated by the U.S. Forest Service (USFS) as a National Forest Scenic Byway, and by the State of Minnesota as a scenic byway, named the Ladyslipper Scenic Byway. Portions of US 2 near the City of Bena and Ball Club Lake that parallel both routes and all alternatives are designated as the Great River Road, a National Scenic Byway that runs parallel to the Mississippi River.

The CNF has an office in Cass Lake that is an information stop for recreational users of the national forest. The office is located about 400 feet north of Routes 2 and 2C. The White Oak Casino is located at the intersection of US 2 and TH 46, within 1 mile of both routes and all alternatives. The Hole-In-Bog Peatland SNA is located about 600 feet south of Routes 1, 1A, 1B, and 1C.

There are several large lakes in the Study Area that are used for fishing and recreational boating (DNR, 2008: Recreation Compass). Section 8.16 outlines the water resources within the Study Area. Twin Lake has an access point within Routes 1, 1A, and 1C. Three lakes, Pike Bay (South Pike Bay Campground), Lower Sucker Lake (off Ketchum Road), and White Oak Lake, have access points within a quarter-mile of Routes 1, 1A, 1B, and 1C. Route 1B is located within 1,800 feet of an access point on Thirteen Lake. Routes 2 and 2C are located within 170 feet of an access point to Cass Lake. Routes 1C and 2C are located within 1,800 feet of an access point to the Mississippi River and within 130 feet of a Leech Lake River access point.

The portion of the Mississippi River running through the Study Area is considered a water trail by the DNR. The DNR has divided the river into 10 subsections from Lake Itasca to the Iowa/Minnesota border. The routes cross the Mississippi River just south of the City of Bemidji, within the subsection known as Lake Itasca to Cass Lake. The second crossing is

located west of Ball Club Lake within the subsection titled Cass Lake to the Vermillion River.

The Study Area also attracts thousands of hunters during deer season, as well as those who hunt small game and waterfowl. Routes 1, 1B, and 1C cross the Bemidji Slough WMA. The WMA is located south of the City of Bemidji, in the northwest quadrant of the intersection of MN Highway 71 and CSAH 46. The WMA is located within the Bemidji State Game Refuge. The Bemidji State Game Refuge is about 47,300 acres and incorporates the City of Bemidji, Lake Bemidji, Lake Bemidji State Park, portions of the US 2 corridor, and other transmission lines. The Bemidji State Game Refuge is an area designated by the DNR which the hunting or trapping of some wild animals is prohibited. Hunting in the WMA and Bemidji State Game Refuge is open for small game, but not waterfowl. In addition, there are deer hunting restrictions within the WMA and game refuge. All routes and alternatives cross units of the Bowstring State Forest. Routes 1, 1A, 1B, and 1C cross units of the Welsh Lake State Forest. In addition, all routes and alternatives cross units of the CNF. Hunting is allowed on state- and federal-owned forest parcels that are crossed by the Proposed Routes (DNR, 2008: Recreation Compass).

Table 8.22-1 Recreational Resources within the Study Area

Location	Resource	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Federal (CNF)	Chippewa National Forest Lands	X	X	X	X	X	X
	Ladyslipper NF Scenic Byway	-	-	-	-	X	X
	Great River Road Scenic Byway	X	X	X	X	X	X
	Lake 13 Road bike route	X	X	X	X	-	-
	East Lake 13 Road bike route	-	-	X	-	-	-
	Pike Bay Loop Road bike route	X	X	-	X	-	-
	Mi-Ge-Zi Trail	X	X	-	X	X	X
	Norway Beach Interpretive Trail	-	-	-	-	X	X
	Moss Lake Road bike route	X	X	-	X	-	-
	South Boundary bike route	X	X	-	X	-	-
	Pipeline Snowmobile Trail	X	X	X	X	X	X
	Winnie Snowmobile Trail	-	-	-	-	X	X
State	North Country Trail (GIA)	X	X	X	X	X	X
	Blue Ox Snowmobile Trail (GIA)	-	-	-	-	X	X
	Cass County Snowmobile Trail(GIA)	X	X	X	X	X	X
	Becida Snowmobile Trail (GIA)	-	X	-	-	-	-
	Paul Bunyon State Trail	X	X	X	X	-	-
	Heartland State Trail	X	X	X	X	-	-
	Soo Line North State Trail (ATV)	X	X	X	X	X	X
	Welsh Lake State Forest parcels	X	X	X	X	X	X
	Bowstring State Forest parcels	X	X	X	X	X	X
	Ladyslipper MN Scenic Byway	-	-	-	-	X	X
	Bemidji Slough WMA	X	X	X	X	-	-
	Bemidji State Game Refuge	X	X	X	X	X	X
	Mississippi River (Water Trail)	X	X	X	X	X	X
Local	Sandtrap Golf Course	-	-	-	-	X	X
	Bemidji High School Tennis Courts and Soccer Fields	-	-	-	-	X	X

X Resource occurs within the 1,000-foot-wide route.
- Resource does not occur within the 1,000-foot-wide route.

Both state and national forests offer opportunities for wildlife viewing, camping, canoeing, fishing, hiking, and picnicking. The administrative boundaries of both forests are connected through state- and federal-designated trails. The trails offer opportunities for horseback riding, cycling, snowmobiling, cross country skiing, and off-road ATV and motorcycle use.

The Proposed Routes cross three state-designated trails, seven CNF walk/bike trails, two CNF snowmobile trails, and four Grant-In-Aid (GIA) snowmobile trails. The state-designated trails include: Paul Bunyan State Trail (runs along TH 36), Heartland State Trail (runs along TH 371), and Soo Line North Trail (runs along US 2 and the BNSF railway near Cass Lake). The CNF biking/walking trails are located near Cass Lake, Pike Bay, and Lake 13, as shown on Figure 9. The trail complex is known as the Mi-Gi-Zi/Pike Bay/Lake 13 Loop. GIA trails include: North Country Snowmobile Trail, Cass County Snowmobile Trail, Becida Snowmobile Trail, and Blue Ox Snowmobile Trail. The Soo Line North Trail is also designated as Cass County GIA trail. The Pipeline and Winnie Snowmobile Trails are managed by the CNF, are designated as Cass County GIA trails, and are connected to the GIA snowmobile trails (DNR, 2008: Minnesota State Trails and Grant-In-Aid). Many of the snowmobile trails are under two designations, for example a trail can be identified as a national forest snowmobile trail and GIA.

Another recreational opportunity in the area is the harvesting of wild rice. Large wild rice beds are protected and actively managed by the DNR, users of this resource must purchase a license to harvest wild rice. For a discussion of wild rice, please refer to Cultural Values in Section 8.7.

8.22.2 Direct/Indirect Effects

Potential effects for the routes and for the route segments located within the Leech Lake Reservation (LLR) and CNF-managed properties would be consistent and are not discussed separately for Recreation and Tourism.

Table 8.22-2 provides a summary of the recreational resources that would be directly affected by each route. Because portions of the routes are co-located with existing transmission lines, pipeline rights-of-way, and US 2, the direct and indirect effects to recreation and tourism would be minimized. Direct effects involve altering or physically changing recreation resources, conflicting with recreation area goals, or affecting accessibility to remote or sensitive areas. Indirect effects are visual impacts to the scenic quality and natural appearance of the landscape as viewed from the recreational use area by a recreational user. Section 8.4 Aesthetics describes the potential for visual impacts.

Generally, the project would span the trails such that there would not be a direct impact to the trail. Rather, there would be a visual impact due to the inclusion of the conductors, cleared right-of-way, or widened existing right-of-way within the viewshed of the trail users. Generally, this impact would be brief as the conductors would be perpendicular to the trails and therefore observed for only a short time.

Table 8.22-2 Potential Direct Effects to Recreation

Resource	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
# of CNF bike/walk trails crossed	5	5	2	5	2	2
# of snowmobile trail crossings[1]	4	4	4	4	9	9
# of state trails crossed[2]	3	3	3	3	1	1
# of scenic byways crossed[3]	1	1	1	1	2	2
# of Mississippi River crossings at existing crossing locations	2	2	2	2	2	2
Temp Impacts to Bemidji Slough WMA by right-of-way	5.0 acres	None	5.0 acres	5.0 acres	None	None
Perm Impacts to Bemidji Slough WMA (within the right-of-way)	675 sq feet	None	675 sq feet	675 sq feet	None	None
Temp Impacts to Bemidji State Game Refuge (within the right-of-way)	65 acres	29 acres	65 acres	65 acres	108 acres	108 acres
Perm Impacts to Bemidji State Game Refuge (within the right-of-way)	0.2 acres	0.1 acres	0.2 acres	0.2 acres	0.3 acres	0.3 acres
Perm and temp impacts to CNF lands (within the right-of-way)[4]	342 acres	336 acres	345 acres	383 acres	282 acres	323 acres

[1] This is the total number of snowmobile trails crossed by the Route, regardless of designation. Some trails are designated by two jurisdictions, but are the same trails therefore it is one trail. Some trails are crossed by a Route in more than one location, thus the number of crossings was counted regardless of name. This number does not include the State trail crossings, including Soo Line North.
[2] State trails may be used for snowmobiling.
[3] Includes state- and federal-designated scenic byways.
[4] See the Land Use Section (Section 8.1) for a classification of permanent and temporary impacts.

Constructing a transmission line adjacent to an existing linear utility corridor may not change the recreational uses of the area, because the corridor was previously disturbed and the existing visual spectrum includes a linear type feature. The Project would change the visual setting for people participating in the aforementioned recreational opportunities on forest lands, by widening an existing right-of-way or creating a new right-of-way, which would change the vegetated state from forest land to shrub land or grassland. The widened or new right-of-way would change approximately 280 acres to 380 acres of forestland to a different vegetative state, depending on the route selected (see Table 8.22-2). It is also possible that clearing vegetation underneath the transmission line would change the wildlife habitat within the immediate vicinity, potentially affecting viewing opportunities. Interior forest dependent wildlife may move to a different area of the forest or utilize other existing habitat. Likewise, shrub- or grassland dependent species may become more available for viewing within an opened corridor.

Routes 1, 1A, 1B, and 1C

Routes 1, 1A, 1B, and 1C cross the Bemidji Slough WMA and Bemidji State Game Refuge. The routes would cross about 1,800 feet of the Bemidji Slough WMA, thereby permanently affecting approximately 675 sq. feet (Table 8.22-2). The routes cross approximately 22,500 feet of the Game Refuge, with permanent impacts estimated to affect about 0.1 to 0.3 acres (Table 8.22-2). The Project is not expected to have impacts to recreational opportunities at either the WMA or the Game Refuge.

No impacts are expected to recreational resources such as golf courses, museums, city parks, or campgrounds within the cities of Bemidji, Cass Lake, Bena, and Deer River.

Routes 2 and 2C

Routes 2 and 2C could impact the scenic quality of landscapes viewed by travelers along US Highway 2, which the USFS has identified as a highly visible corridor and is part of the Great River Road Scenic Byway. However, since the routes parallel an existing 69 kV transmission line and pipeline right-of-way, the impact would be minimal because travelers would be accustomed to viewing a transmission line along the highway. Although the Sand Trap Golf Course is within the initial Project route alignment (Route 2 and 2C), the intent would be to shift the right-of-way in a manner such that no impacts would occur to the golf course.

The following resources are located in proximity to Routes 2 and 2C and may have minor visual impacts: Roger Lehmann Park, Norway Beach Recreation Area, Norway Beach Interpretive Trail, Sandtrap Golf Course, and Stony Point Resort.

8.22.3 Mitigation

Constructing the proposed transmission line along existing pipeline and transmission rights-of-way would minimize any impacts to recreational resources and tourism. Locating the right-of-way adjacent to existing utility rights-of-way would minimize impacts to previously undisturbed parks or management areas. The structure locations, right-of-way, and other disturbed areas would be determined with the landowner and land management agency's input. Structures would span existing trails. Permanent disturbance of wildlife habitat would also be minimized by co-locating within existing disturbed corridors, thus impacts to hunting and wildlife observation would be minimized. Since the primary indirect effect is the visual aspect of the line on recreational resources, the mitigation measures would include those as described in Aesthetics in Section 8.4.

8.23 *Agricultural Production*

8.23.1 Existing Conditions

Table 8.23-1 summarizes farmland, cropland, and agricultural production for Beltrami, Cass, Hubbard, and Itasca counties based on the 2002 US Department of Agriculture census data.

Table 8.23-1 1997 and 2002 Agricultural Census Data

County	Beltrami	Cass	Hubbard	Itasca
Number of Farms in 2002 (in 1997)[1]	746 (733)	646 (677)	535 (503)	494 (476)
Average Size of Farms in 2002 (ac.) (in 1997)	312 (335)	305 (306)	262 (289)	243 (242)
Land Acreage in Farmland in 2002[2] (in 1997)	232,735 (245,736)	197,153 (207,438)	140,004 (145,512)	120,176 (115,380)
2002 Percentage of County in Farmland[2]	14.5%	15.3%	23.7%	7.0%
2002 Percentage of County in Cropland[3]	7.8%	7.8%	12.7%	3.4%
Total Market Value of Agricultural Products Sold in 2002 (in 1997)	$17,314,000 ($18,738,000)	$14,327,000 ($20,982,000)	$22,958,000 ($24,384,000)	$6,440,000 ($5,173,000)
2002 Market Value of Crops Sold	$4,592,000	$3,949,000	$17,309,000	$3,394,000
2002 Market Value of Livestock and Other Uses Sold	$12,722,000	$10,378,000	$5,649,000	$3,046,000

Source: USDA, NASS, 2002 Census of Agriculture
[1]The census definition of a farm is any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold during the census year.
[2]Farmland is defined as cropland, woodland, pasture, livestock, and other uses (i.e. eggs, aquaculture, etc).
[3]Cropland is defined as row or small grain crop and hay.

The majority of agricultural land in each of the aforementioned counties occurs in scattered parcels, typically in the southern portions of the counties. The primary crop is hay, with significantly less production of wheat, oats, corn, barley, and soybeans. According to the 2002 Census of Agriculture, Hubbard County had the highest market value of crop production at about $17.3 million. Beltrami County had the highest market value of livestock, poultry, and similar products at about $12.7 million. Itasca County had the lowest market value of crop production and livestock, poultry, and similar products at about $3.4 million and $3.0 million, respectively. The number of farms in Beltrami and Hubbard counties increased between 1997 and 2002; however the average size of farms decreased. The average farm size in Cass County decreased between 1997 and 2002, whereas the number of full-time farms increased by 31 farms during that time period. The number of farms decreased in Itasca County and the average farm size decreased slightly between 1997 and 2002. Figure 2 in the Figures Appendix displays the approximate locations of farmland land cover types near the proposed routes.

Prime farmland is defined by the Natural Resource Conservation Service (NRCS) as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. The NRCS has three levels for prime farmland, and each county NRCS department is responsible for assigning prime farmland designations to each of the soil series found in its county. The most important class is prime farmland, which produces high yields of crops. Prime farmland when drained includes soils that have the potential to be prime farmland but require drainage or hydrologic alteration to achieve high productivity. Farmland of statewide importance includes soils that are nearly prime, but are not as productive due to permeability, slope, erosion potential, or some other soil property. Figure 10 displays the location of prime farmland is near the proposed routes.

8.23.2 Direct/Indirect Effects – All Routes

As shown in Table 8.23-2, Route 1 and alternatives presently contain about twice the percentage of agricultural land uses and prime farmland within the right-of-way than Routes 2 and 2C (DNR, GAP Land Cover Data, 2002 and USDA 2003). For this analysis, prime farmland was assumed to include prime farmland, prime farmland when drained, and farmland of statewide importance (USDA 2003).

All routes would result in permanent and temporary impacts to lands in agricultural use. Permanent impacts would occur as a result of structure placement. The estimated permanent impacts range from 0.3 acres to 0.7 acres. Temporary construction impacts range from 31 acres to 57 acres.

Table 8.23-2 Agricultural Production Effects for the Right-of-way

	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Agricultural Uses (% of right-of-way)	20.9	21.5	20.2	19.7	12.5	11.8
Prime Farmland (% of right-of-way)	39.6	44.1	41.2	39.0	23.5	23.5
Permanent Impacts (acres)	0.7	0.7	0.7	0.7	0.3	0.3
Permanent Impact to Prime Farmland (acres)	0.3	0.3	0.3	0.3	0.1	0.1
Temporary Impacts (acres)	51.9	56.7	54.2	51.9	30.6	30.6

Note: Calculation methodology is described in Section 7.0 Methods and Regulations.

During construction, temporary impacts such as soil compaction and crop damages within the rights-of-way may occur, depending on the time of construction. The Applicants' preferred methodology for setting up staging areas and stringing set-up areas is to use previously disturbed sites; therefore, the Applicants are not anticipating temporary impacts to agricultural lands from staging or setup areas. Land use impacts for the Project are described in more detail in Section 8.1.

Removal of the small amount of prime farmland as shown in Table 8.23-2 is not expected to negatively affect the general farm community in the Study Area.

8.23.3 Direct/Indirect Effects within the Leech Lake Reservation

The agricultural impacts for lands within the Leech Lake Reservation (LLR) would be the same as those stated above (Section 8.23.2), except that impact numbers would be specific to the LLR, as shown in Table 8.23-3.

Table 8.23-3 Agricultural Production Effects within the LLR

	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Agricultural Uses (% of right-of-way)	8.4	9.0	8.7	7.7	5.4	4.9
Permanent Impacts (acres)	24.5	21.0	27.3	24.2	12.1	11.4
Permanent Impact to Prime Farmland (acres)	0.2	0.2	0.3	0.2	0.1	0.1
Temporary Impacts (acres)	0.05	0.04	0.08	0.05	0.03	0.03
Agricultural Uses (% of right-of-way)	13.2	13.9	15.5	13.2	8.4	8.4

Calculation methodology is described in Section 7.0 Methods and Regulations.

8.23.4 Direct/Indirect Effects within the Chippewa National Forest

The proposed agricultural impacts for lands managed by the Chippewa National Forest (CNF) would be the same as those stated above (Section 8.23.2) except that impact numbers would be specific to the CNF-managed lands as shown in Table 8.23-4.

Table 8.23-4 Agricultural Production Effects for CNF-managed Lands

	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
Agricultural Uses (% of right-of-way)	2.0	2.0	2.4	1.8	0.7	0.6
Permanent Impacts (acres)	39.6	44.1	41.2	39.0	21.9	20.6
Permanent Impact to Prime Farmland (acres)	0.0	0.0	0.0	0.0	0.0	0.0
Temporary Impacts (acres)	0.0	0.0	0.0	0.0	0.0	0.0
Agricultural Uses (% of right-of-way)	1.6	1.6	2.0	1.6	0.5	0.5

Calculation methodology is described in Section 7.0 Methods and Regulations.

8.23.5 Mitigation

The Applicants would work with landowners to minimize impacts to farming operations along the route. Impacts can be minimized by aligning the transmission line along existing transmission, pipeline, and roadway rights-of-way. The easements would not restrict farming operations once construction is completed, so the easement area between structures would be available for crop production.

The Applicants would compensate landowners for any crop damage or soil compaction that may occur during construction.

8.24 *Transportation and Pipeline Facilities*

8.24.1 Existing Conditions

This section provides an overview of the roadways, railways, airports and pipeline facilities located in proximity to the Project. Figure 8 illustrates existing transportation and utility infrastructure in the project vicinity.

Roadway

Routes 1, 1A, 1B, and 1C

Routes 1, 1A, 1B, and 1C cross three highways: US Highway (US) 71, Trunk Highway (TH) 371, and TH 6. These routes would parallel US 2 and US 2/TH 6 for a cumulative length of approximately 25 miles (about 36 percent of their lengths). The routes would generally be located within 300 to 1,500 feet of US 2 along these parallel segments.

US 2 south of Bemidji has an annual average daily traffic (AADT) volume that ranges between 7,300 and 9,800. The 2006 AADT of US 2 and US 2/TH 6 between Bena and the Boswell Substation ranges from 3,400 to 8,400. The 2006 AADT is 8,600 where Routes 1, 1B, and 1C cross US 71; 5,600 where Route 1A crosses US 71; 3,800 where the routes cross TH 371; and 560 where the routes cross TH 6 (MN/DOT, 2006).

Routes 2 and 2C

Routes 2 and 2C cross five highways including: US 71, TH 197, TH 371, TH 6, and US 2. These routes would be collocated with US 2/US 71, US 2, and US 2/TH 6 for a cumulative length of approximately 60 miles or about 88 percent of the routes length. The primary deviations from US 2 are along the south sides of Cass Lake and Deer River.

The highest AADT volumes on US 2 for Routes 2 and 2C occur between the cities of Bemidji and Cass Lake, with a 2006 AADT range between 5,200 and 12,300. The lowest volumes, about 3,400 AADT, occur between the cities of Cass Lake and Deer River. The 2006 AADT is between 7,700 and 8,600 where the routes cross US 71/TH 197; between 5,600 and 6,100 where the routes cross TH 371; and 560 where the routes cross TH 6 (MN/DOT, 2006).

Future Transportation Plans of US and State Highways

The Minnesota Department of Transportation (MN/DOT) has indicated that it plans to expand US 71 into a four-lane divided highway on the south side of Bemidji. This highway improvement project is planned to occur in 2010 or 2011, and would involve expansion of an estimated 70 feet of new road area and approximately 40 feet of new right-of-way along the east side of existing US 71.

MN/DOT has long-term plans to add bypass lanes to US 2 between the cities of Cass Lake and Deer River. However, a specific timeline for this highway improvement project has not been developed since funding has not become available. The proposed improvement is not part of the MN/DOT 2003-2023 Statewide Transportation Plan (Bittman, 2008). If the project does receive funding, MN/DOT has indicated that it hopes to design the project

without having to acquire additional right-of-way. MN/DOT has also indicated that it would likely design the US 2 bypass lanes according to current freeway standards (Frisco, 2008).

County State Aid Highways

Routes 1, 1A, 1B, and 1C cross the following County State Aid Highways (CSAHs) (by County): Beltrami – 14, 7, 11, and 2; Hubbard – 36, 45, and 9; Cass – 69, 76, and 8; and Itasca – 18, and 11.

Routes 2 and 2C cross the following CSAHs (by County): Beltrami – 6, 7, 11, 50, and 45; Hubbard – 8, 45, and 46; Cass – 75, 10, 8, and 9; and Itasca – 39, 18, and 11.

Railways

The Burlington Northern Santa Fe (BNSF) railway runs between the Wilton and Boswell Substations, generally paralleling the south side of US 2 (Figure 8). Routes 1, 1A, 1B, and 1C follow the BNSF corridor for an estimated 11 miles, between Bena and Ball Club along US 2/ TH 6. These routes may cross the railway at two locations, both of which are southeast of Zemple, by approximately 1 mile and 3.5 miles, respectively.

Routes 2 and 2C follow the BNSF railway corridor for the majority of the alignment, with deviations away from the railroad near the southwest side of Bemidji, near Lake Irving; along the west side the City of Cass Lake, near Grace Lake, Midge Lake, and Little Wolf Lake; and south of the City of Deer River to the Boswell Substation. These routes have the potential for multiple crossings of the railway, including the following locations: about 500 feet north of the Beltrami-Hubbard County Line; at the Cass Lake Substation along the west side of the City of Cass Lake; at the east side of the City of Cass Lake; about 2 miles west of the City of Deer River; about 1 mile southeast of Zemple; and about 1 mile north of the Boswell Substation.

Airports

There are four public airports and two private airports located within 2 miles of the Study Area. Three of the aforementioned airports are within 2 miles of Route 1A, including: Bemidji Regional Airport (located approximately 1.5 miles north-northeast of the Wilton Substation); Moberg Airbase (located approximately 1 mile north of the Wilton Substation); and an unnamed airport north of the City of Deer River. The fourth airport is Nary National-Shefland Field, which is within 2 miles of Routes 1, 1B, and 1C.

Pipelines

Routes 1, 1A, 1B, and 1C would follow the Great Lakes Gas pipeline right-of-way, whereas Routes 2 and 2C would be collocated with Enbridge pipeline right-of-way. Great Lakes Gas pipeline is a high-capacity natural gas pipeline regulated by the Federal Energy Regulatory Commission and pipeline safety is overseen by the US Department of Transportation (USDOT). The Enbridge pipeline system carries crude oil and is regulated by the State of Minnesota.

8.24.2 Direct/Indirect Effects

Potential effects for the routes and route segments located within the Leech Lake Reservation (LLR) and Chippewa National Forest (CNF)-managed lands would be consistent with potential effects across the Study Area and are not discussed separately.

Transmission structures are not expected to permanently impact roadway and railway rights-of-way. Short-term impacts to roadways may be necessary during construction, due to detours or short-term traffic delay for crossing roads, delivering materials, setting guard poles, or stringing conductors.

Future Transportation Plans for US and State Highways

Route 1A would not affect the planned US 71 expansion because, according to MN/DOT, the limits of the construction are located between the City of Bemidji and 1,000 feet south of the junction of US 71 and CSAH 9 in Hubbard County (Frisco, 2008).

Railway Compatibility with High-Voltage Transmission Lines

When a high-voltage alternating current (AC) transmission line is located adjacent to a railway, the railway's tracks and signals may be subject to electrical interference from capacitive, electric and magnetic, and conductive effects. Capacitive coupling results from the electric field from the transmission lines' conductors coupling with above ground conductive objects that are insulated from the earth, such as the railways tracks which are typically installed on high impedance ballast (the rock bed used to support the tracks). Electric and magnetic induction results from the magnetic field produced by the alternating current flowing in the conductors of the transmission line coupling with the above ground and below ground metallic objects, such as railway tracks and buried communications cables, if present. Conductive interference results from fault currents entering the ground and raising the soil potential in the vicinity of the railway. If a transmission line is located in proximity and parallel to a railway for long distances, all these interference mechanisms can cause high currents and voltages to develop on the railway's tracks and communication cables. If the AC interference is above certain thresholds, it can result in personal safety hazards, damage to signal and communication equipment, and false signaling of equipment.

These AC interference effects can be easily predicted with computer modeling. With proper planning and mitigation management, railways and high-voltage AC transmission lines can be safely collocated. The American Railway Engineering and Maintenance-of-Way Association (AREMA) has specifications for steady state rail-to-ground and equipment-to-ground voltage levels to insure safety of railway operating personnel and the public. During fault conditions the safety criteria established by the American National Standards Institute/Institute of Electrical and Electronics Engineers Standard 80 (Guide for Safety in AC Substation Grounding) is used. In addition, railway signal and equipment manufactures provide AC interference voltage tolerances for proper signal operation so that nearby transmission facilities can be designed to insure that AC interference levels do not exceed the acceptable safety criteria or equipment voltage tolerance.

Pipeline Compatibility with High-Voltage Transmission Line

When a high-voltage AC transmission line is located adjacent to pipeline's right-of-way the pipeline may be subjected to electrical interference from electric and magnetic induction, conductive interference and capacitive effects.

Electric and magnetic induction is the primary effect of the high-voltage AC transmission line on a buried pipeline during normal (steady state) operation. This form of interference is due to the magnetic field produced by the AC current flowing in the conductors of the transmission line coupling with the metallic pipeline, inducing a voltage and associated current on the pipeline.

Conductive interference is a concern when a transmission line fault occurs in proximity to the pipeline as it can cause AC currents to enter the pipeline at coating holidays (flaws in the coating) and produce a voltage gradient across the pipeline coating. Electric and magnetic effects are also a concern during a fault because the phase current in at least one phase (conductor) of the high-voltage AC transmission line is elevated.

Capacitive effects are typically only a concern during pipeline construction when long sections of the pipeline are above ground. Lastly, to prevent contact shock hazards, proper horizontal and vertical separation between the transmission line's conductors and equipment used during pipeline construction and maintenance (such as cranes and shovels) must be maintained.

If these electrical interference effects are great enough during normal operation, then a potential shock hazard exists for anyone that touches an above ground part of the pipeline, such as a valve or cathodic protection test station. In addition, during normal operation, if the induced AC current density at a flaw in pipeline coating is great enough, AC pipeline corrosion may occur. Lastly, damage to the pipeline coating can occur if the voltage between the pipeline and surrounding soil becomes excessive during a fault condition.

8.24.3 Mitigation

Transmission lines would be designed in accordance with National Electrical Safety Code (NESC) standards to minimize impacts to transportation. The Applicants would work with the state and local officials to minimize any impacts during construction and operation of the proposed transmission line.

MN/DOT

Applicants would obtain MN/DOT and county permits as applicable for transmission line crossings over regulated roadways.

Construction activities may necessitate access from the highway right-of-way to the transmission line right-of-way at existing or additional turnout or approach locations. Construction of temporary additional turnouts or approaches may require installation of culverts and fill materials. Installation of additional temporary access points would be subject to review and approval of highway officials. Construction forces would implement traffic control measures in accordance with the MN/DOT Manual on Uniform Traffic Control Devices. Removal of existing conductors and stringing of new overhead conductors over highways requires installation of temporary wood pole "guard structures" and other

measures to safeguard the public and construction forces. Temporary guard structures are designed to provide vertical clearance of the conductors above the road surface to avoid impacting normal vehicular traffic on the roadway.

After installation of the new conductors is complete, the temporary guard structures are removed. At some locations, additional measures such as boom trucks equipped with "bat wings" may be employed to ensure that adequate vertical clearance is maintained at the highway crossing during stringing operations. Restriction of traffic may occasionally be required for short periods of time during pole deliveries or during critical wire stringing activities. Construction forces would work closely with Minnesota State Patrol to ensure implementation of appropriate measures to safeguard the public and construction forces.

Mitigation for High-Voltage Transmission Line and Railway Compatibility

Depending on AC interference levels, several mitigation methods can be used. These include reducing the distance between insulated joints in track sections, grounding the railroad's tracks, and buried gradient control wires or matting. It is unlikely that installing any of the above mitigation methods would require additional right-of-way. Reducing the distance between insulated joints involves placement of additional joints in the existing tracks in order to shorten track sections. This reduces coupled track area and AC interference voltage levels. Grounding the tracks and communication cables is one of the most effective methods. Typically this is done at communication and signal cable access points (such as at splice locations and manholes) and the other points where the track would have high induced voltage if not grounded. Grounding reduces voltage levels along track sections and provides a path for AC interference currents to flow to ground. Burying gradient control wires or matting is a highly effective method to mitigate both inductive and conductive interference. They raise the earth potential in the vicinity of the railroad such that the difference in potential between the railroad and local ground is reduced. As a result, rail-to-ground and rail touch voltages are significantly reduced. Gradient control wires or matting consist of one or more bare conductors buried parallel to and near the railroad.

The Applicants would insure that computer modeling of AC interference effects is completed and that any required mitigation is designed and installed prior to energizing the transmission line. Based on past projects, the cost to complete computer modeling, mitigation design, and installation is low in comparison to the cost of the overall proposed Project. Based on previous projects and the range of possible collocation distances for this project, it is anticipated that the cost of modeling and any needed design and mitigation measures for the Project if located adjacent to the BNSF railroad would range from approximately $400,000 to $750,000.

Mitigation for High-Voltage Transmission Line and Pipeline Compatibility

With proper planning and mitigation, pipelines and high voltage AC transmission lines can be safely collocated. The AC interference effects can be easily predicted with computer modeling. The National Association of Corrosion Engineers has standards that ensure that pipeline integrity would not be degraded nor personnel safety compromised because of AC interference from a transmission line constructed and operated adjacent to a pipeline. Mitigation techniques for AC interference on pipelines include reducing the impedance of the transmission structure grounds, grounding the pipeline in conjunction with de-couplers,

burying gradient control wires along the pipeline, or ground mats under aboveground facilities (such as at valves) and the use of dead fronts at test stations.

None of the above mitigation methods would be expected to require additional right-of-way. Reducing transmission impedance consists of adding stacked or parallel ground rods to the structure grounding system. This is done adjacent to the transmission structure, thus no additional transmission line right-of-way is required. Grounding a pipeline typically occurs within the existing pipeline right-of-way and consists of connecting a copper or zinc cable to the pipeline through a de-coupler device to prevent DC cathodic protection current from flowing to ground. Gradient control wires are typically copper conductors buried parallel to and adjacent to the pipeline (within 5 to 10 feet).

Ground mats consist of an approximately 8-foot square section of conductors buried underneath where pipeline personnel stand when operating a valve. Dead fronts consist of replacing the existing test stations with test stations that are non-conductive and require no additional land. Lastly, additional "coupon stations" are sometimes installed to monitor the pipeline to insure that mitigation measures are effective at preventing AC pipeline corrosion. These facilities are installed adjacent to the pipeline and use coupons that are exposed to the same environment as the pipeline and that are monitored to determine if AC corrosion is occurring. This typically would not require additional right-of-way.

The Applicants would insure that computer modeling of AC interference effects is completed and that any required mitigation is designed and installed prior to energizing the transmission line. Based on past projects, the cost to complete computer modeling, mitigation design, and installation is low in comparison to the overall cost of the Project. If mitigation were required, it is anticipated that the cost would be less than $2.0 million. The Applicants have been meeting and working with Enbridge and Great Lakes Gas to ensure there will be the necessary separation between the proposed transmission line and pipelines to ensure safety requirement are met. This would insure there are no adverse impacts on pipeline structure, pipeline operation, or public safety resulting from locating the transmission line adjacent to a pipeline right-of-way.

8.25 *Forestry*

8.25.1 Existing Conditions

The Project is located in a part of Minnesota that contains economically important forestlands. According to the Chippewa National Forest's (CNF) *Fiscal Year (FY) 2006 Monitoring and Evaluation Report*, the CNF harvested timber on 2,572 acres of land in FY 2006. Of the areas harvested, 53 percent of the stands were thinned, 31 percent were clearcut, 11 percent were shelterwood/partial cut, and 5 percent were uneven-aged harvest treatments. In FY 2006, 20.6 million board feet (MMBF) of timber were harvested, and 28.9 MMBF of timber were sold. The timber sold at an average bid price of $108.42 per thousand board feet. This represents over $3.1 million in timber sales during FY 2006 (CNF, 2007).

According to the Department of Natural Resources' (DNR) *Chippewa Plains/Pine Moraines and Outwash Plains Subsection Forest Resource Management Plan Assessment (SFRMP)*, about $1.5 million of timber was sold from DNR lands within the Chippewa Plains Subsection in the 2004 fiscal year. The Chippewa Plains Area includes large sections of the Study Area counties, as well as smaller parts of Clearwater, Mahnomen, and Koochiching counties. The most commonly harvested timber (in order of prevalence): aspen, jack pine, balsam fir, tamarack, and paper birch. According to the SFRMP, approximately 9 percent of the state-owned land in the Chippewa Plains Subsections is considered timberland.

As part of their 2004 *Land and Resource Management Plan*, CNF delineated its lands into specific Management Areas (MA) with management directions that identify suitability for timber production. The routes include six different MAs. Areas classified as General Forest or General Forest—Longer Rotation offer the most opportunity for timber production.. On average about 66 percent and 50 percent, respectively, of the land in the "Recreation Use in a Scenic Landscape" (RU) and "Riparian Emphasis" (RE) MAs are considered suitable for timber management. "Experimental Forest" (EF) and "Unique Biological, Aquatic, Geological, or Historical Areas" (UB) MAs are not considered suitable for timber management.

Private forest lands are also located within Routes 1, 2, and their alternatives. While data is not readily available on the management practices within these private lands, it is likely that some of these areas are also managed for timber production.

Table 8.25-1 summarizes the approximate acreages of forestland within Routes 1, 2, and their alternatives. Figure 1 displays the location of federal and state forestland near the project. Figure 2 displays the approximate land cover types.

Table 8.25-1 Forested Landcover within each Route

	Cover Type	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
		Acres					
Entire Route	Conifer Forest	1,200	1,166	1,200	1,313	1,278	1,390
	Conifer-Deciduous Forest	140	146	163	148	114	122
	Deciduous Forest	3,516	3,888	4,040	3,852	2,453	2,789
	Total	4,856	5,200	5,403	5,313	3,845	4,301
CNF Owned Lands	Conifer Forest	708	699	588	786	580	658
	Conifer-Deciduous Forest	48	48	50	52	30	34
	Deciduous Forest	1,617	1,567	1,799	1,839	1095	1317
	Total	2,373	2,314	2,437	2,677	1,705	2,009
LLR	Conifer Forest	1,002	993	1,001	1,113	964	1075
	Conifer-Deciduous Forest	109	111	132	117	76	84
	Deciduous Forest	2,462	2,315	2,987	2,782	1,807	2,127
	Total	3,573	3,419	4,120	4,012	2,847	3,286

8.25.2 Direct/Indirect Effects

Construction of the transmission line would convert right-of-way forestlands to shrub and grasslands. Route 1 and its alternatives would permanently convert 579 to 639 acres of forested area by the clearing of a 125-foot-wide right-of-way (Table 8.25-2). Route 2 and 2C would permanently convert 439 and 499 acres, respectively. The majority of the forest impacts within the right-of-way would occur to deciduous forest communities, with lesser impacts occurring to coniferous forest communities, and relatively minimal impacts occurring to mixed conifer-deciduous forest communities.

Table 8.25-2 Forest Impacts with the 125-foot Right-of-way

Cover Type	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
	Acres					
Conifer Forest	118	112	116	132	152	167
Conifer-Deciduous Forest	9	8	13	9	11	11
Deciduous Forest	452	479	510	498	276	321
Total	579	599	639	639	439	499

Within these broad forest types, Geographical Analysis Program (GAP) level 4 landcover data (see Table 8-18.1 in Flora section) indicate that aspen/white birch and upland deciduous are the most common forest compositions within the routes. Red/white pine,

lowland deciduous, and lowland black spruce are also relatively prevalent forest communities.

Additional impacts to forestlands are likely because of a new substation proposed in the vicinity of Cass Lake. Approximately 4 acres of forest would be impacted for substation construction associated with Route 1. Substation expansion associated with Route 2 would likely result in less than 4 acres of forest impacts.

8.25.3 Direct/Indirect Effects within the Leech Lake Reservation

GAP data analysis of Route 1 and its alternatives indicates that about 413 acres to 492 acres of forested area would be permanently impacted by the clearing of a 125-foot-wide right-of-way (Table 8.25-3). Route 2 and 2C would permanently impact about 336 acres and 394 acres, respectively. Impacts to forest type would be similar to those discussed in Section 8.25.2, above.

Table 8.25-3 Forest Impacts within the Leech Lake Reservation

Cover Type	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
	Acres					
Conifer Forest	97	97	93	111	129	143
Conifer-Deciduous Forest	7	7	12	7	7	7
Deciduous Forest	329	309	387	373	200	244
Total	433	413	492	491	336	394

Within these broad forest types, GAP level 4 landcover data (see Table 8-18.1 in Flora Section) indicate that aspen/white birch and upland deciduous are the most common forest compositions within the routes. Red/white pine, lowland deciduous, jack pine, and maple/basswood are also relatively prevalent forest communities.

8.25.4 Direct/Indirect Effects to CNF-managed Property

Forest Types

GAP data analysis of Route 1 and its alternatives indicates that about 287 to 333 acres of forested area within CNF-managed land would be permanently impacted by the clearing of a 125-foot-wide right-of-way (See Table 8.25-4). Route 2 and 2C would permanently impact 202 and 241 acres, respectively. Impacts to forest type would be similar to those discussed in Section 8.25.2 above.

Table 8.25-4 Forest Impacts within CNF-managed Property

Cover Type	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
	Acres					
Conifer Forest	69	68	54	78	75	84
Conifer-Deciduous Forest	3	3	4	3	3	3
Deciduous Forest	222	216	238	252	124	154
Total	294	287	296	333	202	241

Within these broad forest community types, forest stand information provided by the CNF (see Table 8.18-4 in Flora Section) indicates that quaking aspen is the most common forest community within the rights-of-way, with red pine and maple/basswood also being dominant forest communities. Lesser areas of jack pine, paper birch, balsam fir, bigtooth aspen, tamarack, white pine, white cedar, and black spruce also occur within the CNF-managed right-of-way.

CNF Management Areas

As noted above, CNF has delineated its lands into specific MAs. See Table 8.25-5 for right-of-way impacts within CNF MA areas.

Table 8.25-5 CNF Management Areas within the 125-foot Right-of-way

CNF Management Area	Route 1	Route 1A	Route 1B	Route 1C	Route 2	Route 2C
	Acres					
Experimental Forest (Pike Bay)	31.8	31.8	0.0	31.8	0.0	0.0
General Forest	185.0	185.0	188.7	220.8	189.5	225.2
General Forest - Longer Rotation	69.5	69.5	129.6	69.5	29.1	29.1
Rec Use - Scenic Landscape	0.0	0.0	0.0	0.0	25.9	25.9
Riparian Emphasis	7.3	7.3	7.3	7.3	0.0	0.0
Unique Biol/Aquatic/Geol/Hist (Ten Section Area)	37.8	31.0	9.0	37.8	27.1	27.1
Unique Biol/Aquatic/Geol/Hist (Other Areas)	15.8	15.8	15.8	21.0	11.5	16.7
Water	0.3	0.3	0.3	0.3	0.7	0.7
Total	347.5.3	340.8	350.9	388.6	283.8	324.7

Pike Bay Experimental Forest Management Area

Routes 1, 1A, and 1C would all impact part of Pike Bay Experimental Forest (EF). Pike Bay EF is primarily managed for silviculture research and experimentation purposes. Much of this experimental forest is dominated by mature aspen and paper birch (60 to 80 years old) and mixed hardwood forest (maple, elm, and basswood).

Ten Section Unique Biological, Aquatic, Geological, or Historical Management Area (UB)

The right-of-way of the routes would all impact some part of the Ten Section Area UB. Routes 1, 1A, and 1C would cross through the Ten Section area along the south side of Pike Bay, impacting about 31 to 38 acres. Routes 2, and 2C would cross through the Ten Section area along the north side of Pike Bay, impacting about 27 acres. Route 1B deviates to the south side of the Ten Section Area, generally avoiding direct impacts to the area.

The Ten Section Area was protected from timber cutting in the early 1900s, and is now used primarily for recreation and interpretive purposes. Stand data provided by the CNF indicates that small areas of mature red pine dating from the 1800s and early 1900s would be impacted by the routes, with the exception of Route 1B, which would not impact mature red pine forest. Routes 1, 1A, and 1C would impact an estimated 2.1 acres of mature red pine within the Ten Section Area, and Routes 2 and 2C would impact an estimated 3.4 acres of mature red pine.

8.25.5 Mitigation

Construction of the project would result in a conversion of forestland to non-forest use. Timber harvested for the project would be made available to the local community for use as firewood. Once construction is complete, the right-of-way would be allowed to naturally regenerate with local species. Long-term management would promote the establishment of forbs and grasses. Shrubs would be allowed to regenerate within the right-of-way as long as they do not interfere with maintenance, access and the safe operation of the line.

Construction staging areas would be located and arranged in a manner to preserve trees and vegetation to the maximum practicable extent. The preferred locations are previously disturbed areas. Unless otherwise agreed upon by the landowner, all storage and construction buildings, including concrete footings and slabs, and all construction materials and debris would be removed from the site once construction is complete. To the extent practicable, staging areas would be restored to preconstruction conditions.

Temporary access roads outside of the right-of-way may be required. The Applicants would work with local property owners to identify suitable access locations. Temporary impacts would be restored once construction is completed.

The Applicants would coordinate with regulatory agencies to identify appropriate avoidance and minimization measures for use in federal and state-owned properties.

8.26 *Mining*

8.26.1 Existing Conditions

Large deposits of glacially derived sediments are present within the Study Area (See Section 8.12 for a more detailed description of the Geomorphic and Physiographic Environment). Consequently, aggregate mining operations are located along the length of the routes.

According to data produced by the Minnesota Department of Transportation'a (MN/DOT) Aggregate Source Information, there are seven areas that contain active and inactive aggregate resources within the Study Area (Table 8.26-1, see also Segment maps in Appendix A). All of these sites are located between Bemidji and Cass Lake. The most notable concentration of such mining operations within the Study Area is located along the south side of US Highway 2 (US 2), near the junction of US 2 and County Road 45 in Hubbard County.

Table 8.26-1 Aggregate Resource Locations

County	Township	Range	Section	Status
Beltrami	146N	33W	20	Inactive
Beltrami	146N	33W	29	Inactive
Hubbard	145N	33W	1	Active (2 sites)
Hubbard	145N	32W	7	Active (2 sites)
Hubbard	145N	32W	8	Active (2 sites); Inactive (1 site)
Hubbard	145N	32W	9	Active (3 sites); Inactive (1 site)
Hubbard	145N	32W	11	Active

There are no mineral based mining operations taking place in or near the Study Area.

8.26.2 Direct/Indirect Effects

Routes 1, 1A, 1B and 1C.

No impacts to mining resources would occur due to construction of the Project within Route 1 or its alternatives.

Routes 2 and 2C

Routes 2 and 2C cross an existing aggregate mining operation that is located in Sections 7, 8, and 9 of Farden Township (T145, R32) in Hubbard County. The rights-of-way of Routes 2 and 2C would avoid this resource by staying to the north side of the mining operation. Thus, the Applicants do not expect these routes to result in any direct or indirect effects to the existing aggregate resources.

8.26.3 Mitigation

If mining operations cannot be avoided, the Applicants would work with existing mining operations to identify the extent of current and planned mining operations and develop appropriate mitigation measures.

8.27 *Preferred Route (Route 1)*

This section summarizes the deciding factors in selecting Route 1 as the preferred route for the proposed Bemidji-Grand Rapids Line. Section 8.0 provides a summary of potential impacts and effects (Table 8-1) and recommended mitigation (Table 8-2) for the proposed Project.

The information analyzed in Sections 8.1-8.26 as well as the list below, summarizes the deciding factors in selecting the Preferred Route (Route 1):

- Route 1 would impact less area of High Scenic Integrity than Route 2. About 33 percent of Route 1 is classified as needing management for High Scenic Integrity, contrasted with about 88 percent of Route 2. The primary negative visual impacts within Route 2 are associated with the US 2 corridor. US 2 is considered the "gateway" into the Chippewa National Forest (CNF), and the Project would be another visual impact along US 2 if that route were selected.
- Route 1 avoids going through the towns of Cass Lake and Bena. In contrast, Route 2 would directly affect the cities of Cass Lake and Bena. The US 2 corridor in the Cass Lake area is considered a "pinch-point," located on an isthmus between Cass Lake and Pike Bay (approximately 2.5 miles in length and approximately 1,200-feet wide). Along with US 2, there are four existing pipelines, two proposed pipelines, a railroad, a recreational trail, and commercial buildings located on this narrow strip of land.
- Route 1 would affect fewer residences than Route 2.
- Route 1 would affect fewer commercial and industrial operations than Route 2.
- Route 1 uses existing transmission line corridors and creates more opportunities for double-circuiting with existing lines than Route 2.
- Route 1 has options to avoid the Pike Bay Experimental Forest.
- The Applicants recognize that Route 1 would convert more forested wetlands to non-forested wetlands as compared to Route 2. However, the Applicants believe that the benefits of following existing transmission and pipeline rights-of-way outweigh the additional impacts. Best management practices and mitigation would be used to compensate for wetland impacts.
- The Applicants believe that Route 1 also best addresses concerns raised at public meetings by utilizing existing transmission and pipeline rights-of-way to minimize impacts to landowners, businesses, and population concentrations.
- Route 2 could conflict with the construction schedule of Enbridge's proposed pipeline project.

9.0 Cumulative Impacts

In addition to analyzing the individual impacts of a project, the federal environmental review process requires consideration of the cumulative environmental impact of multiple projects within an area. In conformance with National Environmental Policy Act (NEPA) requirements, this section discusses the cumulative significance of past, present, and reasonably anticipated future projects on the environment along the Bemidji-Grand Rapids Line route alternatives.

9.1 *Regulatory Requirement*

The Council on Environmental Quality's (CEQ) Regulations for Implementing the Procedural Provisions of NEPA defines cumulative impacts as:

- The impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions (40 CFR 1508.7).
- Cumulative impacts are considered direct effects, which are "caused by the action and occur at the same time and place" (40 CFR 1508.8).

The CEQ regulations also require a discussion of cumulative actions and connected actions in the scope of the environmental review. These terms are defined as follows:

- Cumulative actions are those "which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same [environmental review]" (40 CFR 1508.25(a)(2)).
- Connected actions are those that are closely related. "Actions are connected if they: (i) automatically trigger other actions which may require environmental review; (ii) cannot or would not proceed unless other actions are taken previously or simultaneously; or (iii) are interdependent parts of a larger action and depend on that larger action for their justification" (40 CFR 1508.25(a)(1)).
- Indirect effects, also termed secondary effects, are "caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. Indirect effects may include growth inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" (40 CFR 1508.8).

9.2 *Analytical Approach*

This cumulative impacts review was developed in consultation with the federal, state, and local agencies responsible for the various environmental resources within the route alternatives, and is limited to those resources the agencies identified as being of concern and potentially requiring mitigation. This type of screening ensures that the analysis focuses on critical resources. The cumulative impacts analysis is based on existing conditions of the critical environmental resources in each of the route alternatives.

This analysis uses an approach developed through graduate research (Shoemaker, 1994 and 2004) and in dialogue with federal agencies such as the Environmental Protection Agency (EPA), Federal Highway Administration (FHWA), US Army Corps of Engineers (USACE), and the Bureau of Land Management (BLM). It is a nationally accepted methodology on large infrastructure projects and consists of the following steps:

- Establish valued environmental components
- Establish temporal and spatial study boundaries
- Identify past, present, and reasonably foreseeable activities both direct and indirect
- Analyze cumulative impacts through use of a matrix format (CEQ 1997)

9.3 *Valued Environmental Components*

Valued environmental components (VECs) are those components of the environment for which there is regulatory or public concern. VECs include the social, cultural, technical, economic, and natural components of the environment. This section follows two principles identified by CEQ when considering VECs: (1) focus only on the effects and resources within the context of the proposed action; and (2) present a concise list of issues that have relevance to the anticipated effects of the proposed action or eventual decision. Based on this guidance, the resources examined in Section 8, Affected Environment, were reviewed to determine which constituted VECs that may be affected by cumulative actions. The factors used to decide which resources to review are listed below:

- Aesthetics – Further consideration of the potential to affect the US Forest Service's scenic integrity objectives.
- Agricultural Production and Prime Farmland – Further consideration of whether any of the routes would permanently remove land from crop production.
- Air Quality – No further consideration as all predicted emission levels would be caused by construction equipment during the construction period. The resulting emissions would be low and temporary, with concentrations likely not exceeding state and federal standards.
- Archaeological and Historic Resources and Cultural Values – No further consideration as the routes are not expected to impact known cultural resources and values. The Applicants would conduct a cultural resource survey prior to construction and adjust the Project's right-of-way alignment to avoid impacting any discovered cultural resource sites.
- Climate – No further consideration as the routes would not cause an increase in greenhouse gas emissions.
- Economic Factors – No further consideration as all routes would positively affect economic conditions by improving the reliability of the local transmission system and reducing the potential for brown-outs.

- Environmental Justice – Further consideration as all of the routes are located in census blocks with higher than average minority and low income populations.
- Electric and Magnetic Fields – No further consideration as the routes would be constructed following "prudent avoidance" guidance.
- Fauna – Further consideration due to potential for bird strikes, habitat change, and habitat fragmentation.
- Flora – Further consideration to address any regional activities that may affect vegetation potentially impacted by the Project.
- Forestry – Further consideration as the routes are anticipated to permanently impact forestlands.
- Geology, Soils, and Minerals – No further consideration as the Applicants would use approved and proven mitigation measures to minimize the potential for soil erosion.
- Human Settlement – Further consideration because although no residence displacement is anticipated, the Project may have an indirect effect on property values.
- Land Use – Further consideration as the routes have the potential to impact forestry activities. Land in the Project's right-of-way would not return to its pre-existing state as forestland but be maintained in a shrub or grassland state.
- Mining – No further consideration as the routes affect no existing aggregate extraction area.
- Noise – No further consideration as the routes are not expected to exceed state noise standards.
- Public Services – No further consideration as the routes would not restrict the public from any public service.
- Radio, TV, and Cell Phone – No further consideration as transmission lines rarely result in any impacts, and in the rare case that there are, the impacts can be readily mitigated by tightening loose hardware or upgrading receiving antennas.
- Recreation and Tourism – Further consideration as some of the routes permanently impact the Bemidji Slough Wildlife Management Area (WMA) and may have indirect visual impacts upon trail users.
- Rare and Unique Species and Communities – Further consideration to address any regional activities that may affect special status species habitat potentially impacted by the Project.
- Transportation – No further consideration due to the high capacity of the existing roadway system and likelihood of mitigating any impact from Project construction.

- Water Resources – No further consideration as the Applicants would use approved and proven mitigation measures to minimize the potential for sedimentation.
- Wetlands – Further consideration due to the potential for additional losses and habitat conversion of waters of the United States.

9.4 *Temporal and Spatial Boundaries*

The temporal boundary is the design life of the Project facilities. Spatial boundaries are based on the Project Study Area, which includes all land within the alternative transmission line routes under consideration for the Project.

9.5 *Past, Present, and Reasonably Foreseeable Activities*

Regulations and case law provide direction as to what constitutes a reasonably foreseeable action that should be included in a cumulative impacts review. Reasonably foreseeable actions include activities that are not speculative and that constitute an independent utility or function. In addition, a reasonably foreseeable project should be planned and funded (Canter and Rumrill, 1997).

The only large present or reasonably foreseeable development action that may impact resources affected by the Project is the construction of two new pipelines by Enbridge Pipeline. Past activities (e.g. the general loss of wetlands) are treated as part of baseline conditions and considered in conjunction with any potential impacts posed by this Project.

Additional development induced by the Project is considered an indirect impact for purposes of a cumulative impacts analysis. The development of a wind generation facility in response to the Project increasing the transmission outlet for such generation would only merit specific analysis if it is reasonably foreseeable. At this point, no wind generation facilities induced by this Project have been identified as reasonably foreseeable. The following provides a summary of the activities identified within the Study Area that may contribute to direct or indirect cumulative impacts.

9.5.1 Transmission Lines

Transmission lines have been constructed within segments of the proposed routes. They vary in capacity from 69 kV to 115 kV. No additional transmission lines are planned for the foreseeable future.

9.5.2 Substations/Breaker Station

There are substations located within the routes, including the Boswell, Cass Lake, and Wilton substations. All of the routes include modifications to the Boswell and Wilton substations and, possibly, a breaker station at Nary Junction. The existing Cass Lake Substation would be upgraded to accommodate 230 kV if Route 2 or 2C is selected. A new 230 kV substation would be constructed in the Cass Lake area if Route 1, 1A, 1B, or 1C is selected. No other substation modifications are planned for the foreseeable future.

9.5.3 Roadway Infrastructure

The Minnesota Department of Transportation's (MN/DOT) Statewide Transportation Improvement Program identifies various transportation projects in the Study Area for the period 2006-2008. Review of the planned projects for Beltrami, Hubbard, Cass, and Itasca counties (in Districts 1 and 2) shows that the transportation projects generally consist of routine maintenance activities such as road and highway re-surfacing, asphalt surface treatment, bridge repair, bituminous overlay, milling and overlay, concrete paving, and railroad crossings.

MN/DOT has also indicated that it plans to expand US 71 into a four-lane divided highway on the south side of Bemidji. This highway improvement project is planned to occur in 2010 or 2011, and would involve expanding the road area by 70 feet in width, and adding approximately 40 feet of new right-of way along the east side of existing US 71.

MN/DOT also has long-term plans to add bypass lanes to US Highway 2 (US 2) in the cities of Cass Lake and Deer River. However, a specific timeline for this highway improvement project has not been developed since funding has not become available. This proposed improvement is not part of the MN/DOT 2003-2023 Statewide Transportation Plan. If the project does receive funding, MN/DOT has indicated it intends to design the project such that it would not require the acquisition of additional right-of-way.

9.5.4 Pipelines

Great Lakes Gas Transmission (Great Lakes) operates a natural gas pipeline along Route 1. Enbridge Pipelines LLC (Enbridge) operates three other pipelines along Route 2. Enbridge is proposing two new pipelines within the Study Area: (1) Alberta Clipper Project and (2) Southern Lights Diluent Project. These two projects would generally follow Enbridge's existing Minnesota pipeline rights-of-way through the following counties: Kittson, Marshall, Pennington, Red Lake, Polk, Clearwater, Beltrami, Hubbard, Cass, Itasca, Aitkin, St. Louis, and Carlton.

The proposed Alberta Clipper Project begins in Hardisty, Alberta, Canada, and ends in Superior, Wisconsin, a length of approximately 990 miles. In the US, the Alberta Clipper Project is proposed to be co-located with or adjacent to Enbridge pipelines in North Dakota, Minnesota, and Wisconsin. The Minnesota portion of the Alberta Clipper Project extends from the Minnesota-North Dakota border in Kittson County, to the Minnesota-Wisconsin border in Carlton County, approximately 285 miles. The Alberta Clipper Project may also involve construction of new pumping units at the Enbridge pump station sites in Viking, Clearbrook, and Deer River, Minnesota.

The Southern Lights Diluent Project is a new 20-inch-diameter underground pipeline proposed for co-construction with the Alberta Clipper Project, from Clearbrook, Minnesota, to Superior, Wisconsin. This approximately 175-mile Project is proposed to be located on or adjacent to existing Enbridge pipeline rights-of-way.

9.5.5 Energy Corridors

Several federal agencies maintain on-going efforts to identify energy corridors. Although the Study Area is not considered an energy corridor, it contains many different linear energy

rights-of-way. According to the West-wide Energy Corridor Programmatic EIS, an energy corridor is defined as a parcel of land (often linear in character) that has been identified through the land use planning process as being a preferred location for existing and future utility rights-of-way, and that is suitable to accommodate one or more rights-of-way which are similar, identical, or compatible. Energy corridors may accommodate multiple pipelines (such as for oil, gas, or hydrogen), electricity transmission lines, and related infrastructure, such as access and maintenance roads, compressors, pumping stations, and other structures.

According to the Department of Energy (DOE), the East-wide Energy Corridor analysis is focused on identifying national corridors in the Mid-Atlantic Area (Federal Register, May 7, 2007). National energy corridors are not being analyzed, identified, or proposed in Minnesota.

9.6 *Analysis Matrix*

The assessment of potential impacts is possible through the use of an interaction matrix based on the identified relevant activities. An interaction matrix not only lists activities and environmental effects, but also incorporates an association between cause and effect using evaluation criteria (CEQ, 1997).

Table 9-1 below identifies the potential cumulative impacts for the VECs identified above. As previously noted, cumulative impacts result from spatial (geographic) and temporal (time) crowding of environmental impacts. Many researchers and practitioners have used observations or environmental change theory to categorize how cumulative impacts build up and lead to different types of cause-and-effect pathways. Table 9-1 lists cause-and-effect pathway criteria that reflect common categories cited in CEQ's Considering Cumulative Effects under the National Environmental Policy Act (1997). The pathway criteria in Table 9-2 are used to evaluate potential interactions of activities in Table 9-1 leading to potential cumulative impacts.

Table 9-1 Interaction Matrix

Resource	Project Impact	Past, Present, and Reasonably Foreseeable Projects	Cumulative Interaction/ Pathway	Mitigation
Aesthetics	Introduce pole structures and change forest land to shrub-type landscape	Previous powerlines, Enbridge pipelines, Great Lakes pipelines, Roadway and railroad infrastructure, Energy Corridors	Fragmentation and compounding effects	Co-location with existing linear utilities to minimize number of impacted locations and to focus similar activities in one area.
Agricultural Production and Prime Farmland	Remove land from agricultural production	Previous powerlines, Enbridge pipelines, Great Lakes pipelines, Roadway and railroad infrastructure	Fragmentation	Span croplands to extent practicable; follow section or half-sections boundaries to the extent practicable; allow agricultural production under lines and adjacent to structures.

Resource	Project Impact	Past, Present, and Reasonably Foreseeable Projects	Cumulative Interaction/ Pathway	Mitigation
Environmental Justice	Future pipeline, transmission line construction and roadway improvements may have a disproportionate negative effect on minority or low-income populations.	Previous powerlines, Enbridge Pipelines, Great Lakes pipeline, Roadway infrastructure, Energy Corridors	Indirect effects	None anticipated
Fauna	Displacement, avian collisions, habitat change, habitat fragmentation	Previous powerlines, Enbridge Pipelines, Great Lakes pipeline, Roadway infrastructure	Fragmentation and compounding effects	Not constructing the other projects at the same time to displace wildlife, develop avian protection plan, include avian protection design measures at critical stream crossings
Flora	Removal of vegetation, conversion from forest to grass or shrub lands	Previous powerlines, Enbridge Pipelines, Great Lakes pipeline, Roadway infrastructure	fragmentation and compounding effects	Revegetate with native species
Forestry	Removal of vegetation	Previous powerlines, Enbridge Pipelines, Great Lakes pipeline, Roadway infrastructure	Compounding effects	Revegetate with native species
Geology, Soils, and Minerals	Erosion	Previous powerlines, Enbridge Pipelines, Great Lakes pipeline, Roadway infrastructure	Compounding effects	Implement standard best management practices
Human Settlement	Displacement and lower property values	Previous powerlines, Enbridge Pipelines, Great Lakes pipeline, Roadway infrastructure	Compounding effects	Comply with federal relocation requirements, provide compensation to impacted landowners
Land Use	Removal of vegetation in forest areas	Previous powerlines, Enbridge Pipelines, Great Lakes pipeline, Roadway infrastructure	Fragmentation and compounding effects	Develop a reclamation plan
Recreation and Tourism	Bemidji Slough WMA and trail crossings	Previous powerlines, Enbridge Pipelines, Great Lakes pipeline, Roadway infrastructure	Compounding effects	Minimize crossings of recreational trails, consider trail location when identifying structure locations
Special status species	Displacement, mortality, habitat change, habitat fragmentation	Previous powerlines, Enbridge Pipelines, Great Lakes pipeline, Roadway infrastructure	Fragmentation and compounding effects	Coordiante with regulatory agencies and implement project-specific conservation measures

Resource	Project Impact	Past, Present, and Reasonably Foreseeable Projects	Cumulative Interaction/ Pathway	Mitigation
Water Resources/ Wetlands	Sedimentation, turbidity, runoff, and wetland fill and wetland type conversion	Previous powerlines, Enbridge Pipelines, Great Lakes pipeline, Roadway infrastructure	Fragmentation and compounding effects	Comply with state and federal regulations, develop wetland mitigation plan; maintain existing hydologic characteristics

Table 9-2 Cumulative Interaction Criteria

Pathway Criteria	Main Characteristics	Example
Time crowding	Frequent and repetitive effects on an environmental system	Forest harvesting rates exceeding regrowth
Time lags	Delayed effects	Exposure to carcinogens
Space crowding	High spatial density of effects on an environmental system	Pollution discharges into streams from nonpoint sources
Cross-boundary	Effects that occur away from the source	Acidic precipitation
Fragmentation	Change in landscape pattern	Fragmentation of natural habitat
Compounding effects	Effects arising from multiple sources or pathways	Synergism among pesticides
Indirect effects	Secondary effects	Commercial development following highway construction
Triggers and thresholds	Fundamental change in system behavior or structure	Global climate change

10.0 Other Required Considerations

10.1 *Unavoidable Adverse Environmental Impacts*

Unavoidable adverse environmental impacts are those that would occur from constructing and operating the Project after implementing standard and additional mitigation measures. Based on impact analyses using significance criteria, unavoidable adverse impacts would occur for land use, aesthetics, soils, wetlands, flora, fauna, and forestry resources. Mitigation measures associated with these resources have been provided in their respective sections in Chapter 8.0.

10.1.1 Land Use

Construction of the route would result in the unavoidable conversion of approximately 441 to 640 acres of land from forest use to non-forest use, depending upon the approved route. No unavoidable impacts to zoning districts would result from the routes.

10.1.2 Aesthetics

Constructing a new transmission line would result in long-term, new, or additive low-to-moderate visual impacts within the viewshed.

10.1.3 Environmental Justice

Within all of the routes, the percentage of low-income populations is slightly higher, and the percentage of minority populations is higher, than the percentages found in the four-county region of comparison. While there would be permanent visual effects, there are no adverse economic or human health impacts. Additionally, the project may provide temporary employment during construction, and would reduce the potential for future brownouts in the Project Area due to the existing electrical reliability issues.

10.1.4 Soils

Unavoidable adverse impacts would occur on up to 3 acres of soils because of the construction and operation of the transmission line.

10.1.5 Wetlands

Construction and operation of the Proposed Project would result in the unavoidable conversion of 166 to 225 acres of forested wetlands to non-forested wetlands and a permanent loss of less than 1 acre of wetland due to excavation for structure within the proposed routes. The loss or degradation of jurisdictional wetlands would be mitigated under a Section 404 permit issued by the US Army Corps of Engineers (USACE) and the Wetland Conservation Act permit issued by the local government units (LGUs).

10.1.6 Flora

Construction of the Project would require areas to be cleared. Unavoidable adverse impacts would include conversion of 441 to 640 acres of forest vegetation because of the construction and operation of the transmission line, depending on the route chosen. In some cases, the clearing of forest areas within routes may include clearing small areas of what may be considered old growth forest.

10.1.7 Fauna/Rare and Unique Species and Communities

Unavoidable adverse impacts to wildlife species would include the loss or alteration of breeding and foraging habitats and increased habitat fragmentation. Mortality could also occur in less mobile or burrowing species. Abandonment of a nest site and the loss of eggs and/or young may also occur. Unavoidable adverse impacts to migrating and foraging birds would also result from the increased potential for collision with the Project's overhead wires. However, these impacts are not expected to have an overall effect on local populations.

During construction, indirect unavoidable impacts would include habitat fragmentation resulting from elevated noise, increased human presence, and dust deposition. These impacts would extend beyond the boundaries of the construction area. These effects may result in changes in habitat quality, habitat loss, animal displacement, and changes in species composition. Habitat for special status species and the presence of special status species have been identified within the routes. Surveys for special status species within the proposed routes would be conducted once the routes are selected. Implementing mitigation in accordance with the US Fish and Wildlife Service (USFWS) Biological Opinion would reduce impacts to special status species.

10.1.8 Recreation and Tourism

Unavoidable adverse impacts to recreation would include construction of a right-of-way within the Bemidji Slough Wildlife Management Area (WMA), Chippewa National Forest (CNF), and state forestlands. The impacts are primarily visual. Illegal use of the transmission line corridor to access remote areas may occur. Routes 1, 1B, and 1C would cross about 1,800 feet of the Bemidji Slough WMA.

Indirect unavoidable impacts would include visual impacts resulting from the Project crossing various trails and the Ladyslipper Scenic Byway. These effects may be relatively short-term and only affect trail-users as they are crossing under the transmission line.

10.1.9 Agricultural Production

Construction and operation of the Project would result in the unavoidable adverse loss of 0.1 to 0.3 acre of prime farmland within the proposed routes.

10.1.10 Forestry

Construction and operation of the Project would result in the unavoidable loss of 441 to 640 acres of forest lands, depending on the route chosen. The opportunity to harvest timber likely exists within most forestlands in the routes, regardless of ownership (private and public). The US Forest Service-designated "Experimental Forest" (EF) and "Unique Biological, Aquatic, Geological, or Historical Areas" (UB) Management Areas (MAs), however, are not considered suitable for timber management. Some of the routes would cross the Pike Bay Experimental Forest MA and Ten Section Area UB MA.

10.2 *Short-term Uses of the Environment*

Council on Environmental Quality (CEQ) regulations stipulate that an EIS include a description of "…the relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity…." Construction and of the Project would have short-term impacts on environmental resources due to activities

associated with installing the poles and conductors. Short-term environmental impacts would be minimized through site restoration once construction is complete. Long-term productivity refers to the sustainability of the resources over a long period of time. Generally, the long-term impacts associated are localized to the 125-foot right-of-way for most environmental resources. Restoration and mitigation practices minimize long-term impacts.

Impacts to physical, social, and biological resources by the Project are addressed in Section 8. The short-term uses of these resources by the Project would result in electricity generation and distribution for use in the areas serviced by the Utilities. The electricity would provide heating, cooling, lighting, and other residential and commercial benefits.

The Project and its associated facilities (substations and possible breaker station) would remain in operation for their given life, likely more than 50 years, as long as they are maintained and needed to transfer electricity through the region. The environmental resources within the Project Area would generally return to their long-term productivity with the following exceptions:

- Wetlands would be unavoidably impacted by wetland-type conversion and wetland loss due to the construction of the Project. These impacts would be mitigated through reclaiming, restoring, or permanently protecting other wetlands, resulting in an offset of wetland losses.
- Construction of the Project would permanently alter the long-term productivity of impacted prime and unique farmlands within the approved route. Although these sites may be reclaimed for productive farming, they may no longer have the characteristics required for classification as prime and unique.
- Long-term losses in the productivity of vegetation would occur where trees are replaced by grassland and shrubland within the right-of-way of the transmission line. This land would not return to productivity until the transmission line was removed.

10.3 *Irreversible and Irretrievable Commitments of Resources*

Construction and operation of the Project may result in either the irreversible or the irretrievable commitment of certain resources. A commitment of resources is irreversible when the impacts limit the future options for a resource. An irretrievable commitment refers to the use or consumption of a resource that is neither renewable nor recoverable for use by future generations. Irretrievable commitment of resources applies to loss of nonrenewable resources such as minerals or cultural resources, or to those factors, such as soil productivity, that are renewable only over very long periods of time.

Cultural resources are non-renewable, and a loss of a site is an irretrievable impact to that resources. Preservation of archaeological and historical sites would be pursued through cultural resource site avoidance and recovery as part of the proposed programmatic agreement for these resources.

Construction of the proposed Project would require the irretrievable commitment of some non-recyclable building materials and fuel for construction equipment. Many components of the Proposed Project would be recycled after their life, particularly metal components.

11.0 Public Participation and Agency Coordination

The Applicants have engaged interested members of the public, agencies, and local government units in a comprehensive public outreach process to discuss Project alternatives. Interested public, agencies, and local government units include township, city, and county authorities, landowners, tribal officials, Great Lakes Gas Transmission Company, Enbridge Pipelines, environmental groups, and state and federal agencies. Initial meetings with federal and state permitting authorities and tribal officials started in April 2006. Meetings with county, city, and township authorities were held throughout the winter and spring of 2007. In June 2007, the Applicants began hosting a series of open house meetings in the Study Area to discuss the Project with the public and identify potential issues and concerns.

As part of their Certificate of Need application, the Applicants also executed a Minnesota Public Utilities Commission (PUC) approved Notice Plan that alerted potentially affected landowners and local authorities of the Certificate of Need application and process. The Notice Plan consisted of the following:

- Direct mail notice to landowners with property in the preferred Central Macrocorridor
- Direct mail notice to others with mailing addresses within the Central Macrocorridor
- Direct mail notice to local units of government, including tribal governments, within the Central Macrocorridor
- General notice to the public by publishing ads in local papers serving areas within the Central Macrocorridor

The Applicants intend to send upcoming notices to landowners in the Central Macrocorridor, as well as the North and South Macrocorridors.

Table 11-1 summarizes all of the Applicants' public and agency outreach efforts to date.

Table 11-1 Public and agency meetings held for the Project

Meeting with the Leech Lake Tribal Council	4/10/06	Leech Lake offices
Forest Service	4/18/06	CNF offices
Tribal Council Meeting	5/18/06	Leech Lake offices
Forest Service	10/24/06	CNF offices
Leech Lake Band (LLB)Tribal Council	10/27/06	MOU signed
RUS/Federal Agencies	11/28/06	HDR offices
PUC/DOC	11/29/06	PUC/DOC Offices
CNF/LLB/Enbridge/DNR	12/4/06	Palace Casino
Forest Service	12/14/06	CNF offices
Great Lakes Gas Meeting	1/22/07	GLG Duluth offices
Fish and Wildlife Service	1/27/07	Fish & Wildlife Service office
RUS	2/1/07	Conference call
DOC	2/12/07	DOC office
USACE	2/12/07	USACE Office
Boswell Energy Center (MP)	2/22/07	MP

RUS	3/2/07	Conference call
Meeting with CNF	3/5/07	CNF offices
LLB	3/5/07	LLB Offices
City of Deer River	3/12/07	Deer River
OTP/ Bemidji Employees	3/12/07	OTP offices
City of Cohasset	3/13/07	Cohasset
Lake Country Power Board, Virginia	3/16/07	Virginia
City of Grand Rapids	3/26/07	Grand Rapids
DOC	3/29/07	DOC offices
Beltrami Electric Coop	4/3/07	Beltrami Electric Coop
Meeting with the Leech Lake Tribal Council	4/4/07	LLB
City of Bemidji - Township Officer Meetings	4/4/07	Northern Inn
Grand Rapids - Township Officer Meetings	4/5/07	Sawmill
CNF/LLB Meeting On Survey Protocol/Timing	4/5/07	CNF offices
City of Cass Lake	4/11/07	Cass Lake
MN/DOT – Duluth	4/11/07	MN/DOT Duluth office
Great Lakes Gas	4/16/07	Great Lakes Gas
Meeting with Chippewa National Forest	4/18/07	CNF
Mississippi Headwaters Board	4/20/07	
Meeting with Tribe/CNF/USACE	4/26/07	Palace Casino
Beltrami County	4/30/07	Betrami County
City of Bemidji	4/30/07	Bemidji
Bemidji Airport	4/30/07	Bemidji
MNDOT Deer River (Region 2)	4/30/07	MnDot Deer River
Itasca County	5/14/07	Itasca County
RUS/DOC/USACE/PUC/USFWS/LLB	5/17/07	DOC offices
Bemidji - Assoc of County Meeting	5/30/07	Bemidji
Thief River Falls - Assoc of County Meeting	5/31/07	Thief River Falls
MN Utility Investors Meeting Duluth	6/4/07	Duluth
Cass County	6/5/07	Cass County
MN Utility Investors Meeting Chisholm/Grand Rapids	6/5/07	
MN Utility Investors Meeting Bemidji	6/6/07	Bemidji
All Local Indian Council (LIC) Meeting	6/14/07	Casino on Hwy 200
Bemidji Open House	6/26/07	Bemidji - Hampton
Meeting with LLB Representative	6/27/07	
Cass Lake Open House	6/27/07	Cass Lake – Palace Casino
Meeting with Tribe/USACE/DNR	6/28/07	Ball Club Community Center
Meeting with CNF	6/28/07	CNF offices
Cohasset Open House	6/28/07	Cohasset
Meeting with RUS/USACE/HDR re 106 Consultation	7/10/07	Conference call
Meeting with the Leech Lake Tribal Council	7/13/07	
Meeting with LLB/USACE/DNR/CNF	7/25/07	LLB Offices
Meeting with Tribal Council	7/30/07	
Meeting with George Crocker	7/30/07	
LIC Meeting	8/1/07	LIC Meeting Kego Lake/Smokey Point
LIC Meeting	8/6/07	Ball Club LIC
LIC Meeting	8/7/07	Oak Point LIC
LIC Meeting	8/7/07	Cass River LIC
LIC Meeting	8/13/07	Cass Lake LIC

GLG/Enbridge Meeting	8/14/07	Great Lakes Gas
LIC Meeting	8/14/07	Bena
LIC Meeting	8/20/07	S Lake LIC
LIC Meeting	8/20/07	Mission LIC
LLB/DNR Meeting	8/28/07	Cass Lake City Hall
LIC Meeting	8/29/07	Deer River LIC
LIC Meeting	9/6/07	Winnie Dam LIC
LIC Meeting	9/10/07	Sugar Bush/Buck Lake LIC
LIC Meeting	9/10/07	Inger LIC
LLB/USACE/106 Consultation Meeting	9/10/07	LLB offices Cass Lake
GLG/Enbridge Meeting	9/11/07	MP offices
LLB/Meeting with Chairman Goggleye	9/11/07	Roger Moe and Chairman Goggleye
LIC Meeting	9/11/07	Onigum LIC
LIC Meeting	9/12/07	Sugar Point LIC
Tribal Council Meeting	9/17/07	
DOC/PUC Meeting	9/17/07	DOC offices
Bemidji Open House	10/9/07	Bemidji
LLB Land Development Meeting	10/9/07	
Cass Lake Open House	10/10/07	Cass Lake
Meeting with the Leech Lake Tribal Council	10/10/07	
MN/DOT Meeting	10/10/07	MN/DOT offices
Cohasset Open House	10/11/07	Cohasset
Agency Meeting DNR/CNF/LLB/USACE	10/11/07	Palace Casino
Meeting with the Leech Lake Attorney	10/16/07	
LIC/DOC/PUC Dinner Meeting	10/23/07	Northern Lights Casino
Meeting with Chippewa National Forest	10/24/07	CNF
Enbridge/MP Meeting	10/26/07	
CNF Meeting/Applicants/HDR	11/14/07	CNF
HDR/MPC/RUS	11/19/07	Hampton Inn
Agency Meeting DNR/LLB/USACE/CNF	11/20/07	CNF
Meeting with USACE and RUS/Applicants/HDR	11/20/07	USACE
CNF/HDR/MNPower/OTP/Briggs/Grahm Env	11/27/07	CNF
CNF Tour Boswell Plant with MP	2/1/08	Boswell plant
Briggs/HDR/RUS	12/11/07	Conference call
Meeting with DNR	12/21/07	DNR office St. Paul, MN
Meeting with CNF & USACE	1/24/08	USACE offices
RUS Meeting with USACE, CNF, LLBO, DNR	1/31/08	USACE
Meeting RUS Federal/State Agencies and Band	2/28/08	HDR offices
Applicants at RUS	3/5/08	Washington, DC
CNF at RUS	3/6/08	RUS
Windshield Review of Corridors	3/17/08	Cass Lake
Meeting RUS Federal/State Agencies	3/18/08	Cass Lake
Meeting with GLG	4/3/08	GLG Duluth offices
Meeting with MNDOT	4/10/08	MN/DOT office St. Paul, MN

12.0 List of References

ASIA (Aggregate Source Information System) database. Minnesota Department of Transportation. http://www.mrr.dot.state.mn.us/geotechnical/aggregate/asisrlt.asp. Accessed February 2008.

BBC. The impact of large buildings and structures (including wind farms) on terrestrial television reception. http://www.bbc.co.uk/reception/info/pdf/buildings_factsheet.pdf. Access May 2, 2008.

Bittman, Jim, 2008. Personal Communication, Dan Thompson, of NRG, with Jim Bittman, District 2A Transportation Engineer, Minnesota Department of Transportation, February, 2008.

California EMF Program, 2002. *An Evaluation of Possible Risks from Electric and Magnetic Fields (EMFs) from Power Lines, Internal Wiring, Electrical Occupations and Appliances and Policy Options in the Face of Possible Risks from Power Frequency Electric and Magnetic Fields (EMF).* California Department of Health: 383.

Cass County, 2002. *Cass County Comprehensive Plan.* http://www.co.cass.mn.us/. Accessed June 2007.

Chippewa National Forest, 2007. Land and Resource Monitoring Plan: *Fiscal Year 2006 Monitoring and Evaluation Report.* http://www.fs.fed.us/r9/forests/chippewa/publications/monitoring_reports/. Accessed March 13, 2008.

City of Bemidji, 2008. *Zoning Districts Map.* http://www.ci.bemidji.mn.us. Accessed March 20, 2008.

Demaille, R. J. (Editor) 2001. *Plains. Vol. 13 of Handbook of North American Indians.* Smithsonian Institution, Washington D.C.

Explore Minnesota. http://www.exploreminnesota.com/home.aspx.

Federal Emergency Management Agency. 2003. *Flood Insurance Rate Map, Beltrami County, Minnesota.*

Federal Emergency Management Agency. 2003. *Flood Insurance Rate Map, Cass County, Minnesota.*

Federal Emergency Management Agency. 2003. *Flood Insurance Rate Map, Hubbard County, Minnesota.*

Federal Emergency Management Agency. 2003. *Flood Insurance Rate Map, Itasca County, Minnesota.*

Federal Emergency Management Association National Flood Insurance Program. http://www.fema.gov/business/nfip/index.shtm

Federal and State Wild and Scenic River list. http://www.dot.state.mn.us/tecsup/xyz/plu/hpdp/book2sg/wild/wilda1.html.

Frisco, Stephen, 2008. Personal Communication, Aaron Diehl, of HDR, with Stephen Frisco, Roadway Regulation Coordinator, Minnesota Department of Transportation, February 13, 2008.

Marschner, F.J. 1974. *The original vegetation of Minnesota, compiled from U.S General Land Office Survey notes by Francis J. Marschner [map]*. 1:500,000. Redrafted from the original by P.J. Burwell and S.J. Haas under the direction of M.L. Heinselman. St. Paul: North Central Forest Experiment Station, United States Department of Agriculture.

Minnesota Department of Natural Resources (a). Ecological Classification System. http://www.dnr.state.mn.us/ecs/212N/index.html. Accessed 2008.

Minnesota Department of Natural Resources (b). Ecological Classification System - Chippewa Plains Subsection. http://www.dnr.state.mn.us/ecs/212Na/index.html. Accessed 2008.

Minnesota Department of Natural Resources Recreation Compass. http://www.dnr.state.mn.us/maps/compass.html.

Minnesota Department of Natural Resources Wild and Scenic Rivers. http://www.dnr.state.mn.us/waters/watermgmt_section/wild_scenic/index.html.

Minnesota Department of Natural Resources Floodplain Management Program. http://www.dnr.state.mn.us/waters/watermgmt_section/floodplain/index.html#links.

Minnesota Department of Natural Resources, 2008. *Natural Wild Rice in Minnesota*. http://www.dnr.state.mn.us/wildlife/shallowlakes/wildrice.html.

Minnesota Department of Natural Resources. 2007. *Public Waters Inventory Maps and Lists*. http://www.dnr.state.mn.us/waters/watermgmt_section/pwi/maps.html. Accessed November 2007.

Minnesota Department of Natural Resources, 2006. *Chippewa Plains/Pine Moraines and Outwash Plains Subsection Forest Resource Management Plan (SFRMP) Assessment*. http://www.dnr.state.mn.us/forestry/subsection/cp_pmop/preliminary.html. Accessed March 13, 2008.

Minnesota Department of Transportation. 2006. County Traffic Volume Maps: Beltrami, Cass, Hubbard, and Itasca County. http://www.dot.state.mn.us/traffic/data/maps/thcountymapdex.html. Accessed Feb 14, 2008.

Minnesota Department of Trade and Economic Development. *Community Profile for Cass County, Minnesota*. http://www.mnpro.com/. Retrieved June 2007.

Minnesota Department of Transportation. 2003. *Minnesota State Transportation Plan: Moving People and Freight from 2003 to 2023*. www.oim.dot.state.mn.us/ Accessed February 21, 2008.

Minnesota Pollution Control Agency, 2008. *Minnesota's Impaired Waters and Total Maximum Daily Loads*. http://www.pca.state.mn.us/water/tmdl/. Accessed in February 2008.

Mississippi River Great River Road. http://www.mnmississippiriver.com/cass-lake-bena-ball-club.cfm.

Minnesota Pollution Control Agency, 1998. *Baseline Water Quality of Minnesota's Principal Aquifers – Region 2, North Central Minnesota*. Prepared by Ground Water Monitoring and Assessment Program. St. Paul, Minnesota.

National Forest Service National Trail. http://www.fs.fed.us/recreation/programs/trails/nat_trails.shtml#historic.

National Institute of Environmental Health Sciences, 1999. *Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields*. NIH Publication No. 9904493

National Scenic Byway. http://www.byways.org/.

National Trails Recreation Database. http://www.fs.fed.us/recreation/programs/trails/index.shtml.

Olden, Kenneth, 1999. *NIEHS Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields*. National Institute of Environmental Health Sciences, National Institutes of Health. Research Triangle Park, North Carolina.

Real Estate Center, 1999. Overhead Power Lines Impact Residential Sales. http://www.powerlinefacts.com/RECenter%20News%20Release%20Overhead%20Power%20Lines%20Impact%20Residential%20Sales.htm. Accessed March 25, 2008.

US Army Corps of Engineers Recreation. http://www.mvp.usace.army.mil/recreation/

US Census Bureau, 2001. Census 2000 Summary File 1 (SF 1) Minnesota.

US Census Bureau, 2002. Census 2000 Summary File 3 (SF 3) Minnesota.

US Census Bureau, 2007. *State and County Quick Facts, Minnesota*. http://quickfacts.census.gov/. Accessed February 2008.

US Department of Agriculture – National Agricultural Statistics Service. 2002. Census of Agriculture. http://www.agcensus.usda.gov/Publications/2002/Census_by_State/Minnesota/index.asp.

US Department of Agriculture, Economic Research Service, 2007. http://www.ers.usda.gov/. Accessed February 2008.

US Department of Agriculture. NRCS. 2008. Web Soil Survey. http://websoilsurvey.nrcs.usda.gov/app/.

US Department of Agriculture, NRCS. 2003. *State Soil Survey Geographic (SSURGO) Data Base for Minnesota.*

US Department of Agriculture, NRCS. 1994. *State Soil Geographic (STATSGO) Data Base for Minnesota.*

United States Fish and Wildlife Service. 2005. National Wetlands Inventory Wetland polygons. http://www.fws.gov/data/statdata/. Accessed June 22, 2005.

US Fish and Wildlife Service, 2004. *Land and Resource Management Plan: Chippewa National Forest.*

US Fish and Wildlife Service, 1995. Agricultural Handbook Number 701. *Landscape Aesthetics: A Handbook for Scenery Management.*

Waterfowl Refuges and Sanctuaries. http://www.dnr.state.mn.us/wildlife/shallowlakes/refuges.html.

Wild and Scenic Rivers. http://www.rivers.gov/.

Wisconsin Public Service Commission, 2000. Arrowhead-Weston Transmission Project, Final Environmental Impact Statement.