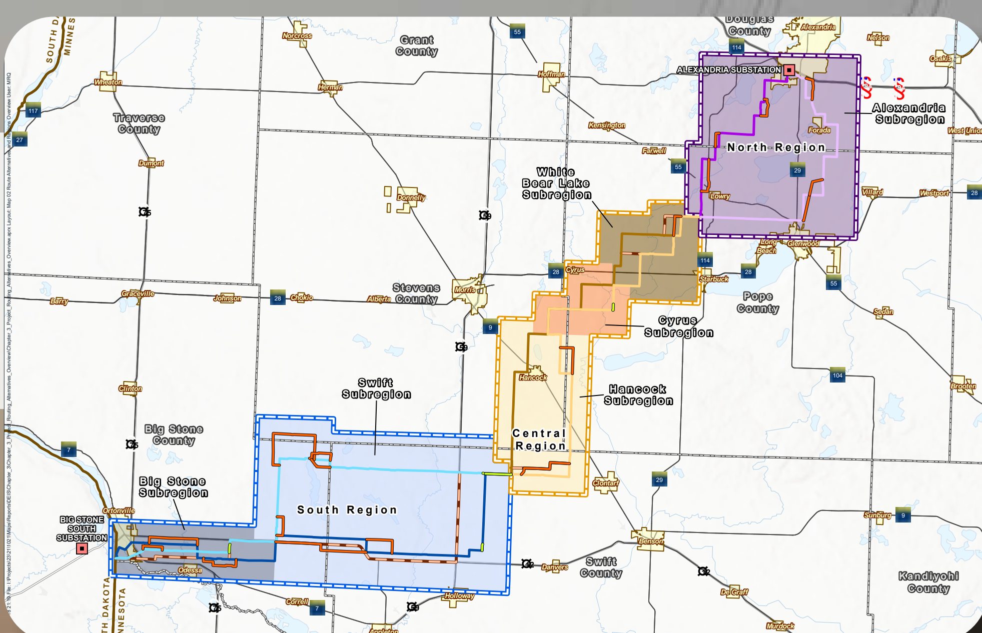
MINNESOTA
PUBLIC UTILITIES COMMISSION

Big Stone South to Alexandria Project Draft Environmental Impact Statement

The human and environmental impacts of constructing and operating the Big Stone South to Alexandria 345 kV transmission line and associated facilities



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Abstract

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Otter Tail Power Company and Western Minnesota Municipal Power Agency, through its agent, Missouri River Energy Services (applicants), propose to construct approximately 91 to 106 miles of 345 kV transmission line using double-circuit capable structures from the Minnesota/South Dakota border, approximately one mile south of Ortonville, Big Stone County, Minnesota, to the existing Alexandria Substation in Alexandria, Douglas County, Minnesota (Big Stone South to Alexandria Project).

The Big Stone South to Alexandria Project requires a route permit from the Minnesota Public Utilities Commission (Commission). The applicants submitted a route permit application to the Commission in October 2024. The Commission requested that Department of Commerce (Department) Energy Environmental Review and Analysis (EERA) staff prepare an Environmental Impact Statement (EIS) for the project. DOC EERA staff initiated environmental review of this project prior to July 1, 2025, and will continue to exclusively perform environmental review duties for this application under Minn. Stat. 216E as Energy Infrastructure Permitting staff. This EIS addresses the matters identified in the May 6, 2025, scoping decision (Appendix A). This EIS is based on the applicants' route permit application, public scoping comments, and input from the Commission.

Public hearings for the project will be held in the project area the week of September 29, 2025. Notice of the hearings will be issued separately. An administrative law judge (ALJ) from the Minnesota Court of Administrative Hearings will preside over the hearings. Upon completion of the hearings, the ALJ will submit a report to the Commission including recommendations to the Commission regarding the applicants' route permit application. Commission decisions on the route permit are expected in April 2026.

Document Availability

This EIS and other materials related to this project are available on the Commission project webpage: https://puc.eip.mn.gov/web/project/15867 and on the state of Minnesota's eDockets system: https://www.edockets.state.mn.us/documents (Docket No. 23-160). Printed copies are also available at the following public libraries:

- Benson Public Library
- Douglas County Public Library
- Glenwood Public Library
- Morris Public Library
- Ortonville Public Library

Alternative Formats

This document can be made available in alternative formats, that is, large print or audio, by calling 651-296-0406 (voice). Persons with hearing or speech impairment may call using their preferred Telecommunications Relay Service or email consumer.puc@state.mn.us for assistance.

Project Mailing List

Sign up to receive notices about project milestones and opportunities to participate or change your mailing preference. Email eservice.admin@state.mn.us or call 651-201-2246 with the docket number (23-160), your name, mailing address, and email address.

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Organization of the Environmental Impact Statement

This Environmental Impact Statement (EIS) addresses the matters identified in the May 6, 2025, scoping decision (Appendix A). This EIS is based on the applicants' route permit application, public scoping comments, and input from the Commission.

Summary

Provides a summary of the project – its potential impacts and possible mitigation measures.

Chapter 1: Introduction

Provides a brief overview of the project, the public's role, and the state of Minnesota's role in the environmental review and energy infrastructure permitting process.

Chapter 2: Regulatory Framework

Summarizes the regulatory framework associated with the project, including the state of Minnesota's route permitting and environmental review processes, other approvals that might be required for the project, and the criteria the Commission uses to make permitting decisions.

Chapter 3: Project and Routing Alternatives Overview

Describes the project, regions, and subregions used for EIS analysis including the routing alternatives outlined in the scoping decision (route connectors, route segments, and alignment alternatives) as well as project design, construction, and operation.

Chapter 4: Affected Environment, Potential Impacts, and Mitigation Overview

Describes the existing resources in the project area generally as well as high-level potential human and environmental impacts that apply to the project as a whole. Impacts discussed in this chapter are expected to be common to all route possibilities for the project. Each general potential impact discusses measures that could be implemented to avoid or mitigate those impacts.

Chapter 5: South Region – Potential Impacts and Mitigation

Analyzes potential human and environmental impacts for each routing alternative in the South Region of the project, including the Big Stone Subregion and Swift Subregion. Mitigation measures are identified on a route-to-route basis, meaning discussions in this chapter focus on impacts and mitigation based on each specific route. A summary of each route's merits relative to the factors in Minnesota Rules 7850.4100 is provided.

Chapter 6: Central Region – Potential Impacts and Mitigation

Analyzes potential human and environmental impacts for each routing alternative in the Central Region of the project, including the Hancock Subregion, Cyrus Subregion, and White Bear Lake Subregion. Mitigation measures will also be identified on a route-to-route basis, meaning discussions in this chapter will focus on impacts and mitigation based on each specific route. A summary of each route's use of paralleling of existing rights-of-way and cost will be analyzed by subregion along with merits that differ by route relative to the factors in Minnesota Rules 7850.4100.

Chapter 7: North Region – Potential Impacts and Mitigation

Analyzes potential human and environmental impacts for each routing alternative in the North Region of the project, including the Alexandria Subregion. Mitigation measures will also be identified on a route-to-route basis, meaning discussions in this chapter will focus on impacts and mitigation based on each specific route. A summary of each route's use of paralleling of existing rights-of-way and cost will be analyzed by subregion along with merits that differ by route relative to the factors in Minnesota Rules 7850.4100.

Chapter 8: Associated Facilities – Potential Impacts and Mitigation

Analyzes potential human and environmental impacts for associated facilities to the project, including the new fiber optic regeneration station in the Central Region, the Alexandria Substation expansion in the North Region, and the Big Stone South Substation expansion in South Dakota.

Chapter 9: Unavoidable Impacts and Irreversible and Irretrievable Commitments of Resources

Discusses the potential unavoidable and irreversible impacts of the project on human and environmental resources.

Chapter 10: Cumulative Potential Effects

Discusses the potential cumulative effects of the project that result from the incremental effects of other projects in the environmentally relevant area.

Table of Contents

Summary 1
Project Need 1
Project Description 1
Routing Alternatives 3
Summary of Potential Impacts and Mitigation 6
Human Settlement 6
Aesthetics 6
Displacement 7
Land Use and Zoning 8
Recreation 8
Human Health and Safety 8
Land-based Economies 8
Archaeological and Historic Resources 9
Natural Environment 10
Air Quality 10
Climate Change 11
Greenhouse Gases 11
Public and Designated Lands 11
Vegetation 12
Wildlife and Wildlife Habitat 12
Rare and Unique Natural Resources 13
Soils 14
Surface Water 14
Wetlands and Calcareous Fens 15
1 Introduction 16
1.1 Project Summary 16
1.2 Project Purpose and Need 17
1.3 The State of Minnesota's Role 17
1.3.1 What does the Commission approve in a route permit? 18
1.4 The Public's Role 18
1.5 What's Next? 19
1.6 Sources of information 19
1.7 Where do I get more information? 19
2 Regulatory Framework 20
2.1 Certificate of Need 20
2.2 Route Permit 20
2.2.1 Route Permit Criteria 20

2.3 Environmental Review 22
2.3.1 Environmental Impact Statement 22
2.3.2 Scoping 22
2.4 Public Hearing 23
2.5 Commission Decision 23
2.6 Eminent Domain 23
2.7 Other Permits and Approvals 24
2.7.1 Tribal Coordination 25
2.7.2 Federal Approvals 25
2.7.3 State of Minnesota Approvals 26
2.7.4 Local and Other Approvals 27
2.7.5 Conservation Programs 28
2.7.6 Electric Safety and Reliability Costs 28
3 Project and Routing Alternatives Overview 29
3.1 Regions and Routing Alternatives 30
3.1.1 South Region 30
3.1.1.1 South 1 Route 31
3.1.1.2 South 2 Route 31
3.1.1.3 Big Stone Subregion 32
3.1.1.4 Swift Subregion 33
3.1.2 Central Region 34
3.1.2.1 Central 1 Route 35
3.1.2.2 Central 2 Route 35
3.1.2.3 Hancock Subregion 36
3.1.2.4 Cyrus Subregion 37
3.1.2.5 White Bear Lake Subregion 37
3.1.3 North Region 38
3.1.3.1 North 1 Route 39
3.1.3.2 North 2 Route 39
3.1.3.3 Alexandria Subregion 39
3.2 Project Design 40
3.2.1 Transmission Lines 40
3.2.1.1 345 kV Transmission Line 40
3.2.2 Structures 41
3.2.3 Conductors 44
3.2.4 Associated Facilities 44
3.2.4.1 Big Stone South Substation Expansion 44
3.2.4.2 Alexandria Substation Expansion 45
3.2.4.3 Fiber Optic Regeneration Station 45

3.3 Route Width, Right-of-Way, and Anticipated Alignment 45
3.3.1 Route Width 46
3.3.2 Right-of-Way 48
3.3.2.1 Right-of-Way Acquisition 48
3.3.3 Anticipated Alignment 49
3.4 Construction and Maintenance Procedures 50
3.4.1 Construction Staging Areas/Laydown Yards 50
3.4.2 Survey Marking of the Right-of-Way 50
3.4.3 Right-of-Way Clearing and Access Preparation 51
3.4.4 Construction Activities 51
3.4.4.1 Foundation and Pole Installation 52
3.4.4.2 Conductor Stringing 52
3.4.4.3 Aerial Marker Installation 53
3.4.5 Restoration and Cleanup Procedures 53
3.4.6 Maintenance Procedures 54
3.4.6.1 Outages and Emergency Response 54
3.5 Project Costs 55
3.6 Project Schedule 55
4 Affected Environment, Potential Impacts, and Mitigation Measures 56
4.1 Describing Potential Impacts and Mitigation 56
4.1.1 Terms and Concepts 56
4.1.2 Regions of Influence 58
4.2 Use or Paralleling of Existing Rights-of-way 60
4.3 Human Settlement 61
4.3.1 Aesthetics 61
4.3.1.1 Existing Conditions 61
4.3.1.2 Potential Impacts 63
4.3.1.3 Mitigation 64
4.3.2 Cultural Values 65
4.3.2.1 Existing Conditions 65
4.3.2.2 Potential Impacts 70
4.3.2.3 Mitigation 71
4.3.3 Displacement 71
4.3.3.1 Existing Conditions 71
4.3.3.2 Potential Impacts 72
4.3.3.3 Mitigation 72
4.3.4 Electronic Interference 72
4.3.4.1 Existing Conditions 72
4.3.4.2 Potential Impacts 73

4.3.4.3 Mitigation 74
4.3.5 Environmental Justice 75
4.3.5.1 Existing Conditions 75
4.3.5.2 Potential Impacts 78
4.3.5.3 Mitigation 78
4.3.6 Land Use and Zoning 78
4.3.6.1 Existing Conditions 78
4.3.6.2 Potential Impacts 81
4.3.6.3 Mitigation 82
4.3.7 Noise 82
4.3.7.1 Existing Conditions 83
4.3.7.2 Potential Impacts 85
4.3.7.3 Mitigation 88
4.3.8 Property Values 88
4.3.8.1 Existing Conditions 88
4.3.8.2 Potential Impacts 89
4.3.8.3 Mitigation 90
4.3.9 Recreation 91
4.3.9.1 Existing Conditions 91
4.3.9.2 Potential Impacts 92
4.3.9.3 Mitigation 92
4.3.10 Socioeconomics 93
4.3.10.1 Existing Conditions 93
4.3.10.2 Potential Impacts 94
4.3.10.3 Mitigation 94
4.3.11 Transportation and Public Services 95
4.3.11.1 Transportation 95
4.3.11.2 Emergency Services 97
4.3.11.3 Airports 98
4.3.11.4 Local and Regional Utilities 100
4.4 Human Health and Safety 102
4.4.1 Electric and Magnetic Fields 102
4.4.1.1 Existing Conditions 103
4.4.1.2 Potential Impacts 105
4.4.1.3 Mitigation 107
4.4.2 Implantable Medical Devices 108
4.4.2.1 Existing Conditions 108
4.4.2.2 Potential Impacts 109
4.4.2.3 Mitigation 109

4.4.3 Public and Worker Safety ... 110
4.4.3.1 Existing Conditions ... 110
4.4.3.2 Potential Impacts ... 110
4.4.3.3 Mitigation ... 111
4.4.4 Stray Voltage ... 111
4.4.4.1 Existing Conditions ... 111
4.4.4.2 Potential Impacts ... 112
4.4.4.3 Mitigation ... 112
4.4.5 Induced Voltage ... 113
4.4.5.1 Existing Conditions ... 113
4.4.5.2 Potential Impacts ... 113
4.4.5.3 Mitigation ... 114
4.5 Land-based Economies ... 114
4.5.1 Agriculture ... 115
4.5.1.1 Existing Conditions ... 115
4.5.1.2 Potential Impacts ... 116
4.5.1.3 Mitigation ... 118
4.5.2 Forestry ... 120
4.5.2.1 Existing Conditions ... 120
4.5.2.2 Potential Impacts ... 121
4.5.2.3 Mitigation ... 122
4.5.3 Mining ... 122
4.5.3.1 Existing Conditions ... 122
4.5.3.2 Potential Impacts ... 123
4.5.3.3 Mitigation ... 123
4.5.4 Tourism ... 123
4.5.4.1 Existing Conditions ... 123
4.5.4.2 Potential Impacts ... 124
4.5.4.3 Mitigation ... 124
4.6 Archaeological and Historic Resources ... 124
4.6.1 Existing Conditions ... 124
4.6.2 Potential Impacts ... 129
4.6.3 Mitigation ... 129
4.6.3.1 Commission Draft Route Permit ... 129
4.6.3.2 Other Proposed Mitigation ... 129
4.7 Natural Environment ... 130
4.7.1 Air Quality ... 130
4.7.1.1 Existing Conditions ... 130
4.7.1.2 Potential Impacts ... 132

4.7.1.3 Mitigation 133
4.7.2 Climate Change 134
4.7.2.1 Existing Conditions 134
4.7.2.2 Potential Impacts 139
4.7.2.3 Mitigation 140
4.7.3 Greenhouse Gases 141
4.7.3.1 Existing Conditions 141
4.7.3.2 Potential Impacts 143
4.7.3.3 Mitigation 144
4.7.4 Geology and Topography 144
4.7.4.1 Existing Conditions 144
4.7.4.2 Potential Impacts 145
4.7.4.3 Mitigation 145
4.7.5 Groundwater 146
4.7.5.1 Existing Conditions 146
4.7.5.2 Potential Impacts 148
4.7.5.3 Mitigation 149
4.7.6 Public and Designated Lands 150
4.7.6.1 Existing Conditions 151
4.7.6.2 Potential Impacts 152
4.7.6.3 Mitigation 154
4.7.7 Vegetation 155
4.7.7.1 Existing Conditions 156
4.7.7.2 Potential Impacts 157
4.7.7.3 Mitigation 158
4.7.8 Wildlife and Wildlife Habitat 159
4.7.8.1 Existing Conditions 159
4.7.8.2 Potential Impacts 161
4.7.8.3 Mitigation 163
4.7.9 Rare and Unique Natural Resources 165
4.7.9.1 Existing Conditions 166
4.7.9.2 Potential Impacts 171
4.7.9.3 Mitigation 173
4.7.10 Soils 176
4.7.10.1 Existing Conditions 176
4.7.10.2 Potential Impacts 177
4.7.10.3 Mitigation 178
4.7.11 Surface Water 179
4.7.11.1 Existing Conditions 180

4.7.11.2 Potential Impacts 182
4.7.11.3 Mitigation 183
4.7.12 Wetlands and Calcareous Fens 186
4.7.12.1 Regulation of Wetlands 186
4.7.12.2 Potential Impacts 187
4.7.12.3 Mitigation 188
4.8 Costs that are Dependent on Design and Route 189
4.9 Electric System Reliability 191
5 South Region – Potential Impacts and Mitigation 195
5.1 Environmental Setting 195
5.2 Big Stone Subregion Routes 195
5.2.1 Use or Paralleling of Existing Rights-of-Way 197
5.2.2 Human Settlement 201
5.2.2.1 Aesthetics 201
5.2.2.2 Cultural Values 206
5.2.2.3 Displacement 206
5.2.2.4 Environmental Justice 206
5.2.2.5 Land Use and Zoning 207
5.2.2.6 Noise 207
5.2.2.7 Property Values 207
5.2.2.8 Recreation 207
5.2.2.9 Socioeconomics 210
5.2.2.10 Transportation and Public Services 210
5.2.3 Human Health and Safety 210
5.2.4 Land-based Economies 210
5.2.4.1 Agriculture 210
5.2.4.2 Forestry 212
5.2.4.3 Mining 212
5.2.4.4 Tourism 213
5.2.5 Archaeological and Historic Resources 213
5.2.5.1 Archaeological Resources 218
5.2.5.2 Historic Resources 218
5.2.5.3 Historic Cemeteries 219
5.2.6 Natural Environment 219
5.2.6.1 Air Quality 219
5.2.6.2 Climate Change 219
5.2.6.3 Greenhouse Gases 219
5.2.6.4 Geology and Topography 220
5.2.6.5 Groundwater 220

5.2.6.6 Public and Designated Lands ... 220
5.2.6.7 Vegetation ... 223
5.2.6.8 Wildlife and Wildlife Habitat ... 225
5.2.6.9 Rare and Unique Natural Resources ... 229
5.2.6.10 Soils ... 234
5.2.6.11 Surface Water ... 236
5.2.6.12 Wetlands and Calcareous Fens ... 238
5.2.7 Costs that are Dependent on Design and Route ... 242
5.2.8 Relative Merits of the Big Stone Subregion Routes ... 242
5.2.9 Route Segments and Alignment Alternatives for the Big Stone Subregion ... 248
5.2.9.1 Route Segment S207 ... 249
5.2.9.2 Route Segment S208 ... 251
5.2.9.3 Route Segment S210 ... 253
5.2.9.4 Alignment Alternative SAA04 ... 255
5.3 Swift Subregion Routes ... 257
5.3.1 Use or Paralleling of Existing Rights-of-Way ... 258
5.3.2 Human Settlement ... 260
5.3.2.1 Aesthetics ... 260
5.3.2.2 Cultural Values ... 266
5.3.2.3 Displacement ... 266
5.3.2.4 Environmental Justice ... 267
5.3.2.5 Land Use and Zoning ... 267
5.3.2.6 Noise ... 267
5.3.2.7 Property Values ... 267
5.3.2.8 Recreation ... 267
5.3.2.9 Socioeconomics ... 268
5.3.2.10 Transportation and Public Services ... 268
5.3.3 Human Health and Safety ... 268
5.3.4 Land-based Economies ... 269
5.3.4.1 Agriculture ... 269
5.3.4.2 Forestry ... 272
5.3.4.3 Mining ... 272
5.3.4.4 Tourism ... 272
5.3.5 Archaeological and Historic Resources ... 272
5.3.5.1 Archaeological Resources ... 277
5.3.5.2 Historic Resources ... 277
5.3.5.3 Historic Cemeteries ... 277
5.3.6 Natural Environment ... 278
5.3.6.1 Air Quality ... 278

5.3.6.2 Climate Change 278
5.3.6.3 Greenhouse Gases 278
5.3.6.4 Geology and Topography 278
5.3.6.5 Groundwater 278
5.3.6.6 Public and Designated Lands 278
5.3.6.7 Vegetation 280
5.3.6.8 Wildlife and Wildlife Habitat 282
5.3.6.9 Rare and Unique Natural Resources 285
5.3.6.10 Soils 287
5.3.6.11 Surface Water 288
5.3.6.12 Wetlands and Calcareous Fens 290
5.3.7 Costs that are Dependent on Design and Route 293
5.3.8 Relative Merits of the Swift Subregion Routes 293
5.3.9 Route Segments and Alignment Alternatives for the Swift Subregion 300
5.3.9.1 Route Segment S18 301
5.3.9.2 Route Segment S201 303
5.3.9.3 Route Segment S202 304
5.3.9.4 Route Segment S203 306
5.3.9.5 Route Segment S204 309
5.3.9.6 Route Segment S205 310
5.3.9.7 Alignment Alternative SAA01 312
5.3.9.8 Alignment Alternative SAA02 313
5.3.9.9 Alignment Alternative SAA03 314
6 Central Region – Potential Impacts and Mitigation 316
6.1 Environmental Setting 316
6.2 Hancock Subregion Routes 316
6.2.1 Use or Paralleling of Existing Rights-of-Way 317
6.2.2 Human Settlement 319
6.2.2.1 Aesthetics 319
6.2.2.2 Cultural Values 324
6.2.2.3 Displacement 324
6.2.2.4 Environmental Justice 324
6.2.2.5 Land Use and Zoning 325
6.2.2.6 Noise 325
6.2.2.7 Property Values 325
6.2.2.8 Recreation 325
6.2.2.9 Socioeconomics 326
6.2.2.10 Transportation and Public Services 326
6.2.3 Human Health and Safety 326

6.2.4 Land-based Economies ... 326
6.2.4.1 Agriculture ... 326
6.2.4.2 Forestry ... 329
6.2.4.3 Mining ... 329
6.2.4.4 Tourism ... 329
6.2.5 Archaeological and Historic Resources ... 329
6.2.5.1 Archaeological Resources ... 332
6.2.5.2 Historic Resources ... 332
6.2.5.3 Historic Cemeteries ... 333
6.2.6 Natural Environment ... 333
6.2.6.1 Air Quality ... 333
6.2.6.2 Climate Change ... 333
6.2.6.3 Greenhouse Gases ... 333
6.2.6.4 Geology and Topography ... 333
6.2.6.5 Groundwater ... 333
6.2.6.6 Public and Designated Lands ... 334
6.2.6.7 Vegetation ... 335
6.2.6.8 Wildlife and Wildlife Habitat ... 336
6.2.6.9 Rare and Unique Natural Resources ... 337
6.2.6.10 Soils ... 339
6.2.6.11 Surface Water ... 340
6.2.6.12 Wetlands and Calcareous Fens ... 341
6.2.7 Costs that are Dependent on Design and Route ... 343
6.2.8 Relative Merits of the Hancock Subregion Routes ... 344
6.2.9 Route Segments for the Hancock Subregion ... 349
6.2.9.1 Route Segment C203 ... 350
6.2.9.2 Route Segment C208 ... 351
6.3 Cyrus Subregion Routes ... 353
6.3.1 Use or Paralleling of Existing Rights-of-Way ... 354
6.3.2 Human Settlement ... 356
6.3.2.1 Aesthetics ... 356
6.3.2.2 Cultural Values ... 358
6.3.2.3 Displacement ... 358
6.3.2.4 Environmental Justice ... 358
6.3.2.5 Land Use and Zoning ... 359
6.3.2.6 Noise ... 359
6.3.2.7 Property Values ... 359
6.3.2.8 Recreation ... 359
6.3.2.9 Socioeconomics ... 359

6.3.2.10 Transportation and Public Services 360
6.3.3 Human Health and Safety 360
6.3.4 Land-based Economies 360
6.3.4.1 Agriculture 360
6.3.4.2 Forestry 363
6.3.4.3 Mining 363
6.3.4.4 Tourism 363
6.3.5 Archaeological and Historic Resources 363
6.3.5.1 Archaeological Resources 366
6.3.5.2 Historic Resources 366
6.3.5.3 Historic Cemeteries 366
6.3.6 Natural Environment 366
6.3.6.1 Air Quality 366
6.3.6.2 Climate Change 367
6.3.6.3 Greenhouse Gases 367
6.3.6.4 Geology and Topography 367
6.3.6.5 Groundwater 367
6.3.6.6 Public and Designated Lands 367
6.3.6.7 Vegetation 368
6.3.6.8 Wildlife and Wildlife Habitat 369
6.3.6.9 Rare and Unique Natural Resources 371
6.3.6.10 Soils 373
6.3.6.11 Surface Water 374
6.3.6.12 Wetlands and Calcareous Fens 375
6.3.7 Costs that are Dependent on Design and Route 377
6.3.8 Relative Merits of the Cyrus Subregion Routes 377
6.3.9 Alignment Alternatives for the Cyrus Subregion 382
6.3.9.1 Alignment Alternative CAA01 383
6.4 White Bear Lake Subregion Routes 384
6.4.1 Use or Paralleling of Existing Rights-of-Way 385
6.4.2 Human Settlement 387
6.4.2.1 Aesthetics 387
6.4.2.2 Cultural Values 389
6.4.2.3 Displacement 389
6.4.2.4 Environmental Justice 390
6.4.2.5 Land Use and Zoning 390
6.4.2.6 Noise 390
6.4.2.7 Property Values 390
6.4.2.8 Recreation 390

6.4.2.9 Socioeconomics ... 391
6.4.2.10 Transportation and Public Services ... 391
6.4.3 Human Health and Safety ... 391
6.4.4 Land-based Economies ... 391
6.4.4.1 Agriculture ... 391
6.4.4.2 Forestry ... 393
6.4.4.3 Mining ... 394
6.4.4.4 Tourism ... 394
6.4.5 Archaeological and Historic Resources ... 394
6.4.5.1 Archaeological Resources ... 396
6.4.5.2 Historic Resources ... 396
6.4.5.3 Historic Cemeteries ... 396
6.4.6 Natural Environment ... 396
6.4.6.1 Air Quality ... 396
6.4.6.2 Climate Change ... 396
6.4.6.3 Greenhouse Gases ... 397
6.4.6.4 Geology and Topography ... 397
6.4.6.5 Groundwater ... 397
6.4.6.6 Public and Designated Lands ... 397
6.4.6.7 Vegetation ... 399
6.4.6.8 Wildlife and Wildlife Habitat ... 400
6.4.6.9 Rare and Unique Natural Resources ... 403
6.4.6.10 Soils ... 405
6.4.6.11 Surface Water ... 406
6.4.6.12 Wetlands and Calcareous Fens ... 407
6.4.7 Costs that are Dependent on Design and Route ... 409
6.4.8 Relative Merits of the White Bear Lake Subregion Routes ... 410
6.4.9 Route Segments for the White Bear Lake Subregion ... 415
6.4.9.1 Route Segment C202 ... 417
7 North Region – Potential Impacts and Mitigation ... 419
7.1 North Region – Environmental Setting ... 419
7.2 Alexandria Subregion Routes ... 420
7.2.1 Use or Paralleling of Existing Rights-of-Way ... 421
7.2.2 Human Settlement ... 422
7.2.2.1 Aesthetics ... 422
7.2.2.2 Cultural Values ... 425
7.2.2.3 Displacement ... 425
7.2.2.4 Environmental Justice ... 425
7.2.2.5 Land Use and Zoning ... 426

7.2.2.6 Noise 426
7.2.2.7 Property Values 426
7.2.2.8 Recreation 426
7.2.2.9 Socioeconomics 427
7.2.2.10 Transportation and Public Services 427
7.2.3 Human Health and Safety 427
7.2.4 Land-based Economies 427
7.2.4.1 Agriculture 427
7.2.4.2 Forestry 430
7.2.4.3 Mining 431
7.2.4.4 Tourism 432
7.2.5 Archaeological and Historic Resources 432
7.2.5.1 Archaeological Resources 436
7.2.5.2 Historic Resources 436
7.2.5.3 Historic Cemeteries 436
7.2.6 Natural Environment 437
7.2.6.1 Air Quality 437
7.2.6.2 Climate Change 437
7.2.6.3 Greenhouse Gases 437
7.2.6.4 Geology and Topography 437
7.2.6.5 Groundwater 437
7.2.6.6 Public and Designated Lands 438
7.2.6.7 Vegetation 439
7.2.6.8 Wildlife and Wildlife Habitat 441
7.2.6.9 Rare and Unique Natural Resources 444
7.2.6.10 Soils 445
7.2.6.11 Surface Water 447
7.2.6.12 Wetlands and Calcareous Fens 449
7.2.7 Costs that are Dependent on Design and Route 450
7.2.8 Relative Merits of the Alexandria Subregion Routes 451
7.2.9 Route Segments for the Alexandria Subregion 455
7.2.9.1 Route Segment N9 457
7.2.9.2 Route Segment N10 459
7.2.9.3 Route Segment N11 461
7.2.9.4 Route Segment N205 463
7.2.9.5 Route Segment N206 464
7.2.9.6 Route Segment N207 466
8 Associated Facilities – Potential Impacts and Mitigation 469
8.1 Big Stone South Substation Expansion 469

8.2 Fiber Optic Regeneration Substation 469
8.2.1 Potential Impacts 469
8.2.2 Mitigation 470
8.3 Alexandria Substation Expansion 470
8.3.1 Potential Impacts 471
8.3.2 Mitigation 471
9 Unavoidable Impacts and Irreversible and Irretrievable Commitments of Resources 472
9.1 Unavoidable Impacts 472
9.2 Irreversible and Irretrievable Commitments of Resources 473
10 Cumulative Potential Effects 474
10.1 Human Settlement 477
10.2 Human Health and Safety 478
10.3 Land-based Economies 478
10.4 Archaeological and Historic Resources 478
10.5 Natural Environment 479
11 References 480

Tables

Table 2-1	Potential Federal Permits and Approvals Required for the Project	25
Table 2-2	Potential State Permits and Approvals Required for the Project	27
Table 2-3	Potential Local and Other Permits and Approvals Required for the Project	28
Table 3-1	South Region Municipality and Township Summary	31
Table 3-2	Big Stone Subregion Municipality and Township Summary	32
Table 3-3	Routes, Route Segments, and Alignment Alternatives in the Big Stone Subregion	33
Table 3-4	Swift Subregion Municipality and Township Summary	34
Table 3-5	Routes, Route Segments, and Alignment Alternatives in the Swift Subregion	34
Table 3-6	Central Region Municipality and Township Summary	35
Table 3-7	Hancock Subregion Municipality and Township Summary	36
Table 3-8	Routes, Route Segments, and Alignment Alternatives in the Hancock Subregion	37
Table 3-9	Cyrus Subregion Municipality and Township Summary	37
Table 3-10	Routes and Alignment Alternatives in the Cyrus Subregion	37
Table 3-11	White Bear Lake Subregion Municipality and Township Summary	38
Table 3-12	Routes, Route Segments, and Alignment Alternatives in the White Bear Lake Subregion	38
Table 3-13	North Region Municipality and Township Summary	38
Table 3-14	Routes and Route Segments in the Alexandria Subregion	40
Table 3-15	Typical Structure Design Summary	43
Table 3-16	Summary of Route Width Variations	47
Table 4-1	Regions of Influence	59
Table 4-2	Environmental Justice Area Census Comparison Data Analysis	77
Table 4-3	Minnesota Noise Standards	85
Table 4-4	Population, Income, and Employment	93
Table 4-5	Electric and Magnetic Field Ranges for Common Household Appliances	104
Table 4-6	International Electric and Magnetic Field Guidelines	105
Table 4-7	Electric Field Calculations for Proposed 345 kV Transmission Line (3.28 feet above ground)	106
Table 4-8	Calculated Magnetic Field Magnitudes for Double-Circuit 345 kV Transmission Line (3.28 feet above ground)	107
Table 4-9	Historical Annual Mean, Maximum, and Minimum Daily Air Temperature Trends (°F/decade) for the West Central Climate Division from 1895 to 2024	135
Table 4-10	Modeled Historical and Projected Temperature Trends for the Project	138
Table 4-11	Modeled Historical and Projected Precipitation Trends for the Project	138
Table 4-12	Climate Change Risks for Counties Traversed by the Project	139
Table 4-13	Federal Species Potentially Present in the Vicinity of the Project	167

Table 4-14 Natural Heritage Information System Database Records of State or Federally Threatened or Endangered Species within One Mile of the Project 168
Table 4-15 Route Count of Crossings with Existing Transmission Lines Greater than 100 kV 193
Table 4-16 Route Segment or Alternative Alignment Count of Crossings with Existing Transmission Lines Greater than 100 kV 194
Table 5-1 Routes in the Big Stone Subregion 197
Table 5-2 Big Stone Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail 200
Table 5-3 Big Stone Subregion, Proximity of Non-Residential Structures 203
Table 5-4 Big Stone Subregion, Recreational Resources within Route Width 209
Table 5-5 Big Stone Subregion, Cultural Resource counts within Route's ROI 214
Table 5-6 Big Stone Subregion, Descriptions of Cultural Resources within Route's ROI 215
Table 5-7 Big Stone Subregion, Public and Designated Lands within Route Width and ROW 222
Table 5-8 Big Stone Subregion, Landcover Types in the ROW 224
Table 5-9 Big Stone Subregion, Wildlife Management and Conservation Areas within Route Width 228
Table 5-10 Big Stone Subregion, Natural Heritage Information System Database Records of Protected Species Within One Mile 231
Table 5-11 Big Stone Subregion, Sensitive Ecological Resources within the ROW and Route Width 233
Table 5-12 Big Stone Subregion, NRCS Mapped Soils Within ROW 235
Table 5-13 Big Stone Subregion, Count of Floodplain Crossings Over 1,000 feet 238
Table 5-14 Big Stone Subregion, Wetland Crossings Greater than 1000 feet 241
Table 5-15 Big Stone Subregion, Summary of Estimated Cost by Route 242
Table 5-16 Guide to Relative Merits Analysis 243
Table 5-17 Big Stone Subregion, Relative Merits of Subregion Routes 244
Table 5-18 Big Stone Subregion Route Segments and Alignment Alternatives 249
Table 5-19 Route Segment S207 vs Its Equivalent Impacts Summary 249
Table 5-20 Route Segment S208 vs Its Equivalent Impacts Summary 251
Table 5-21 Route Segment S210 vs Its Equivalent Impacts Summary 253
Table 5-22 Alignment Alternative SAA04 vs Its Equivalent Impacts Summary 256
Table 5-23 Swift Subregion Routes 258
Table 5-24 Swift Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail 260
Table 5-25 Swift Subregion, Proximity of Non-Residential Structures 261
Table 5-26 Swift Subregion, Recreational Resources within Route Width 268
Table 5-27 Swift Subregion, Cultural Resource counts within Route's ROI 274
Table 5-28 Swift Subregion, Descriptions of Cultural Resources within Route's ROI 274

Table 5-29 Swift Subregion, Public and Designated Lands within Route Width and ROW 280
Table 5-30 Swift Subregion, Landcover Types in the ROW 281
Table 5-31 Swift Subregion, Wildlife Management and Conservation Areas within Route Width 284
Table 5-32 Swift Subregion, Natural Heritage Information System Database Records of Protected Species within One Mile 286
Table 5-33 Swift Subregion, Sensitive Ecological Resources within the ROW and Route Width of Each Route 287
Table 5-34 Swift Subregion, NRCS Mapped Soils within ROW 288
Table 5-35 Swift Subregion, Summary of Estimated Cost by Route 293
Table 5-36 Guide to Relative Merits Analysis 294
Table 5-37 Swift Subregion, Relative Merits of Subregion Routes 295
Table 5-38 Swift Subregion Route Segments and Alignment Alternatives 301
Table 5-39 Route Segment S18 vs Its Equivalent Impacts Summary 302
Table 5-40 Route Segment S201 vs Its Equivalent Impacts Summary 303
Table 5-41 Route Segment S202 vs Its Equivalent Impacts Summary 305
Table 5-42 Route Segment S203 vs Its Equivalent Impacts Summary 307
Table 5-43 Route Segment S204 vs Its Equivalent Impacts Summary 309
Table 5-44 Route Segment S205 vs Its Equivalent Impacts Summary 310
Table 5-45 Alignment Alternative SAA01 vs Its Equivalent Impacts Summary 313
Table 5-46 Alignment Alternative SAA02 vs Its Equivalent Impacts Summary 314
Table 5-47 Alignment Alternative SAA03 vs Its Equivalent Impacts Summary 315
Table 6-1 Hancock Subregion Routes 317
Table 6-2 Hancock Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail 319
Table 6-3 Hancock Subregion, Proximity of Non-Residential Structures 320
Table 6-4 Hancock Subregion, Cultural Resource counts within Route's ROI 331
Table 6-5 Hancock Subregion, Descriptions of Cultural Resources within Route's ROI 331
Table 6-6 Hancock Subregion, Public and Designated Lands within Route Width and ROW 334
Table 6-7 Hancock Subregion, Landcover Types in the ROW 336
Table 6-8 Hancock Subregion, Wildlife Management and Conservation Areas within Route Width 337
Table 6-9 Hancock Subregion, Natural Heritage Information System Database Records of Protected Species within One Mile 338
Table 6-10 Hancock Subregion, Sensitive Ecological Resources within the ROW and Route Width of Each Route 339
Table 6-11 Hancock Subregion, NRCS Mapped Soils within ROW 340
Table 6-12 Hancock Subregion, Summary of Estimated Cost by Route 344

Table 6-13 Guide to Relative Merits Analysis ... 344
Table 6-14 Hancock Subregion, Relative Merits of Subregion Routes ... 345
Table 6-15 Hancock Subregion Route Segments ... 350
Table 6-16 Route Segment C203 vs Its Equivalent Impacts Summary ... 350
Table 6-17 Route Segment C208 vs Its Equivalent Impacts Summary ... 352
Table 6-18 Cyrus Subregion Routes ... 354
Table 6-19 Cyrus Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail ... 356
Table 6-20 Cyrus Subregion, Proximity of Non-Residential Structures ... 357
Table 6-21 Cyrus Subregion, Cultural Resource counts within Route's ROI ... 365
Table 6-22 Cyrus Subregion, Descriptions of Cultural Resources within Route's ROI ... 365
Table 6-23 Cyrus Subregion, Public and Designated Lands within Route Width and ROW ... 368
Table 6-24 Cyrus Subregion, Landcover Types in the ROW ... 369
Table 6-25 Cyrus Subregion, Wildlife Management and Conservation Areas within Route Width ... 371
Table 6-26 Cyrus Subregion, Natural Heritage Information System Database Records of Protected Species within One Mile ... 372
Table 6-27 Cyrus Subregion, Sensitive Ecological Resources within the ROW and Route Width of Each Route ... 373
Table 6-28 Cyrus Subregion, NRCS Mapped Soils within ROW ... 374
Table 6-29 Cyrus Subregion, Summary of Estimated Cost by Route ... 377
Table 6-30 Guide to Relative Merits Analysis ... 378
Table 6-31 Cyrus Subregion, Relative Merits of Subregion Routes ... 379
Table 6-32 Cyrus Subregion Alignment Alternative ... 382
Table 6-33 Alignment Alternative CAA01 vs Its Equivalent Impacts Summary ... 383
Table 6-34 White Bear Lake Subregion Routes ... 385
Table 6-35 White Bear Lake Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail ... 386
Table 6-36 White Bear Lake Subregion, Proximity of Non-Residential Structures ... 388
Table 6-37 White Bear Lake Subregion, Cultural Resource counts within Route's ROI ... 395
Table 6-38 White Bear Lake Subregion, Descriptions of Cultural Resources within Route's ROI ... 395
Table 6-39 White Bear Lake Subregion, Public and Designated Lands within Route Width and ROW ... 399
Table 6-40 White Bear Lake Subregion, Landcover Types in the ROW ... 400
Table 6-41 White Bear Lake Subregion, Wildlife Management and Conservation Areas within Route Width ... 403
Table 6-42 White Bear Lake Subregion, Sensitive Ecological Resources within the ROW and Route Width of Each Route ... 405

Table 6-43	White Bear Lake Subregion, NRCS Mapped Soils within ROW	406
Table 6-44	White Bear Lake Subregion, Summary of Estimated Cost by Route	410
Table 6-45	Guide to Relative Merits Analysis	411
Table 6-46	White Bear Lake Subregion, Relative Merits of Subregion Routes	411
Table 6-47	White Bear Lake Subregion Route Segment	416
Table 6-48	Route Segment C202 vs Its Equivalent Impacts Summary	417
Table 7-1	Alexandria Subregion Routes	420
Table 7-2	Alexandria Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail	422
Table 7-3	Alexandria Subregion, Proximity of Non-Residential Structures	423
Table 7-4	Alexandria Subregion, Recreational Resources within Route Width	427
Table 7-5	Alexandria Subregion, Cultural Resource counts within Route's ROI	434
Table 7-6	Alexandria Subregion, Descriptions of Cultural Resources within Route's ROI	434
Table 7-7	Alexandria Subregion, Public and Designated Lands within Route Width and ROW	439
Table 7-8	Alexandria Subregion, Landcover Types in the ROW	441
Table 7-9	Alexandria Subregion, Wildlife Management and Conservation Areas within Route Width	443
Table 7-10	Alexandria Subregion, Natural Heritage Information System Database Records of Protected Species within One Mile	445
Table 7-11	Alexandria Subregion, Sensitive Ecological Resources within the ROW and Route Width of Each Route	445
Table 7-12	Alexandria Subregion, NRCS Mapped Soils within ROW	446
Table 7-13	Alexandria Subregion, Summary of Estimated Cost by Route	451
Table 7-14	Guide to Relative Merits Analysis	451
Table 7-15	Alexandria Subregion, Relative Merits of Subregion Routes	452
Table 7-16	Alexandria Subregion Route Segments	457
Table 7-17	Route Segment N9 vs Its Equivalent Impacts Summary	457
Table 7-18	Route Segment N10 vs Its Equivalent Impacts Summary	459
Table 7-19	Route Segment N11 vs Its Equivalent Impacts Summary	461
Table 7-20	Route Segment N205 vs Its Equivalent Impacts Summary	463
Table 7-21	Route Segment N206 vs Its Equivalent Impacts Summary	464
Table 7-22	Route Segment N207 vs Its Equivalent Impacts Summary	466
Table 10-1	Current and Reasonably Foreseeable Future Projects	475

Figures

Figure 3-1	Typical Transmission Line Structure Components	41
Figure 3-2	Typical 345-kV Structures	42
Figure 3-3	Typical 345-kV Structures Dead-End Structures	42
Figure 3-4	Transmission Line Height Comparison to a Grain Elevator	43
Figure 3-5	Route Width, ROW, and Anticipated Alignment Illustration	46
Figure 4-1	Census Tract 9604 - Environmental Justice Area of Concern	76
Figure 4-2	Common Activity Noise Levels	84
Figure 4-3	Minnesota Department of Transportation Example of Airport Zoning	99
Figure 4-4	Electric Field Calculations for Proposed 345 kV Transmission Line	106
Figure 4-5	Calculated Magnetic Field Magnitudes (mG) for Double-Circuit 345 kV Transmission Line	107
Figure 4-6	Sustainable Forest Incentive Act land within BSSR11 and BSS12 ROI	121
Figure 4-7	Air Pollution Risk Sources in Minnesota	131
Figure 4-8	Historical Annual Mean, Maximum, and Minimum Daily Air Temperature (°F) for the West Central Climate Division from 1895 to 2024	135
Figure 4-9	Historical Total Annual Precipitation (inches) for the West Central Climate Division from 1895 to 2024	136
Figure 4-10	Historical Drought Severity for the West Central Climate Division from 1895 to 2024	137
Figure 4-11	Greenhouse Gases and Earth's Atmosphere	142
Figure 4-12	Typical Bird Flight Diverter	164
Figure 5-1	Big Stone Subregion Routes	196
Figure 5-2	Big Stone Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail	199
Figure 5-3	Big Stone Subregion, Proximity of Residential Structures	202
Figure 5-4	Areas Bordered by Existing Transmission and BSSR01, BSSR03, BSSR05, BSSR07 and BSSR09	206
Figure 5-5	Big Stone Subregion, Prime Farmland within Route Width	211
Figure 5-6	Big Stone Subregion, Acres of Agricultural Lands within Route Width	212
Figure 5-7	Big Stone Subregion, Number of Waterbody Crossings by Type	237
Figure 5-8	Big Stone Subregion, Number of Watercourse Crossings by Type	237
Figure 5-9	Big Stone Subregion, Wetland Area within ROI by Route	240
Figure 5-10	Big Stone Subregion Route Segments and Alignment Alternatives	248
Figure 5-11	Swift Subregion Routes	258
Figure 5-12	Swift Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail	259

Figure 5-13 Swift Subregion, Proximity of Residential Structures ... 261
Figure 5-14 Swift Subregion Area 1 Bordered by Existing Transmission and SSR01, SSR02, SSR03, and SSR04 ... 264
Figure 5-15 Swift Subregion Area 2 Bordered by Existing Transmission and SSR02 ... 265
Figure 5-16 Swift Subregion Area 3 Bordered by Existing Transmission and SSR02 ... 266
Figure 5-17 Swift Subregion, Prime Farmland within Route Widths ... 270
Figure 5-18 Swift Subregion, Acres of Agricultural Lands within Route Width ... 271
Figure 5-19 Swift Subregion, Number of Waterbody Crossings by Type ... 289
Figure 5-20 Swift Subregion, Number of Watercourse Crossings by Type ... 290
Figure 5-21 Swift Subregion, Wetland Area within ROI by Route ... 292
Figure 5-22 Swift Subregion Route Segments and Alignment Alternatives ... 300
Figure 6-1 Hancock Subregion Routes ... 317
Figure 6-2 Hancock Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail ... 318
Figure 6-3 Hancock Subregion Routes, Proximity of Residential Structures ... 320
Figure 6-4 Hancock Subregion Area 1 Bordered by Existing Transmission and HSR01 ... 322
Figure 6-5 Hancock Subregion Area 2 Bordered by Existing Transmission and HSR01 ... 323
Figure 6-6 Hancock Subregion Area 3 Bordered by Existing Transmission and HSR02 or HSR03 ... 324
Figure 6-7 Hancock Subregion, Prime Farmland within Route Widths ... 327
Figure 6-8 Hancock Subregion, Acres of Agricultural Lands within Route Width ... 328
Figure 6-9 Hancock Subregion, Number of Watercourse Crossings by Type ... 341
Figure 6-10 Hancock Subregion, Wetland Area within ROI by Route ... 343
Figure 6-11 Hancock Subregion Route Segments ... 349
Figure 6-12 Cyrus Subregion Routes ... 354
Figure 6-13 Cyrus Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail ... 355
Figure 6-14 Cyrus Subregion, Proximity of Residential Structures ... 357
Figure 6-15 Cyrus Subregion, Prime Farmland within Route Widths ... 361
Figure 6-16 Cyrus Subregion, Acres of Agricultural Lands within Route Width ... 362
Figure 6-17 Cyrus Subregion, Number of Watercourse Crossings by Type ... 375
Figure 6-18 Cyrus Subregion, Wetland Area within ROI by Route ... 376
Figure 6-19 Cyrus Subregion Alignment Alternative ... 382
Figure 6-20 White Bear Lake Subregion Routes ... 384
Figure 6-21 White Bear Lake Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail ... 386
Figure 6-22 White Bear Lake Subregion, Proximity of Residential Structures ... 388
Figure 6-23 White Bear Lake Subregion, Prime Farmland within Route Widths ... 392
Figure 6-24 White Bear Lake Subregion, Acres of Agricultural Lands within Route Width ... 393

Figure 6-25 White Bear Lake Subregion, Number of Watercourse Crossings by Type 407
Figure 6-26 White Bear Lake Subregion, Wetland Area within ROI by Route 409
Figure 6-27 White Bear Lake Subregion Route Segment 416
Figure 7-1 Alexandria Subregion Routes 420
Figure 7-2 Alexandria Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail 421
Figure 7-3 Alexandria Subregion, Proximity of Residential Structures 423
Figure 7-4 Alexandria Subregion, Prime Farmland within Route Widths 429
Figure 7-5 Alexandria Subregion, Acres of Agricultural Lands within Route Width 430
Figure 7-6 Active Mining Operation MNDOT ASIS Number 21059 432
Figure 7-7 Alexandria Subregion, Number of Waterbody Crossings by Type 448
Figure 7-8 Alexandria Subregion, Number of Watercourse Crossings by Type 448
Figure 7-9 Alexandria Subregion, Wetland Area within ROI by Route 450
Figure 7-10 Alexandria Subregion Route Segments 456
Figure 7-11 Alexandria Subregion Areas Boxed in by N207 468
Figure 10-1 Cumulative Potential Effects 477

Maps

Map 1 Applicant Proposed Project Overview
Map 2 Routing Alternatives and Regions Overview
Map 3 South Region Overview
Map 4 Central Region Overview
Map 5 North Region Overview
Map 6 Locations of Route Width Variations
Map 7 ROW Paralleling and Existing Infrastructure
Map 8 Zoning Districts
Map 9 Residences and Structures
Map 10 Recreation Resources
Map 11 Land Cover
Map 12 Prime Farmland
Map 13 Central Pivot Irrigation Systems
Map 14 Water Resources
Map 15 Sensitive Ecological Resources
Map 16 Ecological Classification System
Map 17 Wildlife Action Network
Map 18 Wildlife Resources
Map 19 Archaeological and Historic Resources
Map 20 Surface Soil Texture

Appendices

Appendix A	Scoping Decision
Appendix B	Draft Route Permit
Appendix C	Information Request Responses from Applicants
Appendix D	Spatial Data
Appendix E	Landowner Rights Factsheet
Appendix F	Map Books
Appendix G	Property Values Supplement
Appendix H	Emergency Services
Appendix I	Electric and Magnetic Fields Supplement
Appendix J	Draft Vegetation Management Plan
Appendix K	Draft Agricultural Impact Mitigation Plan
Appendix L	Greenhouse Gas Calculations
Appendix M	Wells
Appendix N	Protected Species

Acronyms and Abbreviations

AC	alternating current
ACGIH	American Conference of Governmental Industrial Hygienists
AIMP	Agricultural Impact Mitigation Plan
ALJ	administrative law judge
AM	amplitude modulation
AQI	Air Quality Index
ARMER	Allied Radio Matrix for Emergency Response
ASIS	Aggregate Source Information System
BGEPA	Bald and Golden Eagle Protection Act
BMP(s)	best management practice(s)
BWSR	Minnesota Board of Water and Soil Resources
CAH	Court of Administrative Hearings
CH_4	methane
CO	carbon monoxide
CO_2	carbon dioxide
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
Commission	Minnesota Public Utilities Commission
CREAT	Climate Resilience Evaluation and Awareness Tool
CREP	Conservation Reserve Enhancement Program
CWA	Clean Water Act
dBA	A-weighted scale
DNR	DNR Natural Heritage Information System
DNR	Minnesota Department of Natural Resources
DWSMA	Drinking Water Supply Management Areas
ECS	Ecological Classification System
ECS	Ecological Classification System
EIS	environmental impact statement
EJ	environmental justice
ELF-EMF	extremely low frequency electric and magnetic field
EMF(s)	electric and magnetic field(s)
EMI	electromagnetic interference
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FAA	Federal Aviation Administration
FEMA	Federal Emergency Management Administration
FM	frequency modulation
FPPA	Farmland Protection Policy Act
G	Gauss

GBCAs	Grassland Bird Conservation Areas
GHG	greenhouse gas
GPS	global positioning system
GWP	global warming potential
HUC	Hydrologic Unit Codes
HVTL	high-voltage transmission line
ICDs	implantable cardioverter defibrillators
IPaC	Information for Planning and Consultation
IPCC	Intergovernmental Panel on Climate Change
kV	kilovolt
kV/m	kilovolt per meter
LGU	local units of government
LRTP	Long-Range Transmission Plan
LRTP	Long-Range Transmission Plan
mA	milliamps
MDA	Minnesota Department of Agriculture
MDOR	Minnesota Department of Revenue
mG	milliGauss
MHz	megahertz
MIAC	Minnesota Indian Affairs Council
MISO	Midcontinent Independent System Operator, Inc.
MnDOT	Minnesota Department of Transportation
MnSHIP	Minnesota Statewide Historic Inventory Portal
MPCA	Minnesota Pollution Control Agency
MWI	Minnesota Well Index
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards
NAC	noise area classifications
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NESC	National Electrical Safety Code
NEV	neutral-to-earth voltage
NHIS	Natural Heritage Inventory System
NHPA	National Historic Preservation Act
NLCD	National Landcover Database
NO_2	nitrogen dioxide
NO_X	nitrogen oxides
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resource Conservation Service
NRHP	National Register of Historic Places
NWI	National Wetlands Inventory
O_3	ozone

OHGW	overhead ground wire
OPGW	optical ground wire
OSA	Office of the State Archaeologist
Pb	lead
$PM_{10}/PM_{2.5}$	particulate matter
Project	Big Stone South to Alexandria Project
PSD	Prevention of Significant Deterioration
PWI	Public Water Inventory
PWI	Public Waters Inventory
RIM	Reinvest in Minnesota
rms	root mean square
ROI	regions of influence
ROW	right-of-way
RTK GPS	real-time kinematic GPS
scPDSI	Self-Calibrated Palmer Drought Severity Index
SDS	State Disposal System
SF_6	sulfur hexafluoride
SF_6	sulfur hexafluoride
SFIA	Sustainable Forest Incentive Act
SGCN	Species in Greatest Conservation Need
SHPO	Minnesota State Historic Preservation Office
SO_2	sulfur dioxide
SSA	sole source aquifer
SSP	Shared Socioeconomic Pathway
SSURGO	Soil Survey Geographic
SWPPP	Stormwater Pollution Prevention Plan
TCPs	traditional cultural properties
THPO	Tribal Historic Preservation Offices
UHF	ultra-high frequency
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDA	U.S. Department of Agriculture
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VMP	Vegetation Management Plan
VOR	very high frequency omni-directional range
W/m^2	watts per meter squared
WCA	Wetland Conservation Act
WCCD	West Central Climate Division
WCROC	West Central Research and Outreach Center
WHAF	Watershed Health Assessment Framework

WHPA	Wellhead Protection Area
WMAs	Wildlife Management Areas
WPAs	Waterfowl Protection Areas
WRP	Wetlands Reserve Program

Summary

The Minnesota Public Utilities Commission (Commission) has prepared this environmental impact statement (EIS) for the Big Stone South to Alexandria Project (project), a 345 kilovolt (kV) transmission line proposed by Otter Tail Power Company and Western Minnesota Municipal Power Agency, through its agent, Missouri River Energy Services (hereinafter the applicants). The EIS evaluates the potential human and environmental impacts of the project and possible mitigation measures, including routing alternatives.

This EIS is not a decision-making document but rather a guide for decision-makers. The EIS is intended to facilitate informed decisions by the Commission and other state agencies, particularly with respect to the goals of the Minnesota Environmental Policy Act to create and maintain conditions under which human beings and nature can exist in productive harmony, and fulfill the social, economic, and other requirements of present and future generations of the state's people (Minnesota Statute § 116D.02).

Project Need

The project is one of several identified in the Long-Range Transmission Plan (LRTP) Tranche 1 Portfolio by the Midcontinent Independent System Operator, Inc.'s (MISO) Board of Directors in July 2022 as part of its 2021 Transmission Expansion Plan (reference (1)). The project is the western segment of the larger Big Stone South – Alexandria – Big Oaks 345 kV Transmission Project. The applicants view this project as needed to provide reliable, resilient, and cost-effective delivery of energy as generation resource mix continues to evolve in the upcoming years. This project will address thermal and voltage reliability issues across the MISO transmission system and allow continued reliable delivery of energy as coal-fired generators are retired and replaced with renewable resources. A certificate of need for the Big Stone South – Alexandria – Big Oaks Project was issued by the Commission on October 30, 2024 (reference (1)).

Project Description

The applicants propose to construct a single-circuit 345 kV high-voltage transmission line (HVTL) (referred to as a transmission line throughout this document), from the Minnesota/South Dakota border to the Alexandria Substation in Douglas County, Minnesota. The project is also expected to require a new fiber optic regeneration station.

The project consists of the installation of a single-circuit 345 kV transmission line constructed on double-circuit-capable structures line between the Minnesota/South Dakota border and the Alexandria Substation in Douglas County. The project is also expected to require a new fiber optic regeneration station. The applicants proposed two possible transmission line routes as required by Minnesota Rules 7850.1900 (Map S.1). The applicants have identified both routes as feasible and have not indicated a preference for a particular route.

The applicants have generally requested a route width of 1,000 feet and a right-of-way (ROW) width of 150 feet. Exceptions to the 1,000-foot route width include areas with routing constraints, like areas where natural resources and state conservation easements exist. Locations where a wider or narrower route width are requested are summarized in Section 3.3.1.

The applicants anticipate that construction will begin in the second quarter of 2028 and that the project will be complete between the fourth quarter of 2030 and the fourth quarter of 2031.

The existing Big Stone South Substation is the western endpoint of the project in Grant County, South Dakota one mile west of Big Stone City. It would be expanded on land owned by Otter Tail Power Company to accommodate new equipment. The Big Stone South Substation is entirely in South Dakota, therefore potential impacts from the expansion are not completely analyzed as part of this EIS. Additionally, permits from the state of South Dakota would be obtained for the expansion and the transmission line portions of the project in that state. The existing ring bus configuration would be modified to a breaker and half configuration by adding one additional row to the 345 kV portion of the substation. This new row would allow for additional reactive power equipment and new breaker positions on the transmission line to the Alexandria Substation.

A new fiber optic regeneration station may be needed along the permitted route to amplify and regenerate optical communications between substations if another communication connection is not available. Fiber optic regeneration stations are typically required when the line length exceeds 75 miles. The applicants anticipate constructing this new building within the Central Region within the permitted route width. The exact placement depends on the route chosen by the Commission for the final route permit. The equipment required to regenerate optical communications would be placed within a new shelter building approximately 15 feet by 25 feet and 15 feet above grade. The final footprint would be approximately 100-feet wide by 100-feet long (0.23 acres). This area would be permanently fenced, covered with gravel, and may have low-wattage flood lighting on the outside of the shelter building for security purposes.

The existing Alexandria Substation is the terminus of the project southwest of the city of Alexandria, Minnesota, south of Interstate 94. New substation equipment necessary to accommodate the transmission line will be installed as part of the Alexandria to Big Oaks 345 kV Transmission Project (eDockets No. TL-23-159) route permit, including termination structures, circuit breakers, reactive power equipment, relays, and associated control equipment. This expansion would be 4 to 6 acres from the existing fenced area and require purchase of additional land that would support the overall project's termination position.

The Alexandria Substation expansion was analyzed in an Environmental Assessment completed for the Alexandria to Big Oaks 345 kV Transmission Project (eDockets No. TL-23-159) that was ultimately issued a route permit. The Alexandria Substation expansion is considered an associated facility in requirement 2.2 of the route permit issued for the Alexandria to Big Oaks 345 kV Transmission Project. Thus, construction for the Alexandria Substation expansion has already been authorized and may commence before the route permit decision for the Big Stone South to Alexandria Project is made. The potential impacts and mitigation information provided below is a reiteration of the environmental review that was already conducted for this part of the project. Both the Alexandria to Big Oaks 345 kV Transmission Project and Big Stone South to Alexandria 345 kV Transmission Project will require and use the Alexandria Substation expansion.

Routing Alternatives

The May 6, 2025, scoping decision included 36 routing alternatives. The term "routing alternatives" is used to refer collectively to the applicants' proposed routes and all route segments, route connectors, and alignment alternatives identified in the scoping decision, including those proposed by the public, regulatory agencies, and the applicants. The "applicants' proposed routes" is a term used to refer collectively to what the applicants proposed in their route permit application. The 36 routing alternatives in the scoping decision included 18 route segments (four proposed by the applicants), seven route connectors (three proposed by the applicants), and five alignment alternatives.

For purposes of analysis, route connectors are not analyzed in the EIS as standalone route connectors; instead, they are incorporated with applicants' proposed routes to create new routes.

Routing alternatives studied in the EIS are shown on Map S.1 and include the following:

- **Routes**—Across all six subregions, there are 27 routes studied in the EIS. Routes extend the length of a particular subregion and connect designated subregion start and end points. Routes combine the applicants' proposed routes with route connectors and routing alternatives developed during the scoping process. The total number of routes in a subregion represents all of the possibilities to get from a subregion start point to a subregion endpoint. Routes are listed and described within their respective subregion in Section 3.1.

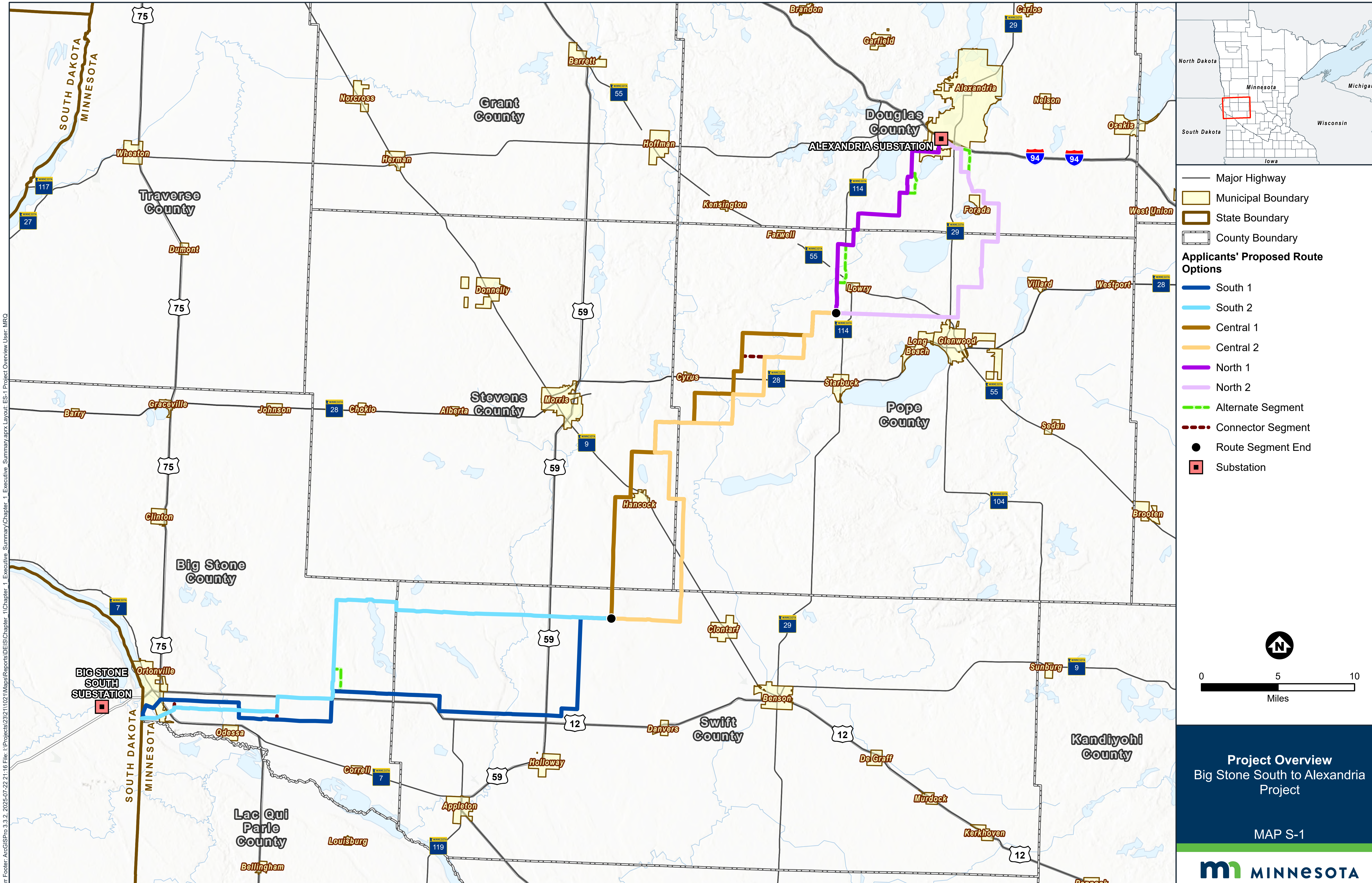
- **Route segments**—This EIS studies 18 route segments, including four proposed by the applicants and 14 identified during the scoping process that were approved for inclusion in the EIS in the scoping decision. Route segments are listed and described within their respective subregions in Section 3.1.

- **Alignment alternatives**—There are five alignment alternatives studied in the EIS, all of which were identified during the scoping process and approved for inclusion in the EIS in the scoping decision. Alignment alternatives are listed and described within their respective subregions in Section 3.1. They deviate from the applicants' anticipated alignments but fall within the original route width(s) proposed by the applicants.

The EIS studies these routing alternatives as standalone routes, route segments, or alignment alternatives within three identified regions (South, Central, and North). Each of the three regions is further subdivided into subregions that were developed based on shared start and endpoints for all of the possible routes. The South Region has two subregions: Big Stone and Swift; the Central Region has three: Hancock, Cyrus, and White Bear Lake; and the North Region has one: Alexandria.

Chapters 5 through 7 discusses the relative merits of the different routing alternatives based on the routing factors outlined in Minnesota statute and rule. For each subregion, routes are compared against one another and summarized in a relative merits table. Graphics are used to represent the magnitude of anticipated difference between potential impacts or consistency with the routing factor. The graphic for a specific routing factor or element is not meant to be indicative of the "best" route but is provided as a relative comparison to be evaluated together with all other routing factors. In this way, the EIS includes significant discussion of potential impacts by subregion.

If the Commission elects to issue a route permit for the project, it must select a complete route from the Big Stone South Substation to the Alexandria Substation. These complete routes will be comprised of the routes, route segments, and alignment alternatives from each subregion as discussed in Chapters 5 through 7.



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Summary of Potential Impacts and Mitigation

Project construction and operation will impact human and environmental resources. Potential impacts are measured on a qualitative scale based on an expected impact intensity level; the impact intensity level takes mitigation into account.

Potential impacts on human and environmental resources are analyzed within specific geographic areas called regions of influence (ROI). The ROI is the geographic area where the project might exert some influence and is used as the basis for assessing potential impacts. ROIs vary by resource and potential impact. This EIS uses the following ROIs: ROW (150 feet), route width (1,000 feet), local vicinity (within 1,600 feet), project area (within one mile), and the five-county area (the five counties in which the project would be constructed, including Big Stone, Swift, Stevens, Pope, and Douglas counties).

Some impacts are anticipated to be minimal or do not vary significantly based on subregion. These include:

- Impacts on human settlements (factor A)—cultural values, human health and safety (for example, electric and magnetic fields, stray voltage, etc.), environmental justice, land use and zoning, noise, property values, socioeconomics, transportation, and public services.
- Impacts on land-based economies (factor C)—mining, forestry, and tourism.
- Impacts on the natural environment (factor E)—air quality, climate, greenhouse gases, geology and topography, floodplains, and groundwater.

Human Settlement

Transmission lines have the potential to negatively impact human settlements through a variety of means. Impacts to human settlements resulting from the project are anticipated to range from minimal to significant depending on the route selected. Impacts to human settlements could be minimized by prudent routing (that is by choosing routing alternatives that avoid residences, businesses, and other places where citizens congregate). Impacts could also be mitigated by limiting the aesthetic impacts of the structures themselves and by using structures which are, to the extent possible, harmonious with existing human settlements and activities.

Aesthetics

The ROI for aesthetics is the local vicinity. Aesthetic impacts are subjective, and the potential impacts can vary widely and be unique to each person. Impacts can be minimized by selecting routes that are located away from residences and places where people congregate or by following existing infrastructure including sharing ROW with existing transmission lines or roads where elements of the built environment already partly define the viewshed. Following other infrastructure, such as roads and railroads, would also be expected to reduce potential impacts but not to the same extent as paralleling existing transmission lines.

Impacts are largely assessed by reviewing the number of nearby residences, opportunities for ROW paralleling, the presence of recreational resources and infrastructure, as well as scenic byways and similar designations visible in the local vicinity of the proposed route. The greatest aesthetic impacts are where residences are surrounded or boxed-in by transmission line infrastructure as well as one residence within 75 feet of the anticipated alignment. Throughout the project, there is variability in the number of nearby residences and opportunities for paralleling existing ROW, but these follow similar trends in each subregion. State water trails and scenic byways are crossed in most subregions, and in a few cases the proposed transmission line would introduce new infrastructure in an otherwise undeveloped area resulting in more aesthetic impacts. Such cases include a crossing of the Minnesota River in the Big Stone Subregion and the Pomme de Terre River in the Swift Subregion. Crossing options that require less vegetation clearing, such as crossings of the Little Chippewa River, would have minimal aesthetic impacts due to less visual disruption compared to existing conditions. Scenic byways, including the Minnesota River Scenic byway and the Historic Highway 75 King of Trails are crossed in the Big Stone subregion. In the Alexandria subregion, the Glacial Ridge Trail Scenic Byway is crossed by ASR02.

The greatest aesthetic impacts would occur where residences would be boxed in by the proposed transmission line and existing transmission lines. These parcels would be subject to significant aesthetic impacts. These occur in all subregions except for Cyrus, White Bear Lake, and Alexandria. There are two locations in the Big Stone Subregion where any route associated with South 1 (BSSR01, BSSR03, BSSR05, BSSR07 and BSSR09) would box in residential parcels on two sides of their property with existing transmission lines and portions of the proposed transmission line. In the Swift Subregion there are three areas where routes box in parcels on two sides of their property with existing transmission lines and portions of the proposed transmission line. In the Hancock Subregion, HSR01, HSR02, or HSR03 would box in parcels on two sides of their property with existing transmission lines and portions of the proposed transmission line.

Displacement

The ROI for displacement is the ROW. Potential displacement impacts are assessed by identification of buildings within the ROW, which is based on the anticipated alignment. Displacement occurs when a residence or building is required to be removed within the ROW for construction of the project. There is one residential structure within the ROW of SSR03 within the Swift Subregion that would experience significant impacts if they were required to be displaced. Throughout the project there are non-residential structures present within the ROW that could potentially remain if the activities taking place in these buildings are compatible with the safe operation of the line. There are 11 non-residential structures (for example, agricultural outbuildings or animal production structures) within the ROW of the various routing alternatives.

Displacement of non-residential structures can be avoided by adjusting the placement of transmission line structures, using specialty structures, increasing structure height, or by modifying the ROW location. The applicants would work with landowners on a case-by-case basis to address potential displacement. The applicants might need to conduct a site-specific analysis to determine if a building would need to be displaced. Building owners would be compensated by the applicants for any buildings that are displaced.

Land Use and Zoning

The ROI for land use and zoning is the route width. To assess human settlement impacts, potential land use and zoning impacts are addressed by evaluating the project against local land use and zoning ordinances. Impacts to planning and zoning are anticipated to be negligible throughout the project.

Recreation

The ROI for recreation is the route width. Impacts to recreation are assessed through identification of recreational resources within the ROI. Few recreational resources are present within the ROI. Intermittent and localized indirect impacts could occur during construction; long-term impacts during operation could occur in the form of aesthetic impacts. Most recreational resources are long linear features (state water trails and scenic byways) that are crossed by all routes and cannot be avoided. These recreational resources would be subject to aesthetic impacts to recreational users.

Other recreational resources that are present include publicly accessible lands (Wildlife Management Areas and Waterfowl Production Areas), snowmobile trails, and a public water access site.

Human Health and Safety

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

Potential impacts to human health and safety would be mitigated through standard conditions of the route permit (for example, mitigation related to grounding, electric field and electronic interference). Specifically, the applicants would be required to design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line would not exceed 8.0 kV/m rms. Applicable standards including National Electrical Safety Code (NESC), Occupational Safety and Health Administration standards, and electrical performance standards would also be followed by the applicants. Nevertheless, members of the public would be subject to negligible increases in EMF if living or working, for example, operating farm equipment, near the transmission line.

Land-based Economies

The ROI for land-based economies is the route width except for tourism which is the local vicinity. Impacts to land-based economies within the ROI are primarily associated with agriculture. During construction, impacts would include the limited use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Permanent impacts would also occur when the footprint of the transmission line structures directly impedes agricultural production and efficiency of farming operations such as maneuvering around structures during tillage, planting, spraying, irrigating, and harvesting of fields.

Most of the land within the project area is used for agricultural purposes. Implementation of the Agricultural Impact Mitigation Plan (AIMP) and prudent routing (paralleling existing infrastructure and paralleling division lines) could minimize potential impacts. More localized impacts to agriculture would include disruption to an airstrip potentially used for agricultural aerial spraying and center pivot irrigation systems. The anticipated alignments of HSR01, HSR02, HSR03, CSR01, and CSR02 are within one mile of a private airstrip, which could impede or eliminate aerial spraying operations. Based on the anticipated alignments, potential impacts to center pivot irrigation systems are present within SSR03, SSR04, HSR02, and HSR03.

The Reinvest in Minnesota (RIM)/Conservation Reserve Enhancement Program (CREP) program provides financial incentives to farmers to remove land from agricultural production. The anticipated alignment of the routes avoid crossing RIM/CREP easements. The RIM Reserve program compensates landowners for granting conservation easements. The applicants committed to working with the landowners if easements are present to avoid or minimize impacts. Impacts can be mitigated by compensating individual landowners through negotiated easement agreements. These agreements are outside the scope of this EIS.

Overall impacts to mining are expected to be minimal. Active mining operations are present within the route width, but in most cases the final alignment is anticipated to be on the outer boundary or across the road from operations. ASR02 is anticipated to significantly interfere with the current mining operations at MNDOT ASIS Number 21059 (comment #53 reference (2)). Route Segment N11 or ASR01 would avoid impacts to this commercial aggregate. No other operational impacts to mining were identified.

Impacts to tourism would be negligible. There are limited recreational resources within the route width; therefore, any direct impacts to recreation that would cause an indirect impact to tourism-based economies are anticipated to be negligible.

Impacts to forestry would be minimal. There is Sustainable Forest Incentive Act (SFIA) state managed forest land within the ROI in the Big Stone Subregion along BSSR11 and BSSR12; however, the alignment could be adjusted within the route width to avoid placement within the SFIA land. The routing alternatives generally do not bisect large contiguous forested parcels, with Route Segment N10 in the Alexandria Subregion being the exception.

Archaeological and Historic Resources

The ROI for archaeological resources is the route width, while the ROI for historic resources is the local vicinity, to include resources that may be outside of the route width but within visual range of the project. An understanding of potential impacts is assessed through identification of documented archaeological and historic resources within the ROIs of the routing alternatives.

Background research indicates that documented archaeological sites are consistent with the following patterns.

- In the Big Stone Subregion, archaeological sites are primarily along the Minnesota River.

- Archaeological resources are concentrated along the Pomme de Terre River and in the Artichoke lakes area in the Swift Subregion.
- The Hancock Subregion contains a very low density of known archaeological sites, none of which intersect the ROI.
- The Cyrus and White Bear Lake Subregions also contain low densities of documented archaeological sites, likely due to the dearth of major waterbodies.
- In the Alexandria Subregion, the highest density of sites is around the shores of the major lakes in Pope and Douglas counties.

Each of the routes contains at least one archaeological and/or historic resource. The majority of the documented archaeological sites are unevaluated for listing on the National Register of Historic Places (NRHP). Unevaluated archaeological sites include precontact mounds and artifact scatters. Historic resources include NRHP-listed or eligible railways, roads, and road markers. Unevaluated historic resources, including residences, schools, churches, and other buildings. Additional archaeological and historic resources, beyond those identified in existing records, might be identified during future survey efforts prior to construction.

Direct and indirect impacts could occur from the project's construction and operation. Direct impacts to archaeological and historic resources could result from construction activities such as ROW clearing, placement of structures, the construction of new substations and access roads, temporary construction areas, and vehicle and equipment operation. Indirect impacts to historic resources could occur if the project is located near or within view of a resource (typically a historic building, structure, or traditional cultural property).

The preferred means of mitigating impacts to cultural resources is prudent routing or structure placement to avoid known archaeological and historic resources. The applicants stated that they will consult with the Minnesota State Historic Preservation Office (SHPO) and Tribal Historic Preservation Offices (THPOs) prior to construction, to assess the potential for impacts to undocumented archaeological and historic resources and determine whether further investigations are warranted.

Natural Environment

Air Quality

The ROI for air quality is the project area. Air quality impacts can occur during construction and operation of the transmission line and regeneration station. Potential impacts to air quality during construction would be intermittent, localized, short-term, and minimal. Impacts associated with mobile sources, such as fugitive dust and exhaust, can be mitigated by using modern and low emissions rating equipment. If fugitive dust levels become problematic, the applicants are expected to employ construction-related practices to control fugitive dust levels such as water application or other commercially available non-chloride dust control agents. Long-term impacts to air quality would also be minimal and are associated with routine inspection and maintenance activities and the creation of ozone and nitrous oxide emissions along the transmission line. The applicants will keep exhaust emissions minimized by having vehicles and equipment in good working order, not running equipment unless necessary, and minimizing the number of driving trips. These localized emissions would be below state and federal standards. Impacts are unavoidable and do not affect a unique resource.

Climate Change

The ROI for climate change is the surrounding five-county area. The climate change risks the project is most susceptible to include increases in annual temperatures, increases in storm frequencies and intensities, and more frequent wildfires. High temperatures can affect the sagging of a transmission line conductor and its thermal tolerance. Changes in storm timing and intensities may increase landslide potential in areas of steeper terrain and increase the risk of local flooding. Due to increases in annual temperatures, there may be periods of dry weather and concerns of wildfires caused by increases in drought severity. The project would generally be routed and engineered to be resilient against changing climatic factors and risks. The project would minimally contribute to climate change impacts as a result of greenhouse gas (GHG) emissions during construction. The project as a whole will reduce carbon dioxide (CO_2) emissions by reducing congestion on the electrical grid, enabling greater use of existing renewable generation, and supporting the development of new renewable generation.

Greenhouse Gases

An ROI has not been assigned for GHG emissions, as the influence of GHG emissions cannot be confined by geographic boundaries. GHG emissions impacts associated with the project consist of direct and indirect emissions from construction and operational activities. Construction activities within the route would result in short-term increases in GHG emissions because of the combustion of fossil fuels in construction equipment and vehicles. These emissions would be short-term and minimal. Maintenance activities within the ROW would also cause GHG emissions, but to a much lesser extent. Operational impacts from the formation of nitrous oxide and the release of sulfur hexafluoride would be minimal. Changes in land type associated with the project would impact the natural carbon stock rates. Impacts are unavoidable but can be minimized by limiting vehicle idling and taking the necessary precautions to avoid sulfur hexafluoride (SF_6) emissions at the substations. Natural carbon stocks will be minimally disturbed to the extent necessary.

Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands within the ROI are more common in the Big Stone and Swift Subregions and more limited in the Hancock, Cyrus, White Bear Lake, and Alexandria Subregions. Public lands (local, state, or federal level) and conservation easements within the ROI are identified and qualitatively assessed for potential impact. Public lands within the ROI include Wildlife Management Areas, all of which are owned by the DNR, and the Big Stone Wildlife Refuge, the Northern Tallgrass Prairie Wildlife Refuge, and Waterfowl Production Areas, which are owned by the USFWS. The Big Stone Subregion contains an extensive network of Waterfowl Production Areas, and the anticipated alignments of all routes in the Big Stone Subregion would cross these public lands. The applicants avoided areas with USFWS public lands as feasible, and will work with the USFWS to reduce impacts to public lands and acquire applicable permits depending on the route selected. No other public lands such as local parks, state forests, or national forests were identified.

Designated lands with easements or covenants within the ROI include CREP, RIM, and Wetlands Reserve Program easements. The anticipated alignment does not cross these easement areas, and the easements are anticipated to be avoided during final design. Other easements and covenants include a Native Prairie Bank program easement crossed by the anticipated alignment of BSSR02, BSSR04, BSSR05, BSSR08, and BSSR09, and an SFIA covenant crossed by the anticipated alignment of BSSR11 and BSSR12.

The applicants avoided areas with easements as practicable and, in some areas, requested a narrower route width to avoid easements. The narrower route width would ensure that placing transmission structures directly into these lands would be avoided. If easements are crossed, the applicants would work with landowners to determine measures to avoid and minimize impacts to these resources and to avoid interfering with landowner participation in the CREP, RIM, WRP, Native Prairie Bank, or SFIA programs. Additionally, the applicants would continue to coordinate potential easement crossings with the applicable State agency, such as the Minnesota Department of Natural Resources (DNR) or the Minnesota Board of Water and Soil Resources (BWSR).

Vegetation

The ROI for vegetation is the ROW. Impacts to vegetation are primarily evaluated by examining vegetative landcover types within the ROW. Most existing vegetation is dominated by cultivated agricultural crops rather than significant concentrations of forested areas in the ROWs. Potential short-term impacts on vegetation, such as clearing, compacting, or otherwise disturbing soil or vegetation, could occur during construction and ROW maintenance activities. Potential long-term impacts on vegetation would occur where the ROW is established, and conversion of forested vegetation to low-growing vegetation would be required. Vegetation would be permanently removed where grading occurs for the regeneration station.

Impacts would be localized and unavoidable. Several measures could be implemented to partially avoid, minimize, or mitigate impacts to vegetation. The routine clearing of woody vegetation within the ROW would result in the widening of existing corridors or bisecting (fragmenting) forests to establish a new ROW. Given the predominance of agricultural vegetation in the region, forest fragmentation is anticipated to be minimal for the project. The most forested land in the ROW is in the Alexandria Subregion, with the highest potential impacts along ASR01 (5.1 acres) and route segment N10 (4.9 acres). Other higher potentially impactful routing options include BSSR11 (3.2 acres), BSSR11 (3.2 acres), SSR03 (4.2 acres), and SSR04 (4.2 acres). All other routing alternatives have less than 1.5% of forested land within their ROW acreage and less than 3 acres overall.

Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width, except that potential impacts to birds are evaluated at the local vicinity (1,600 feet). Potential short-term, localized impacts could occur from mortality, injury, or displacement during construction or maintenance activities. Potential long-term impacts, such as resource limitation or a decline in habitat quality, could occur as a result of habitat loss, conversion, or fragmentation. Impacts to wildlife and wildlife habitat are assessed by considering the presence of potential wildlife inhabitance and widlife habitat within the ROI. Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife and wildlife habitat.

Wildlife inhabiting the ROI are typical of those found in disturbed habitats associated with agriculture and rural and suburban residential development. Watercourses and waterbodies and areas of natural vegetation, such as wooded areas, wetlands, open herbaceous areas, and scattered prairies also provide habitat for wildlife in the area.

Several lands that are preserved or managed for wildlife and associated habitat are scattered throughout the project, including DNR Wildlife Management Areas, lakes that are part of the DNR Shallow Lakes Program, USFWS Grassland Bird Conservation Areas, USFWS Waterfowl Production Areas, USFWS National Wildlife Refuges, and National Audubon Society Important Bird Areas. All these areas are located within the ROI of various routes within the subregions, including Wildlife Management Areas (Cyrus, White Bear Lake, and Alexandria Subregions), shallow wildlife lakes (Swift, Cyrus, and Alexandria Subregions), Grassland Bird Conservation Areas (all subregions), Waterfowl Production Areas (all regions), National Wildlife Refuges (Big Stone Subregion), and Important Bird Areas (Big Stone and Swift Subregions).

Rare and Unique Natural Resources

The ROI for protected species is the project area, and the ROI for sensitive ecological resources is the route width. Potential direct and indirect impacts to protected species could occur should they be present within or near the ROW during construction or maintenance activities. While more mobile species would leave the area to nearby comparable habitats, non-mobile species, such as vascular plants or nesting birds, could be directly impacted. Construction activities also have the potential for direct impacts to sensitive ecological resources if they are subject to construction disturbance. Long-term impacts would involve permanent clearing of vegetation in areas identified as sensitive ecological resources, which could indirectly impact any protected species associated with these habitats.

Impacts to protected species are evaluated by reviewing documented occurrences of these species within the ROI. Potential impacts to sensitive ecological resources, which could provide suitable habitat for protected species, are evaluated by assessing the presence of these resources within the ROI. Several measures could be implemented to avoid, minimize, or mitigate impacts to protected species and sensitive ecological resources, including those provided in the DNR Natural Heritage Review response for the project.

A USFWS Information for Planning and Conservation system query identified seven federal species that could potentially be in the project area, including one endangered species, two threatened species, and four proposed endangered or threatened species. The DNR Natural Heritage Information System (NHIS) database identified records for eight state endangered, nine threatened, and 31 special concern species within one mile of the project.

Formal protected species surveys have not been conducted for the project; as such, it is possible that additional federal or state protected species, outside of what is reported in the NHIS, could be present where suitable habitat is available within the ROI. Prior to construction, the applicants could be required to conduct field surveys in coordination with the U.S. Fish and Wildlife Service and DNR for the potential presence of protected species.

The DNR has established several classifications for sensitive ecological resources across the state, many of which are scattered throughout the project. Some of these sensitive ecological resources intersect the ROW or are crossed by the anticipated alignments of various routes, including Sites of Biodiversity Significance (Big Stone, Swift, Hancock, Cyrus, White Bear Lake, and Alexandria Subregions), native plant communities (Big Stone, Swift, Cyrus, and Alexandria Subregions), railroad rights-of-way prairie (Hancock Subregion), prairie bank easements (Big Stone Subregion), Prairie Conservation Plan sites (Big Stone Subregion, Cyrus, and White Bear Lake Subregions), and a Lake of Biological Significance (Artichoke Lake) in the Swift Subregion.

Soils

The ROI for soils is the right-of-way. Impacts to soils within the ROI are unavoidable but can be minimized and mitigated. Common soil impacts include rutting, compaction, and erosion. Potential impacts would be short-term during construction. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicants would grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicles trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored a suitable location. Disturbed areas would be promptly seeded after construction. The applicants would obtain a National Pollutant Discharge Elimination System (NPDES)/State Disposal System (SDS) Construction Stormwater Permit from the Minnesota Pollution Control Agency and develop a Stormwater Pollution Prevention Plan.

Surface Water

The ROI for surface water is the route width. Direct impacts could be caused by structures placed in surface waters, but these would be avoided where possible by spanning surface waters, and all surface waters are expected to be spannable in this project. Construction activities near surface waters could cause riparian vegetation disturbance and surface erosion, which can lead to runoff impacting surface waters.

Major Public Water Inventory (PWI) watercourses in the ROI include the Minnesota River, Pomme de Terre River, Stony Run, Little Chippewa River, and Chippewa River. Several jurisdictional watercourses, county ditches, and unnamed streams also cross the ROI. No designated trout streams are within the ROI. Major PWI water basins in the ROI include Artichoke Lake, Mud Lake, and Union Lake. There are no Section 10 navigable waters regulated under the Rivers and Harbors Act in the ROI. There are also no Outstanding Resource Value Waters in the ROI. There are two state water trails in the ROI, including the Minnesota River in the Big Stone Subregion and a portion of the Pomme de Terre River in the Swift

Subregion. The Minnesota River is crossed by all of the routes in the Big Stone Subregion and is considered a designated wild and scenic river further downstream, but is not a designated river in the project's ROI.

The ROI contains several larger waterbodies including: Artichoke Lake, South Drywood Lake, Solvie Slough, and Mud Lake. None of these are designated shallow wildlife lakes. One Lake of Biological Significance, Artichoke Lake, is in the ROI, however, no routing alternative crosses it in an area that would create a new infrastructure corridor.

The project is expected to be able to span all watercourses and waterbodies. Thus, no structures would be placed within these features, and no direct impacts on watercourses and waterbodies are anticipated. Removal of vegetation and soil cover could result in short-term water quality impacts due to increased turbidity. Construction impacts could also remove riparian or shoreline forest areas within the ROW that currently assist with water attenuation and decreasing erosion impacts. Mitigation measures are outlined to prevent and minimize impacts to watercourses and waterbodies.

Wetlands and Calcareous Fens

The ROI for wetlands is the route width, except for forested wetlands where it is the ROW due to permanent conversion within that area. Impacts to wetlands are evaluated by examining wetland types, sizes, and potential for spanning. Localized direct impacts to wetlands would include vegetation clearing, movement of soils, and construction traffic which could alter or impair wetland function. Forested wetlands would be subject to permanent impacts given their conversion to non-forested wetlands. Wetland crossings longer than 1,000 feet might require one or more structures to be placed in the wetland, resulting in small, localized permanent wetland impacts. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a routing alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a less impactful alignment within the route width.

The U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI), as updated by the DNR, identifies numerous wetland complexes and small isolated wetlands throughout the ROI. Wetlands are most prevalent in the Big Stone, Swift, and Alexandria Subregions. Many of the wetlands are associated with riverine and floodplain ecosystems in the southwestern portion of the project area, and localized depressions and lake ecosystems in the northeastern portion of the project area. Crossings of wetlands greater than 1,000 feet are limited to the South Region, and occur most frequently for BSSR11 and BSSR12 with three each. BSSR02, BSSR04, BSSR06, BSSR08, BSSR10, and SSR01/SSR02 all have two crossings greater than 1,000 feet in length.

One calcareous fen occurs in the ROI (Stony Run) of the Big Stone Subregion. Routes BSSR11 and BSSR12 have the potential to cause significant impacts to the calcareous fen.

1 Introduction

Otter Tail Power Company and Western Minnesota Municipal Power Agency, through its agent, Missouri River Energy Services, propose to construct approximately 91 to 106 miles of 345 kV transmission line using double-circuit capable structures from the Minnesota/South Dakota border, approximately one mile south of Ortonville, Big Stone County, Minnesota, to the existing Alexandria Substation in Alexandria, Douglas County, Minnesota.

This EIS evaluates the potential human and environmental impacts of the project and possible mitigation measures, including route and alignment alternatives. These mitigation strategies can become enforceable conditions of the Commission's route permit.

This EIS is not a decision-making document, but rather an information document that guides decision makers. The EIS is intended to facilitate informed decisions by state agencies, particularly with respect to the goals the Minnesota Environmental Policy Act "to create and maintain conditions under which human beings and nature can exist in productive harmony and fulfill the social, economic, and other requirements of present and future generations of the state's people" (Minnesota Statute § 116D.02, subd. 1).

1.1 Project Summary

The applicants propose to construct a single-circuit 345 kV HVTL (referred to as transmission line throughout this document), from the Minnesota/South Dakota border to the Alexandria Substation in Douglas County, Minnesota. The project is also expected to require a new fiber optic regeneration station.

The project consists of the installation of a single-circuit 345 kV transmission line constructed on double-circuit-capable structures line between the Minnesota/South Dakota border and the Alexandria Substation in Douglas County. The applicants proposed two possible transmission line routes as required by Minnesota Rules 7850.1900 (Map 1). The applicants have identified both routes as feasible and have not indicated a preference for a particular route.

The project may involve a new fiber optic regeneration station located within the route width of the Central Region, with a more specific location to be determined after the final route is selected.

The applicants have generally requested a route width of 1,000 feet and a ROW width of 150 feet. Exceptions to the 1,000-foot route width include areas with routing constraints, like areas where natural resources and state conservation easements exist. Locations where a wider or narrower route width is requested are summarized in Section 3.3.1.

The applicants anticipate that construction will begin in the second quarter of 2028 and that the project will be completed between the fourth quarter of 2030 and the fourth quarter of 2031.

1.2 Project Purpose and Need

The project is one of several identified in the Long-Range Transmission Plan (LRTP) Tranche 1 Portfolio by the MISO's Board of Directors in July 2022 as part of its 2021 Transmission Expansion Plan (reference (3)). The project is the western segment of the larger Big Stone South – Alexandria – Big Oaks 345 kV Transmission Project. The applicants view this project as needed to provide reliable, resilient, and cost-effective delivery of energy as generation resource mix continues to evolve in the upcoming years. This project will address thermal and voltage reliability issues across the MISO transmission system and allow continued reliable delivery of energy as coal-fired generators are retired and replaced with renewable resources. A certificate of need for the Big Stone South – Alexandria – Big Oaks Project was issued by the Commission on October 30, 2024.

1.3 The State of Minnesota's Role

The Commission will make a route permit decision that is informed by this EIS as well as public meetings, hearings, and comment periods.

On July 1, 2025, Department of Commerce (Department) Energy Environmental Review and Analysis (DOC EERA) unit staff moved to the Minnesota Public Utilities Commission Energy Infrastructure Permitting (PUC EIP) unit as directed by state law (Laws of Minn. 2024, ch.126, art. 7) and in response to permitting reform under Minnesota Statute 216I (2024). The review of the Big Stone South to Alexandria application began under and will continue under Minnesota Statute 216E (2023). DOC EERA staff initiated environmental review of this proposal prior to July 1, 2025, and will continue to exclusively perform environmental review duties for this application under 216E (2023) as *EIP staff*. Likewise, analyst staff at the PUC will continue to exclusively perform analyst duties on this application as *PUC staff*.

In Minnesota, the Commission determines whether certain transmission lines are needed by the state and, if so, where they should be located. The Commission has already decided that this project, the Big Stone South to Alexandria 345 kV project, is needed by the state. A certificate of need for the Big Stone South – Alexandria – Big Oaks Project was issued by the Commission on October 30, 2024 (Docket No. E002, E017, ET2, E015, ET10/CN-22-538). The remaining decision – where the project should be located – will be determined in this route permit proceeding.

A route permit application for the project was submitted to the Commission on October 22, 2024. With this application, the Commission must determine the least impactful route for the project and the appropriate mitigation measures.

To help the Commission with its decision-making and to allow for a fair and robust airing of the issues, the state of Minnesota has set out a process for the Commission to follow when making decisions. For this project, this process requires: (1) the development of an EIS and (2) hearings before an administrative law judge (ALJ) (Minnesota Statutes § 216B and 216E). The purpose of the EIS is to describe the potential human and environmental impacts of the project ("the facts"); the purpose of the hearings is to allow individuals to advocate, question, and debate what the Commission should decide about the project ("what the facts mean"). The entire record developed in this process—the EIS and the report from the administrative law judge, including public input and testimony—is available to the Commission when it makes its decisions on the applicants' route permit application.

1.3.1 What does the Commission approve in a route permit?

The Commission approves a route and anticipated alignment. The route is a temporary designation; the transmission line must be constructed within the route width. The permit also authorizes permittees to obtain permanent right-of-way for the transmission line and any associated facilities.

When the Commission issues a route permit it designates a route and an anticipated alignment. The ROW is the area required for safe operation of the transmission line. It must be within the designated route and is the area for which the permittee may obtain easements to construct and operate the transmission line. The route width is typically wider than the actual ROW needed for the transmission line. This width provides flexibility when constructing the transmission line but is not so wide that it is impossible to determine where the transmission line would be constructed. The route width also allows permittees to work with landowners to address their concerns and to address engineering issues that may arise after a permit is issued. The route width, in combination with the anticipated alignment, is intended to balance flexibility and predictability.

The transmission line must be constructed within the Commission's designated route and along the anticipated alignment. The anticipated alignment is where the structures and transmission line are expected within the ROW and route. It is not the final alignment. The anticipated alignment is considered the centerline of the project for review purposes only—the structures and transmission line might ultimately be constructed elsewhere within the route.

Notwithstanding the previous paragraph, the transmission line must be constructed along the anticipated alignment unless subsequent permissions are requested and approved by the Commission. Modifications to the designated route must have comparable overall impacts relative to the factors in Minnesota Rules 7850.4100 (Section 2.2.1). These modifications must be specifically identified and documented in and approved as part of the plan and profile that is submitted to the Commission for review prior to construction as required by the route permit. Construction means any clearing of land, excavation, or other action that would adversely affect the natural environment of the site or route but does not include changes needed for temporary use of sites or routes for nonutility purposes, or uses in securing survey or geological data, including necessary borings to ascertain foundation conditions (Minnesota Statute 216E.01, subd 3). The route permit also outlines conditions specifying construction and operation standards. A draft route permit is included as Appendix B.

1.4 The Public's Role

Minnesota needs the public's help to make informed decisions. During scoping, you told staff your concerns about the project so that we could collect the right facts. At the upcoming hearing, you can tell us what those facts mean and if you think we have represented them correctly. Your help in pulling together the facts and determining what they mean helps the Commission make informed decisions regarding the project.

1.5 What's Next?

Public hearings will be held in the project area and virtually. You can provide comments on this draft EIS either at a hearing or as part of the associated public comment period. Your input on the draft EIS will be incorporated into a final EIS. An ALJ will consolidate public comments, prepare a report, and make recommendations for the Commission to consider. The Commission will then review the record and decide whether to grant a route permit.

Once the draft EIS is complete, public hearings will be held in the project area and a public comment period opened. During the hearings and comment period, public comments can be submitted on the draft EIS and other issues related to the project. Comments received on the draft EIS will be compiled and included as an appendix in the final EIS. Commission staff will respond to substantive comments received and incorporate your input on the draft EIS into the final EIS consistent with the scoping decision.

The ALJ will use the public comments received during the hearings and the EIS to prepare a report for the Commission. The ALJ will submit its report and recommendations to the Commission on whether to issue a route permit. The record developed during this process, including all public input, will be available to the Commission when it makes its permit decision. More information on this process is available in Chapter 2. The Commission is expected to make a route permit decision in spring 2026.

1.6 Sources of information

The primary source of information used to prepare this EIS is the route permit application (reference (4) submitted by the applicants. Additional sources include new information provided by the applicants (Appendix C) and information from relevant federal and state environmental review documents for similar projects.

Additionally, spatial and other technical resource data was used through publicly available sources or via established license agreements (Appendix D). Information sources are referenced; unless otherwise noted, URL addresses were current as of August 26, 2025.

1.7 Where do I get more information?

For additional information, don't hesitate to contact Commission staff. The Commission's public advisor for the project is Sam Lobby (Sam.Lobby@state.mn.us), 651-201-2233 and the environmental review manager is Jenna Ness (jenna.ness@state.mn.us), 651-539-1061.

Project documents, including the route permit application, can be found on eDockets at https://www.edockets.state.mn.us/EFiling/search.jsp by searching "23" for year and "160" for number. Information is also available on the Commission's website: https://puc.eip.mn.gov/web/project/15867.

2 Regulatory Framework

The project requires a route permit from the Commission. The project will also require approvals from other state and federal agencies with permitting authority for actions related to the project.

2.1 Certificate of Need

Construction of a large energy facility in Minnesota requires a certificate of need from the Commission (Minnesota Statute § 216B.243). The project is the western segment of the larger Big Stone South – Alexandria – Big Oaks 345 kV Transmission Project. The Commission issued a certificate of need for the Big Stone South – Alexandria – Big Oaks Project on October 30, 2024 (Docket No. E002, E017, ET2, E015, ET10/CN-22-538) (reference (1)).

2.2 Route Permit

In Minnesota, an HVTL is a “conductor of electric energy and associated facilities designed for and capable of operating at a nominal voltage of 100 kilovolts or more and is greater than 1,500 feet in length” (Minnesota Statute § 216E.03). Construction of an HVTL requires a route permit from the Commission (Minnesota Statute § 216E.03). Thus, the project, which is a 345 kV transmission line greater than 1,500 feet in length, requires a route permit from the Commission. The applicants filed a route permit application on October 22, 2024. The Commission accepted the application as complete on December 3, 2024.

A route permit supersedes and preempts all zoning, building, and land-use regulations promulgated by local units of government (Minnesota Statute § 261E.10). The project also requires approvals (for example, permits, licenses) from other state agencies and federal agencies with permitting authority for specific resources (for example, the waters of Minnesota).

2.2.1 Route Permit Criteria

The Commission approves a route and anticipated alignment. The route is a temporary designation; the transmission line must be constructed within the route. The permit also authorizes permittees to obtain permanent right-of-way for the transmission line and any associated facilities.

The Commission is charged with selecting transmission line routes that minimize adverse human and environmental impacts while ensuring electric power system reliability and integrity. Route permits issued by the Commission include a permitted route and anticipated alignment, as well as conditions specifying construction and operation standards.

Minnesota Statute § 216E.03 identifies factors that the Commission must consider when designating transmission lines routes, including minimizing environmental impacts and minimizing human settlement and other land-use conflicts. Minnesota Rules 7850.4100 lists 14 factors for the Commission to consider when making a decision on a route permit:

A. Effects on human settlement, including, but not limited to, displacement, noise, aesthetics, cultural values, recreation and public services.

B. Effects on public health and safety.

C. Effects on land-based economies, including, but not limited to, agriculture, forestry, tourism, and mining.

D. Effects on archaeological and historic resources.

E. Effects on the natural environment, including effects on air and water quality resources and flora and fauna.

F. Effects on rare and unique natural resources.

G. Application of design options that maximize energy efficiencies, mitigate adverse environmental effects, and could accommodate expansion of transmission or generating capacity.

H. Use or paralleling of existing ROW, survey lines, natural division lines, and agricultural field boundaries.

I. Use of existing large electric power generating plant sites.

J. Use of existing transportation, pipeline, and electrical transmission systems or ROWs.

K. Electrical systems reliability.

L. Costs of constructing, operating, and maintaining the facility which are dependent on design and route.

M. Adverse human and natural environmental effects which cannot be avoided.

N. Irreversible and irretrievable commitments of resources.

The Commission must make specific findings that it has considered locating a new transmission line route along an existing transmission line ROW or parallel existing highway ROW and, to the extent these are not used for the route, the Commission must state the reasons why (Minnesota Statute § 216E.03). The Commission may not issue a route permit for a project that requires a certificate of need until a certificate of need has been approved by the Commission, though these approvals may occur consecutively at the same Commission meeting.

The Commission is charged with making a final decision on a route permit within 12 months after finding the route permit application complete. The Commission may extend this time limit for up to three months for just cause or upon agreement of the applicants.

2.3 Environmental Review

Environmental review informs the Commission's permit decisions. It calls attention to potential impacts and possible mitigation measures associated with the project and provides opportunities for public involvement.

2.3.1 Environmental Impact Statement

This document is an EIS. The Commission will use the information in this document to inform its decisions about issuing a route permit for the project.

An EIS describes and analyzes the potential human and environmental impacts of a project and possible mitigation measures, including alternatives to the project. It does not advocate or state a preference for a specific alternative. Instead, it analyzes and compares alternatives so that citizens, agencies, and governments can work from a common set of facts.

Before the Commission makes a final decision on a route permit, it must determine whether the EIS for the project is adequate (Minnesota Rules 7850.2700). This EIS contains an overview of affected resources and discusses potential human and environmental impacts and mitigation measures. The Commission prepares this document as part of the environmental review process.

2.3.2 Scoping

The first step in preparing an EIS is scoping. The purpose of scoping is to provide citizens, local governments, tribal governments, and agencies an opportunity to focus the EIS on those issues and alternatives that are relevant to the proposed project.

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

- January 14, 2025, in Alexandria and Glenwood
- January 15, 2025, in Hancock and Benson
- January 16, 2025, in Ortonville and a virtual meeting

Approximately 138 people in total attended the scoping meetings. Twenty-two people provided verbal comments (reference (2)).

A 45-day comment period, which closed on January 31, 2025, provided an opportunity to submit written comments on potential impacts and mitigation measures for consideration in the scope of the EIS. During the comment period, members of the public provided 97 written comments. Additionally, one federal agency, two state agencies, two local units of government, one labor union, and one private company provided written comments. Scoping comments directly informed the development of routing alternatives for the project.

Department staff provided a summary of the scoping process to the Commission and an opportunity for Commission comment on the alternatives to study in the EIS. The Commission concurred with the Department's recommendations regarding the routing alternatives to carry forward for study in the EIS.

The Department issued a scoping decision for the EIS on May 6, 2025 (reference (5)). The scoping decision identifies the routes, route segments, route connectors, and alternative alignments evaluated in this EIS and those alternatives that were not carried forward for evaluation. Staff provided notice of the scoping decision to those persons on the project mailing list and to landowners along routing alternatives newly proposed during the scoping process. Based on the scoping decision, Commission staff has prepared this EIS.

Commission staff issued this draft EIS on September 4, 2025. The EIS is issued in draft form so that it can be improved through public comment. Members of the public can provide comment on this draft EIS in writing or in the public hearings being held for the project. Comments received during the comment period will be included in a final EIS along with responses to timely, substantive comments as well as appropriate revisions to the draft EIS. The draft and final EIS will be entered in the records for this proceeding so they can be used by the Commission in making a decision on the route permit for the project.

2.4 Public Hearing

After issuance of the draft EIS, hearings presided over by an ALJ from the Court of Administrative Hearings (CAH) will be held in the project area. At these hearings, public members, agencies, and governmental bodies will have an opportunity to submit comments, present evidence, and ask questions. Public members can advocate for what they believe is the most appropriate route for the project and for any conditions to include in a route permit. After the public hearings, an evidentiary hearing will be held in Saint Paul, Minnesota. The ALJ will submit a report to the Commission with findings of facts, conclusions of law, and recommendations regarding a route permit for the project.

2.5 Commission Decision

After considering the entire record, including the final EIS, input received during the hearings, and the ALJ's findings and recommendations, the Commission will determine whether to issue a route permit for the project. Route permits include a permitted route width and an anticipated alignment, as well as conditions specifying construction and operating standards. Route permits also typically include conditions specifying mitigation measures. Decisions by the Commission on the route permit applications are anticipated in spring 2026.

2.6 Eminent Domain

At times, negotiated easement agreements for permanent rights-of-way – the land needed for the construction, maintenance, and operation of a transmission line—cannot be reached. Should this occur, the applicants may exercise the power of eminent domain to acquire land for the project. Once a certificate of need and route permit are issued by the Commission, the applicants could exercise the power of eminent domain to acquire land for the project (see Section 3.3 for additional information regarding ROW acquisition).

The judicial process of exercising the right of eminent domain is called condemnation. Minnesota's condemnation laws are well-developed and provide a clear framework for the determination of issues such as the applicants' eminent domain authority as well as how the amount of just compensation—the amount a landowner is entitled to receive for rights the applicants acquire by condemnation—is determined. The process typically involves independent valuation experts, a presentation of each side's evidence, and a decision by court-appointed commissioners (who are knowledgeable in real estate issues) as to the amount of just compensation that the applicants are required to pay. Both the landowner and the applicants are bound by this determination. If the eminent domain process is used, the applicants must obtain at least one appraisal for the property proposed to be acquired (Minnesota Statute § 117.036, subdivision 2). The Commission provides guidance to the public regarding landowner rights and the eminent domain process on its website at: https://puc.eip.mn.gov/landowner-information (Appendix E).

Often, settlement agreements are reached shortly after a condemnation action is started, or at some other point during the action. In those cases, the condemnation actions are often dismissed. The applicants and their representatives will look for opportunities to resolve easement acquisition in a voluntary manner at all stages of the project.

There may be instances where a landowner elects to require the applicants to purchase their entire property rather than acquiring only an easement for the transmission facilities. The landowner is granted this right under Minnesota Statute § 216E.12, subdivision 4. This statute, sometimes referred to as the "Buy-the-Farm" statute, applies only to transmission lines with a voltage of 200 kV or greater and to properties that meet certain other criteria; this statute would likely apply to the project. The measure of compensation for acquisition of an owner's fee interest is different than for acquisition of easements, but the process of reaching those valuation determinations—by the Commission and then by a jury or judge in the event of an appeal—are substantively the same as the easement acquisition process described above. In addition, owners who make Buy-the-Farm elections that are accepted as valid by the applicants or ruled valid by the district court may receive other rights or benefits applicable under Minnesota Statute § 117.

2.7 Other Permits and Approvals

A route permit from the Commission is the only state permit required for the project routing. A route permit supersedes local planning and zoning and binds state agencies (Minnesota Statute § 216E.10); therefore, state agencies are required to engage in the Commission's permitting process to aid in the Commission's decision-making and to indicate routes that are not permittable.

Several federal, state, and local permits would be required for construction and operation of the project. Necessary permits subsequent to the issuance of a route permit must be obtained by the applicants. The information in this EIS may be used by the subsequent permitting agencies as part of their decision making.

2.7.1 Tribal Coordination

As noted in the route permit application, the applicants have notified and engaged with multiple Tribal governments. The applicants stated that they have been in contact with leaders and members of the Mille Lacs Band of Ojibwe, the Shakopee Mdewakanton Sioux Community, the Sisseton Wahpeton Oyate THPO, and the Lower Sioux Indian Community.

2.7.2 Federal Approvals

Table 2-1 lists federal permits and approvals that could be required for the project, depending on the final design. The U.S. Army Corps of Engineers (USACE) regulates potential impacts to waters of the United States. Dredged or fill material, including material that moves from construction sites into these waters, could impact water quality. The USACE requires permits for projects that might cause such impacts. The USACE is also charged with coordinating with the SHPO regarding potential impacts to significant cultural resources pursuant to Section 106 of the National Historic Preservation Act (NHPA).

The USFWS requires permits for the taking of threatened or endangered species, bald and golden eagles, and native migratory birds. The USFWS encourages consultation with project proposers to ascertain a project's potential to impact these species and to identify general mitigation measures for the project. The USACE is also charged with coordinating with the USFWS pursuant to Section 7 of the Endangered Species Act (ESA) regarding potential impacts to federally protected species.

The Federal Aviation Administration (FAA) regulates civil aviation, including the airspace used for aviation. The FAA requires permits for tall structures that could adversely impact aviation.

Table 2-1 Potential Federal Permits and Approvals Required for the Project

Unit of Government	Type of Application	Purpose
U.S. Army Corps of Engineers – St. Paul District	Section 106 of the National Historic Preservation Act (NHPA)	Review of historic properties included in the National Register of Historic Places or that meet the criteria for the National Register.
U.S. Army Corps of Engineers – St. Paul District	Section 404 Clean Water Act – Discharge of Dredged and Fill Material	Protects water quality through authorized discharges of dredged and fill material into waters of the United States
U.S. Army Corps of Engineers – St. Paul District	Section 10 – Rivers and Harbor Act	Protects water quality through authorized crossings of navigable waters
U.S. Fish and Wildlife Service	Migratory Bird Treaty Act Consultation	Review to prevent take of protected migratory bird species
U.S. Fish and Wildlife Service	Section 7 – Threatened and Endangered Species Consultation	Consultation to avoid, minimize, and mitigate impacts to federally listed species
U.S. Fish and Wildlife Service	Special Use Permit	For work in Waterfowl Production Areas
Federal Aviation Administration	Part 7460 Review	Review to Prevent airspace hazards due to structures taller than 200 feet

2.7.3 State of Minnesota Approvals

Table 2-2 lists state permits and approvals that could be required for the project, depending on the final design. The Minnesota DNR regulates potential impacts to Minnesota's public lands and waters. The DNR requires a license to cross public lands and waters; licenses may require mitigation measures. Similar to the USFWS, the DNR also encourages consultation with project proposers to ascertain a project's potential to impact state-listed threatened and endangered species and possible mitigation measures.

A general NPDES/SDS construction stormwater permit from the Minnesota Pollution Control Agency (MPCA) is required for stormwater discharges from construction sites. A permit is required if a project disturbs one acre or more of land. The general NPDES/SDS permit requires the use of best management practices (BMPs), a stormwater pollution prevention plan, and adequate stormwater treatment capacity once the project is constructed. The NPDES/SDS permit serves as the mechanism to maintain state water quality standards.

SHPO is charged with preserving and protecting the state's cultural resources. SHPO consults with project proposers and state agencies to identify cultural resources (for example, through surveys) and to avoid and minimize impacts to these resources.

The Minnesota Department of Agriculture (MDA) oversees the integrity of Minnesota's food supply while protecting the health of its environment and the resources required for food production. MDA assists in the development of agricultural impact mitigation plans to avoid and mitigate impacts to agricultural lands.

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

The Minnesota BWSR oversees implementation of Minnesota's Wetland Conservation Act (WCA). The WCA is implemented by local units of government (LGUs). For linear projects that cross multiple LGUs, BWSR typically coordinates the review of potential wetland impacts among the affected LGUs. The WCA requires projects proposing a wetland impact to (1) try to avoid the impact, (2) try to minimize any unavoidable impacts, and (3) replace any lost wetland functions.

Table 2-2 Potential State Permits and Approvals Required for the Project

Unit of Government	Type of Application	Purpose
Minnesota Department of Natural Resources (DNR)	License to Cross Public Waters and Public Waters Work Permit	License and permit to prevent impacts associated with crossing public waters
DNR	Water Use (Appropriation) Permit	Authorizes dewatering over 10,000 gallons per day
DNR	State Natural Heritage Information System (NHIS) Review	Consultation to avoid, minimize, and mitigate impacts to state-listed species
Minnesota Pollution Control Agency (MPCA)	National Pollutant Discharge Elimination System (NPDES) Construction Stormwater Permit	Minimizes temporary and permanent impacts to stormwater
MPCA	Section 401 Clean Water Act – Water Quality Certification	Protects water quality by applying state water quality standards to projects
Minnesota State Historic Preservation Office	Minnesota Statute § 138 (Minnesota Field Archaeology Act and Minnesota Historic Sites Act)	Oversees adequate consideration of impacts on significant cultural resources
Minnesota Department of Agriculture	Agricultural Impact Mitigation Plan	Establishes measures for protection of agricultural resources
Minnesota Department of Transportation (MnDOT)	Utility Permit	Authorizes accommodation of utilities within highway rights-of-way
MnDOT	Driveway Access	Authorizes access to driveways along highways
MnDOT	Oversize/Overweight Permit	Authorizes the use of roads for oversize or overweight vehicles
Minnesota Board of Water and Soil Resources (BWSR)	Wetland Conservation Act, Conservation Reserve Enhancement Program (CREP)/ Reinvest in Minnesota (RIM) Conservation Easement authorizations	Coordination with BWSR and local governments for conservation of wetlands and CREP/RIM Conservation Easement authorizations

2.7.4 Local and Other Approvals

Table 2-3 lists local permits and approvals that could be required for the project, depending on the final design. The Commission’s route permit supersedes local planning and zoning regulations and ordinances. However, the applicants must obtain all local approvals necessary for the project that are not preempted by the Commission’s route permit, such as approvals for the safe use of local roads.

Other approvals and/or crossing agreements may be required where project facilities cross an existing utility such as a pipeline, solar facility, or a railway. The need for such approvals will be determined after the final route is selected, and the applicants have indicated that these approvals would be obtained after a route permit has been issued by the Commission.

Table 2-3 Potential Local and Other Permits and Approvals Required for the Project

Unit of Government	Type of Application	Purpose
Local/County Governments	Road Crossing, Driveway, and Oversize or Overweight permits	Permits from local governments to coordinate proper use of local roads and lands
Other utilities (pipelines, railroads, etc.)	Crossing Permits / Agreements / Approvals	Notifications to railroads and utilities

2.7.5 Conservation Programs

There are lands throughout the project area that are part of various conservation programs, including but not limited to RIM and CREP. The applicants indicate that they will work with landowners, local governmental entities administering such programs, and sponsoring federal agencies on a site-specific basis to coordinate the approvals necessary for placing the project on these lands.

2.7.6 Electric Safety and Reliability Costs

The project must meet the requirements of the NESC. Utilities must comply with the most recent edition of the NESC, as published by the Institute of Electrical and Electronics Engineers, Inc., and approved by the American National Standards Institute, when constructing new facilities or upgrading existing facilities (Minnesota Statute § 326B.35).

The NESC is designed to protect human health and the environment. The standards confirm that transmission lines and associated facilities are built from materials that will withstand the operational stresses placed upon them over the expected lifespan of the equipment, provided that routine maintenance is performed.

Utilities must also comply with North American Electric Reliability Corporation (NERC) standards. NERC standards define the reliability requirements for planning and operating the electrical transmission grid in North America.

3 Project and Routing Alternatives Overview

This chapter explains the geographical layout of the project and how the routing alternatives (including the applicants' proposed routes) will be studied and compared in this EIS. It also describes how the project will be designed, constructed, operated, and maintained.

The project is divided into the following three regions, which are shown on Map 2:

- South Region: Up to 42 miles of transmission line between the Minnesota/South Dakota border and continuing east to a point in Tara Township, Swift County, Minnesota.
- Central Region: Up to 39 miles of transmission line between a point in Tara Township and continuing east, northeast to a point in Ben Wade Township, Pope County, Minnesota.
- North Region: Up to 25 miles of transmission line between a point in Ben Wade Township and continuing northeast to the existing Alexandria Substation southwest of Alexandria, Minnesota.

The "applicants' proposed routes" is a term used to refer collectively to what the applicants proposed in their route permit application. The applicants divided their routes by these three regions. The applicants' proposed routes extend the length of a region and connect designated start and end points. Within each of the three regions, the applicants proposed two end-to-end routes for a total of six routes: South 1 and South 2, Central 1 and Central 2, and North 1 and North 2.

During scoping, the Commission decided that 16 route segments, six route connectors, and five alignment alternatives would be studied in the EIS. Routing alternatives is a term used to refer collectively to the applicants' proposed routes and all route segments, route connectors, and alignment alternatives identified in the scoping decision.

Route connectors connect the applicants' proposed routes within a region to a separate route. The applicants included three route connectors in their application, two in the South Region (S16 and S17) and one in the Central Region (C11).

Route segments offer potential modifications to a route and leave and return to the same route or route connector they originate from. The applicants included four route segments in their application, one in the South Region (S18) and three in the North Region (N9, N10, and N11).

For purposes of analyzing impacts in the EIS, the three regions were further divided into the following subregions:

- South Region: Big Stone Subregion and Swift Subregion;
- Central Region: Hancock Subregion, Cyrus Subregion, and White Bear Lake Subregion;
- North Region: Alexandria Subregion. Note, the Alexandria Substation Subregion includes the entire North Region.

Routing alternatives studied in the EIS are shown on Map 2 and include the following:

- **Routes –** across all six subregions, there are 27 routes studied in the EIS. Routes extend the length of a particular subregion and connect designated subregion start and end points. Routes combine the applicants' proposed routes with route connectors and routing alternatives developed during the scoping process. The total number of routes in a subregion represents all of the possibilities to get from a subregion start point to a subregion endpoint. Routes are listed and described within their respective subregion in Section 3.1.

- **Route segments –** there are 18 route segments studied in this EIS, including four proposed by the applicants and 14 identified during the scoping process that were approved for inclusion in the EIS in the scoping decision. Route segments are also listed and described within their respective subregion in Section 3.1. Unique, alpha-numeric identifications were given to route segments starting with 201 in each region. The unique identifier includes a prefix (S- South, C-Central, N- North) corresponding to the region the route segment is in. The applicants' proposed route segments maintain their original names, as identified in the route permit application (i.e., S18, N9, N10, and N11).

- **Route connectors –** there are six route connectors studied in the EIS, including three proposed by the applicants and three identified during the scoping process that were approved for inclusion in the EIS in the scoping decision. Route connectors are also listed and described within their respective subregion in Section 3.1. Route connectors are used to connect the applicants' proposed routes to a separate route. Unique, alpha-numeric identifications were given to route connectors, starting with 101 in each region. The unique identifier includes a prefix (S- South, C- Central, N- North) corresponding to the region the connector is in. For purposes of analysis, route connectors are incorporated into routes and are not analyzed in the EIS as standalone route connectors. The applicants' proposed route connectors maintain their original names, as identified in the route permit application (i.e., S16, S17, and C11).

- **Alignment alternatives –** there are five alignment alternatives studied in the EIS, all of which were identified during the scoping process and approved for inclusion in the EIS as listed in the scoping decision. Alignment alternatives are also listed and described within their respective subregion in Section 3.1. Alignment alternatives deviate from the applicants' anticipated alignments but fall within the original route width(s) proposed by the applicants. Unique identifications were given to alignment alternatives starting with AA1 in each region. The unique identifier includes a prefix (S- South, C- Central, N- North) corresponding to the region the alternative alignment is in.

3.1 Regions and Routing Alternatives

3.1.1 South Region

The South Region represents the southern and western extents of the project. The South Region intersects Big Stone, Lac Qui Parle, Swift, and Stevens counties and includes the municipalities and townships summarized in Table 3-1. The South Region is comprised of the Big Stone and Swift subregions.

Table 3-1 South Region Municipality and Township Summary

County	Municipalities and Township
Big Stone County	Municipalities: city of Ortonville and city of Odessa Townships: Ortonville, Odessa, Akron, and Artichoke
Lac qui Parle County	Townships: Yellow Bank and Agassiz
Swift County	Municipality: city of Holloway Townships: Fairfield, Hegbert, Marysland, Moyer, Shible, and Tara
Stevens County	Townships: Horton, Moore, Stevens, and Synnes

The South Region includes two routes proposed by the applicants, South 1 and South 2. These two routes are summarized below; for purposes of analysis in this EIS, they are also discussed in chapters evaluating the subregions and are compared to other routing alternatives at that level.

3.1.1.1 South 1 Route

South 1 is 41.9 miles long and traverses mostly agricultural land. From the Minnesota/South Dakota border, South 1 follows Big Stone County Road 15 north and then parallels an existing transmission line, crossing the Minnesota River and US Highway 75 (developed in coordination with DNR), to 715th Avenue in Ortonville Township where the route continues east on quarter section lines to 680th Avenue in Odessa Township where it turns south for 1.0 mile to provide more distance from the USFWS Hillman Wetland Management Area. It then turns east at the quarter section line for 6.0 miles until it intersects with 620th Avenue in Akron Township where it turns north for 2.0 miles while also paralleling an existing transmission line. It then turns east, staying parallel within 0.5 miles of US Highway 12 for 16.0 miles, crossing the Pomme de Terre River. It then turns north at 150th Avenue SW for 0.5 mile, then east on 20th Street SW for 1.0 mile, and north to parallel 140th Avenue NW for 6.0 miles. It then turns east and parallels 60th Street NW in Tara Township for 2.0 miles where South 1 ends and the Central Region begins. The South 1 route is shown on Map 3.

3.1.1.2 South 2 Route

South 2 is 38.8 miles long and also traverses mostly agricultural land. From the Minnesota/South Dakota border, Route Option South 2 travels east for approximately 0.8 miles (developed in coordination with the landowner) where it then angles northeast to cross the Minnesota River and US Highway 12 until it meets a section line, goes north 0.15 miles, then east on 715th Ave/430th Street in Ortonville Township. It follows the section line east for approximately 6.5 miles until the quarter section line 0.5 miles east of 660th Avenue in Odessa Township where the route turns north for approximately 1.0 mile. South 2 then parallels US Highway 12 for approximately 3.5 miles east until it turns north and shares a 0.5-mile segment of South 1, parallel to 620th Avenue in Akron Township. South 2 continues north along 620th Avenue for another 5.5 miles, paralleling the same existing transmission line along 620th Avenue for 6.5

miles, where it turns east for 4.0 miles approximately on quarter sections lines 0.5 miles north of 360th Street in Artichoke Township. It then turns south for approximately 0.5 miles on 260th Avenue NW, again paralleling an existing transmission line, to 60th Street NW in Hegbert Township for approximately 12.0 miles, crossing the Pomme de Terre River. It continues east on 60th Street NW in a common segment with South 1 for an additional 2.0 miles where South 2 ends and the Central Region begins. The South 2 route is shown on Map 3.

3.1.1.3 Big Stone Subregion

The Big Stone Subregion represents the southern and western extents of the South Region and intersects Big Stone and Lac Qui Parle counties. Municipalities and townships that the Big Stone Subregion intersects are summarized in Table 3-2.

Table 3-2 Big Stone Subregion Municipality and Township Summary

County	Municipalities and Township
Big Stone County	Municipalities: city of Ortonville and city of Odessa Townships: Ortonville, Odessa, and Akron
Lac qui Parle County	Townships: Yellow Bank and Agassiz

For purposes of analysis, the Big Stone Subregion includes 12 routes, three route segments, and one alignment alternative that are evaluated in further detail in Chapter 5. Route connectors applicable to the Big Stone Subregion (S16, S17, and S104) are not analyzed in the EIS as standalone route connectors. The route connectors are incorporated with the applicants' proposed routes to create additional routing possibilities that cross the entire subregion, whereas route segments and alignment alternatives are an alternate routing possibility within a route. Routing alternatives within the Big Stone Subregion are shown on Map 3 and listed in Table 3-3.

Table 3-3 Routes, Route Segments, and Alignment Alternatives in the Big Stone Subregion

Name	Type	Association to Applicants' Proposed Routes	Total Length (miles)
BSSR01	Route	Applicants' proposed South 1	15.9
BSSR02	Route	Applicants' proposed South 2	13.7
BSSR03	Route	Starts on South 1 and switches to South 2 at the South 1/South 2 intersection	14.9
BSSR04	Route	Starts on South 2 and switches to South 1 at the South 1/South 2 intersection	14.7
BSSR05	Route	Starts on South 1 and uses Route Connector S16 to switch to South 2	15.0
BSSR06	Route	Starts on South 2 and uses Route Connector S16 to switch to South 1	15.6
BSSR07	Route	Starts on South 1 and uses Route Connector S17 to switch to South 2	16.0
BSSR08	Route	Starts on South 2 and uses Route Connector S17 to switch to South 1	14.7
BSSR09	Route	Starts on South 1 and uses Route Connector S16 to switch to South 2, then uses Route Connector S17 to switch to South 1	16.0
BSSR10	Route	Starts on South 2 and uses Route Connector S16 to switch to South 1, then uses Route Connector S17 to switch to South 2	15.6
BSSR11	Route	Starts on South 2 and uses Route Connector S104 to switch to South 1	14.1
BSSR12	Route	Starts on South 2 and uses Route Connector S104 to switch to South 1, then uses Route Connector S17 to switch to South 2	14.1
S207	Route Segment	Alternative to a portion of South 2	2.0
S208	Route Segment	Alternative to a portion of South 1	3.6
S210	Route Segment	Alternative to a portion of South 1	4.7
SAA04	Alignment Alternative	Alignment alternative to a portion of South 2	0.7

3.1.1.4 Swift Subregion

The Swift Subregion is east and northeast of the Big Stone Subregion and intersects Big Stone, Swift, and Stevens counties. Municipalities and townships that the Swift Subregion intersects are summarized in Table 3-4.

Table 3-4 Swift Subregion Municipality and Township Summary

County	Municipalities and Township
Big Stone County	Townships: Akron and Artichoke
Swift County	Municipality: city of Holloway Townships: Fairfield, Hegbert, Marysland, Moyer, Shible, and Tara
Stevens County	Townships: Horton, Moore, Stevens, and Synnes

For purposes of analysis, the Swift Subregion includes four routes, six route segments, and three alignment alternatives that are evaluated in further detail in Chapter 5. No route connectors are applicable to the Swift Subregion. Routing alternatives within the Swift Subregion are shown on Map 3 and listed in Table 3-5.

Table 3-5 Routes, Route Segments, and Alignment Alternatives in the Swift Subregion

Name	Type	Association to Applicants' Proposed Routes	Total Length (miles)
SSR01	Route	Applicants' proposed South 1	26.0
SSR02	Route	Applicants' proposed South 2	25.2
SSR03	Route	Start on Route Segment 211 and switch to South 2	25.5
SSR04	Route	Start on Route Segment 211 and switch to South 1	25.5
S18	Route	Alternative to a portion of South 2	2.4
S201	Route	Alternative to a portion of South 2	2.6
S202	Route	Alternative to a portion of South 2	8.1
S203	Route	Alternative to a portion of South 2	1.8
S204	Route	Alternative to a portion of South 1	3.0
S205	Route	Alternative to a portion of South 1	7.5
SAA01	Alignment Alternative	Alignment alternative to a portion of South 1	2.0
SAA02	Alignment Alternative	Alignment alternative to a portion of South 2	2.2
SAA03	Alignment Alternative	Alignment alternative to a portion of South 1	1.8

3.1.2 Central Region

The Central Region originates at the eastern end of the South Region and continues east, northeast to a point in Ben Wade Township approximately four miles north of the city of Starbuck, Pope County, Minnesota. The Central Region intersects Swift, Stevens, and Pope counties and includes the municipalities and townships summarized in Table 3-6. The Central Region is comprised of the Hancock, Cyrus, and White Bear Lake subregions.

Table 3-6 Central Region Municipality and Township Summary

County	Municipalities and Township
Swift County	Townships: Tara and Clontarf
Stevens County	Municipality: city of Hancock Townships: Moore, Hodges, and Framnas
Pope County	Municipalities: city of Cyrus and city of Starbuck Townships: Ben Wade, Blue Mounds, Hoff, New Prairie, Nora, Walden, and White Bear Lake

The Central Region includes two routes proposed by the applicants, Central 1 and Central 2. These two routes are summarized below; however, for purposes of analysis in this EIS, they are discussed in chapters evaluating the subregions and are compared to other routing alternatives at that level.

3.1.2.1 Central 1 Route

Central 1 begins where the South Region ends and the Central Region begins, in Tara Township, Swift County, Minnesota, and travels north, paralleling 120th Avenue NW, crossing into Stevens County after approximately 2.0 miles where 120th Avenue NW ends but the section line continues as Township Road 7 (TR 7). From the county line, Central 1 continues north for another 6.0 miles on TR 7 through agricultural land and turns east, paralleling County Highway 8, which is approximately 0.1 mile to the east of the city of Hancock, and turns north just west of Hancock along a section line that eventually becomes 430th Ave. Central 1 continues north for approximately 2.5 miles then proceeds to head east at 250th Street where it parallels an existing transmission line for approximately 1.5 miles, then turns north for 2.0 miles on the quarter section lines of Sections 14 and 11 of Hodges Township. Central 1 then turns east and parallels 230th Street for 2.5 miles as it crosses into Pope County at 400th Avenue, where 230th Street turns into County Road 18 in Pope County. The portion of Central 1 from Section 14 to where the route turns north from County Road 18 is the same as the Central 2 route.

From the intersection of County Road 18 and 390th Ave, Central 1 then heads north, east, and north, again following township roads, section lines, and quarter section lines. As it heads east on 210th Street, Central 1 crosses the Chippewa River. It heads north along County Road 1 where it crosses State Highway 28, continues east, north, and east again to cross the Little Chippewa River while paralleling County Road 24. Along County Road 24, Central 1 meets with Central 2 and they both terminate at the same point in Ben Wade Township, north of Malmedal Lake, approximately four miles north of the city of Starbuck. The Central 1 route is shown on Map 4.

3.1.2.2 Central 2 Route

Central 2 begins where the South Region ends and the Central Region begins in Tara Township, Swift County, Minnesota, and travels east along 60th Street NW, paralleling an existing transmission line for approximately 4.5 miles. It then heads north along a quarter section line for 8.0 miles. As it traverses north, it crosses the border into Pope County, then crosses State Highway 9. Approximately 2.5 miles east of the city of Hancock, Central 2 turns west on Township Road 295 for 1.0 mile, crossing into

Stevens County, then north 1.4 miles from Hancock along a quarter section line for 3.0 miles. It heads west at 250th Street for 1.0 mile where it meets up with and follows the Central 1 route.

Where Central 1 and Central 2 are common, they head north at a quarter section line in Section 14 of Hodges Township, Stevens County, Minnesota, for 2.0 miles, and east along 230th Street for 2.5 miles, crossing into Pope County. From the intersection of County Road 18 and 390th Ave, the two subsegments split again and Central 2 continues east along County Road 18 for 2.5 miles, crossing the Chippewa River for the first time. Central 2 heads north at County Road 1 for 2.0 miles, crossing the Chippewa River a second time, then east on 210th Street for 2.0 miles, and north on 340th Avenue for 2.5 miles. Central 2 then follows a quarter section line east for 2.5 miles, turning north at another quarter section line for 1.5 miles to intersect with Central 1 at County Road 24. Central 1 and Central 2 are the same from this point and both terminate at the same point in Ben Wade Township, north of Malmedal Lake, approximately four miles north of the city of Starbuck. The Central 2 route is shown on Map 4.

3.1.2.3 Hancock Subregion

The Hancock Subregion represents the southern and western extents of the Central Region and intersects Swift, Stevens, and Pope counties. Municipalities and townships that the Hancock Subregion intersect are summarized in Table 3-7.

Table 3-7 Hancock Subregion Municipality and Township Summary

County	Municipalities and Township
Swift County	Townships: Tara and Clontarf
Stevens County	Municipality: city of Hancock Townships: Moore and Hodges
Pope County	Townships: Hoff and Walden

For purposes of analysis, the Hancock Subregion includes three routes and two route segments that are evaluated in further detail in Chapter 6. No alignment alternatives are analyzed in the Hancock Subregion. Route connector C102 is in the Hancock Subregion but is not analyzed in the EIS as a standalone route connector. C102 is incorporated with the applicants' routes to create additional routing possibilities that cross the entire subregion, whereas route segments and alignment alternatives are an alternate routing possibility within a route. Routing alternatives within the Hancock Subregion are shown on Map 4 and listed in Table 3-8.

Table 3-8 Routes, Route Segments, and Alignment Alternatives in the Hancock Subregion

Name	Type	Association to Applicants' Proposed Routes	Total Length (miles)
HSR01	Route	Applicants' proposed Central 1	13.4
HSR02	Route	Applicants' proposed Central 2	17.6
HSR03	Route	Starts on Central 1 and uses connector C102 to switch to Central 2	17.5
C203	Route Segment	Alternative to a portion of Central 2	3.0
C208	Route Segment	Alternative to a portion of Central 2	4.6

3.1.2.4 Cyrus Subregion

The Cyrus Subregion represents the central part of the Central Region and intersects Stevens and Pope counties. Municipalities and townships that the Cyrus Subregion intersect are summarized in Table 3-9.

Table 3-9 Cyrus Subregion Municipality and Township Summary

County	Municipalities and Township
Stevens County	Townships: Hodges and Framnas
Pope County	Municipality: city of Cyrus, Townships: Walden and New Prairie

For purposes of analysis, the Cyrus Subregion includes two routes and one alignment alternative that are evaluated in further detail in Chapter 6. No route segments or route connectors are analyzed in the Cyrus Subregion. Routing alternatives within the Cyrus Subregion are shown on Map 4 and listed in Table 3-10.

Table 3-10 Routes and Alignment Alternatives in the Cyrus Subregion

Name	Type	Association to Applicants' Proposed Routes	Total Length (miles)
CSR01	Route	Applicants' proposed Central 1	9.0
CSR02	Route	Applicants' proposed Central 2	8.9
CAA01	Alignment Alternative	Alignment alternative to a portion of Central 2	0.5

3.1.2.5 White Bear Lake Subregion

The White Bear Lake Subregion represents the eastern extent of the Central Region and is entirely within Pope County. Municipalities and townships that the White Bear Lake Subregion intersects are summarized in Table 3-11.

Table 3-11 White Bear Lake Subregion Municipality and Township Summary

County	Municipalities and Township
Pope County	Municipality: city of Starbuck Townships: Ben Wade, Blue Mounds, New Prairie, Nora, Walden, White Bear Lake

For purposes of analysis, the White Bear Lake Subregion includes four routes and one route segment that are evaluated in further detail in Chapter 6 Route connectors applicable to the White Bear Lake Subregion (C11 and C101) are not analyzed in the EIS as standalone route connectors. The route connectors are incorporated with the applicants' routes to create additional routing possibilities that cross the entire subregion, whereas route segments and alignment alternatives are an alternate routing possibility within a route. Routing alternatives within the White Bear Lake Subregion are shown on Map 4 and listed in Table 3-12.

Table 3-12 Routes, Route Segments, and Alignment Alternatives in the White Bear Lake Subregion

Name	Type	Association to Applicants' Proposed Routes	Total Length (miles)
WBLS01	Route	Applicants' proposed Central 1	12.0
WBLS02	Route	Applicants' proposed Central 2	12.1
WBLS03	Route	Starts on Central 1 and uses connector C11 to switch to Central 2	12.0
WBLS04	Route	Starts on Central 1 and uses connector C101 and follows Central 1 and Central 2 (they are the same route in this location	12.1
C202	Route Segment	Alternative to a portion of Central 2	2.0

3.1.3 North Region

The North Region represents the northern and eastern extents of the project. The North Region intersects Pope and Douglas counties and includes the municipalities and townships summarized in Table 3-13. The North Region is not broken down into multiple subregions because there is only one possible start and end point for the permitted route. The North Region contains a single subregion, the Alexandria Subregion, which will be discussed further in the subregional analysis.

Table 3-13 North Region Municipality and Township Summary

County	Municipalities and Township
Pope County	Municipalities: city of Glenwood, city of Long Beach, and city of Lowry Townships: Ben Wade, Glenwood, Leven, Minnewaska, Reno, and White Bear Lake
Douglas County	Municipalities: city of Alexandria and city of Forada Townships: Alexandria, Holmes, Hudson, Lake Mary, La Grand, and Moe

The North Region includes two routes proposed by the applicants, North 1 and North 2. These two routes are summarized below.

3.1.3.1 North 1 Route

North 1 begins where the Central Region ends in Ben Wade Township, Pope County, approximately 4.0 miles north of the city of Starbuck. North 1 proceeds north along the quarter section line between 300th Avenue and 290th Avenue for approximately 4.5 miles, including crossing State Highway 55. It turns east at County Road 76 for 1.0 mile, north at a quarter section line for 1.0 mile, east for 0.25 mile along the county line between Pope and Douglas Counties, Minnesota, and then crosses into Douglas County going north on Iris Lane SW for 1.0 mile. It continues east along a section line for 2.75 miles, north along a quarter section line for 1.5 miles, east for 0.5 miles, and then north in Lake Mary Township for 1.0 mile where it parallels County Road 21 SW between Andrew Lake, Mud Lake, and Lake Mary. From this pinch point, the route traverses east immediately north of Mud Lake for 0.24 miles and north for 1.7 miles until Woodsman Lane SW/Cross Country Lane SW. From there, it turns east and follows the road for 1.7 miles, crossing into the city of Alexandria municipal limits, then north along Sunfish Drive/Waterfowl Drive SW where it exits the municipal limits to terminate at the Alexandria Substation. The Alexandria Substation is adjacent to I-94 and, although it is not within the municipal limits of the city of Alexandria, it is surrounded by it. The North 1 route is shown on Map 5.

3.1.3.2 North 2 Route

North 2 begins where the Central Region ends in Ben Wade Township, Pope County, approximately 4.0 miles north of the city of Starbuck. North 2 proceeds east along the quarter section line between 150th Street and 160th Street, which turns into 155th Street, for 8.0 miles. It crosses State Highway 55 just outside of the city of Glenwood and then continues north along the quarter section line of State Highway 29 and 210th Avenue for 2.0 miles, then east for 1.5 miles, and north for 3.0 miles. It continues east on a quarter section line for 1.0 mile and then north for 2.5 miles, crossing into Douglas County on a section line west of County Road 30. It continues west for 1.0 mile towards Maple Lake and the city of Forada along a section line between Country Road 4 SE and Nash Road SE and then continues north for 0.75 mile. North 2 turns west on a quarter section line for 0.75 mile just north of the city of Forada. At this point, North 2 begins paralleling County Road 87 SE and the Soo Line Canadian Pacific railroad for approximately 1.3 miles generally northwest. It then turns west for 0.5 mile, and north for 1.5 miles along a quarter section line before then turning west to parallel an existing transmission line for 1.4 miles into the Alexandria Substation. The North 2 route is shown on Map 5.

3.1.3.3 Alexandria Subregion

The North Region is not divided into subregions; however, for consistency in analysis with the South Region and Central Region, the North Region is referred to as the Alexandria Subregion for the remainder of this EIS. Impacts and mitigation are discussed on the subregional level with common start and end points for a route rather than at the regional level with common start and end points as identified in the route permit application. Municipalities and townships that the Alexandria Subregion intersects are summarized in Table 3-13.

For purposes of analysis, the Alexandria Subregion includes two routes and six route segments that are evaluated in further detail in Chapter 7. No alignment alternatives or route connectors are analyzed in the Alexandria Subregion. Routing alternatives within the Alexandria Subregion are shown on Map 5 and listed in Table 3-14.

Table 3-14 Routes and Route Segments in the Alexandria Subregion

Name	Type	Association to Applicants' Proposed Routes	Total Length (miles)
ASR01	Route	Applicants' proposed North 1	18.1
ASR02	Route	Applicants' proposed North 2	25.3
N9	Route Segment	Applicants' proposed alternative to a portion of North 1	3.0
N10	Route Segment	Applicants' proposed alternative to a portion of North 1	2.1
N11	Route Segment	Applicants' proposed alternative to a portion of North 2	2.1
N205	Route Segment	Alternative to a portion of North 1	1.3
N206	Route Segment	Alternative to a portion of North 2	2.1
N207	Route Segment	Alternative to a portion of North 2	1.8

3.2 Project Design

The project consists of the installation of a single-circuit 345 kV transmission line constructed on double-circuit-capable structures line. The project also includes the expansion of two substations and is also expected to require a new fiber optic regeneration station.

3.2.1 Transmission Lines

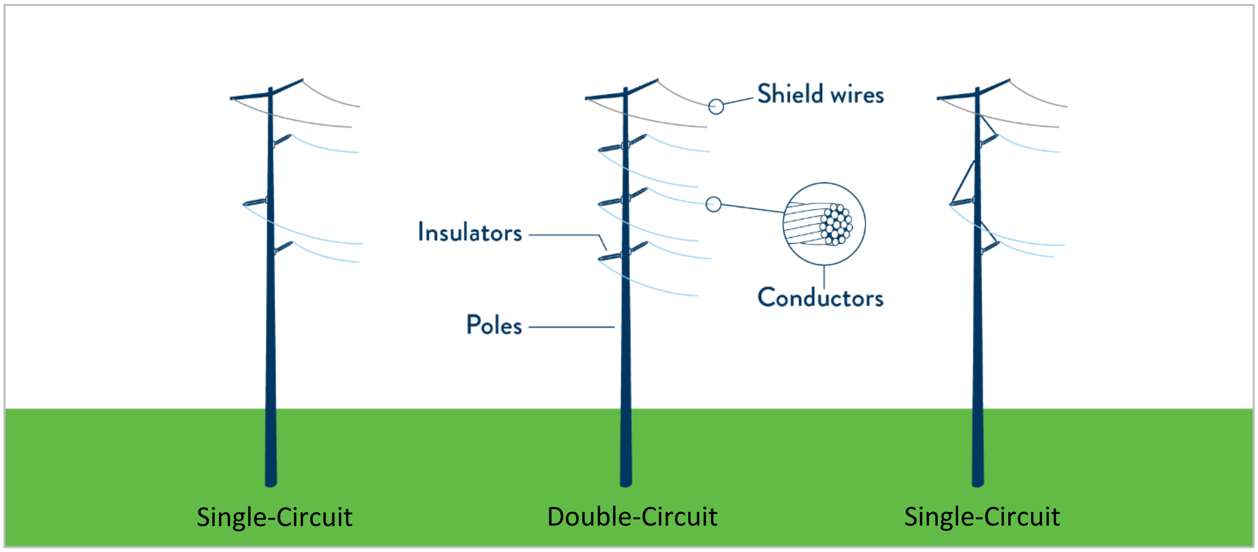
3.2.1.1 345 kV Transmission Line

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

Transmission lines are usually either single-circuit (carrying one, three-phase conductor set) or double-circuit (carrying two, three-phase conductor sets). There are three conductors per circuit because power plants generate electricity such that each of the three conductors operate at a different phase.

The project is a single-circuit 345 kV transmission line. The structures for the project will be double-circuit capable; that is, a second circuit could be added in the future. Any such addition would require appropriate environmental review and permitting by the Commission.

Figure 3-1 Typical Transmission Line Structure Components



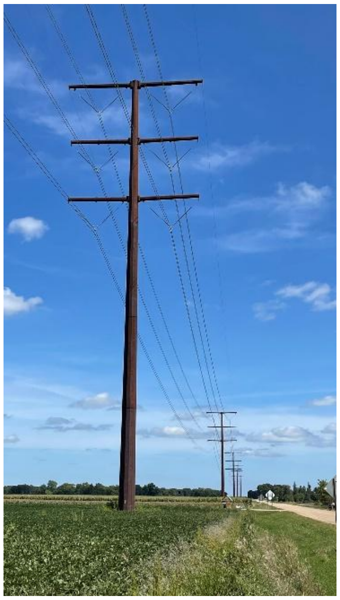
3.2.2 Structures

Structures for the project will primarily consist of single (monopole) steel pole structures. Tangent structures are expected to be the most common structure along the route and are used to support the conductors when there is little to no angle between structures. Dead-end structures are used to support the conductor tension and used at least once every 5 miles or when there are large angles between structures. Due to engineering constraints, tangent structures are generally taller with smaller diameter foundations, whereas dead-end structures are typically shorter and are supported on larger foundations.

For angles and dead-end structures, a multiple pole design would be used. The transmission structures would be a double-circuit capable 345 kV/345 kV design and are proposed to be Corton (weathered) steel. Other specialty structures might be used depending on site-specific conditions.

Figure 3-2 and Figure 3-3 provides photos of typical double-circuit capable structures similar to those the applicants propose to use for this project.

Figure 3-2 Typical 345-kV Structures



Double-Circuit Tangent

Double-Circuit Running Angle

Double-Circuit Crossing Tangent

Figure 3-3 Typical 345-kV Structures Dead-End Structures

Double-Circuit Dead-End

Double-Circuit Two-Pole Dead-End

Double-Circuit Crossing Dead-End

The proposed structures would typically range in height from approximately 100 to 160 feet tall; however, where existing transmission lines are crossed, structure heights could be up to 180 feet tall. Figure 3-4 illustrates how the height of a transmission line could compare to a grain elevator. The typical spans between structures would be about 1,000 feet but can range from 200 to 1,400 feet. The structures will be bolted to concrete, drilled pier foundations embedded in the ground with a depth of 25 to 80 feet. Specialty foundations could be required due to geotechnical (or soil) conditions.

Foundation depth would be based on site-specific conditions and detailed engineering design. Table 3-15 summarizes the typical structure designs for the transmission line. Structure sizes could change based on site conditions and further analysis.

Figure 3-4 Transmission Line Height Comparison to a Grain Elevator

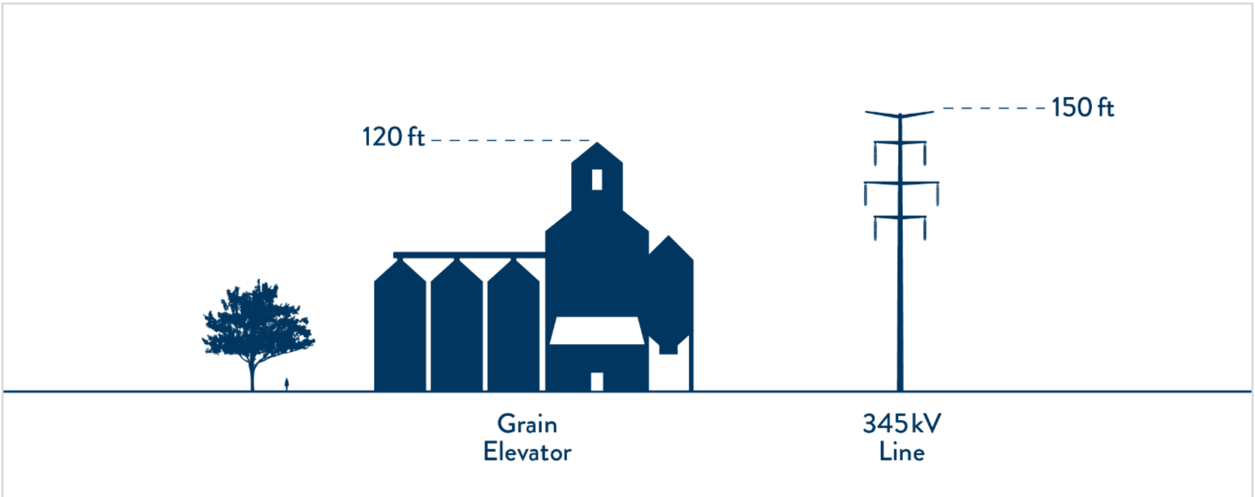


Table 3-15 Typical Structure Design Summary

Line Type	Structure Type	Structure Material	Structure Height (feet)	Foundation Diameter (feet)	Typical Span (distance) Between Structures (feet)
345 kV Double-circuit Tangent, Standard	Monopole with Davit Arms	Corten (weathered) Steel	100 to 180	8 to 9	400 to 1,400
345 kV Double-circuit Running Angle	Monopole with Davit Arms	Corten (weathered) Steel	120 to 170	9 to 11	400 to 1,200
345 kV Double-circuit Large Angle and Dead-end, Standard	Monopole with Davit Arms	Corten (weathered) Steel	90 to 140	12 to 14	200 to 1,200
345 kV Double-circuit Tangent, Crossing Span	Monopole with Davit Arms	Corten (weathered) Steel	90 to 160	9 to 10	400 to 1,200
345 kV Double-Circuit Crossing Dead-end	Monopole with Davit Arms	Corten (weathered) Steel	90 to 160	12 to 14	400 to 1,200
345 kV Double-circuit Large Angle and Dead-end, 2-Pole	Two poles with Davit Arms	Corten (weathered) Steel	90 to 130	8 to 10 (each pole)	200 to 1,200

3.2.3 Conductors

A single-circuit transmission line carries three phases (conductors) and separate shield wire(s). The 345 kV line would utilize twisted pair 636 Aluminum Conductor Steel Reinforced (Grosbeak) or similar performance conductor. Twisted pair conductors consist of two conductors placed side by side and twisted at a predefined distance by the manufacturer. This type of conductor provides motion resistance to wind-induced events on transmission lines (e.g., conductor galloping or vibration) especially during icing conditions. Each phase will consist of two of these twisted pair conductors (bundled conductor) to provide optimal current carrying capacity at 345 kV.

The initial construction will include installation of overhead ground wire (OHGW) and optical ground wire (OPGW) at the top of each structure. OHGW is a collection of twisted steel wires while OPGW includes a fiberoptic cable with a designated set of fibers surrounded by steel wires. While OHGW and OPGW both protect the phases from lightning strikes, OPGW allows for the exchange of information (i.e., communication) between the endpoint substations and other locations on the transmission system.

The project would be designed to meet or surpass relevant national and state codes including the NESC and the applicants' standards. Applicable standards will be met for construction and installation, and applicable safety procedures will be followed during design, construction, and maintenance.

3.2.4 Associated Facilities

Associated facilities are buildings, equipment, and other physical structures that are necessary to the operation of a transmission line (Minnesota Rules 7850.1000, subpart 3). Associated facilities for the project include:

- Expansion of the existing Big Stone South Substation,
- Expansion of the existing Alexandria Substation, and
- Construction of a new fiber optic regeneration station for a new fiber optic communications path.

3.2.4.1 Big Stone South Substation Expansion

The existing Big Stone South Substation is the western endpoint of the project and is in Grant County, South Dakota, one mile west of Big Stone City. The existing ring bus configuration would be modified to a breaker and half configuration by adding one additional row to the 345 kV portion of the substation to support the project. This new row would allow for additional reactive power equipment and new breaker positions on the transmission line to the Alexandria Substation.

The currently fenced area for the Big Stone South Substation would be expanded on land owned by Otter Tail Power Company to accommodate the new equipment. The Big Stone South Substation is entirely in South Dakota, therefore potential impacts from the Big Stone South Substation expansion are not analyzed as part of this EIS. Permits from the state of South Dakota would be obtained for the expansion and the transmission line portions of the project in that state.

3.2.4.2 Alexandria Substation Expansion

The existing Alexandria Substation is the terminus of the project and is southwest of the city of Alexandria, Minnesota, south of Interstate 94.

The Alexandria to Big Oaks 345 kV Transmission Project and Big Stone South to Alexandria Project use the Alexandria Substation expansion. The Alexandria Substation expansion was analyzed in an Environmental Assessment completed for the Alexandria to Big Oaks 345 kV Transmission Project (eDockets No. TL-23-159) that was ultimately issued a route permit; thus, potential impacts from the Alexandria Substation expansion are not analyzed as part of this EIS, and construction for the Alexandria Substation expansion may commence before the route permit decision for the Big Stone South to Alexandria Project is made.

New substation equipment necessary to accommodate the transmission line will be installed as part of the Alexandria to Big Oaks 345 kV Transmission line Project, including termination structures, circuit breakers, reactive power equipment, relays, and associated control equipment. This expansion will support the overall project’s termination position and includes an expansion of four to six acres beyond the existing fenced area. The equipment and improvements required inside the Alexandria Substation will be owned solely by Western Minnesota Municipal Power Agency.

3.2.4.3 Fiber Optic Regeneration Station

A new fiber optic regeneration station may be needed along the permitted route to amplify and regenerate optical communications between substations if another communication connection is not available. Fiber optic regeneration stations are typically required when the transmission line length exceeds 75 miles. The applicants anticipate constructing this new building within the Central Region and within the route width. The exact placement depends on the route chosen by the Commission for the final route permit.

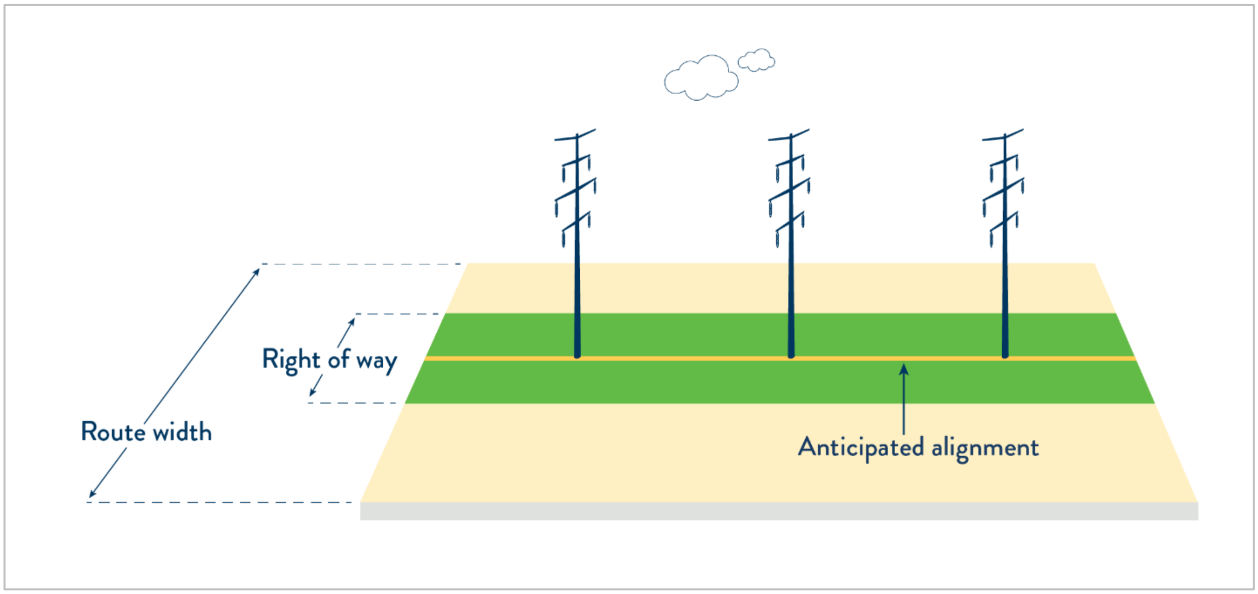
The equipment required to regenerate optical communications would be placed within a new shelter building approximately 15 feet by 25 feet (375 square feet) in size and 15 feet above grade. In addition, a 30-foot-wide permanent access road and underground 240-volt electrical utilities would be required, and equipment for backup power could be needed. The final facility footprint would be approximately 100-feet wide by 100-feet long (0.23 acre). This area would be permanently fenced and covered with gravel.

3.3 Route Width, Right-of-Way, and Anticipated Alignment

If the Commission issues a route permit, the permit would designate a “route.” Route refers to the location of a high-voltage transmission line between two end points. The route may have a variable width of up to one and one-quarter miles (Minnesota Statute 216E.01, subd 8). The width of the route can vary and may be up to 1.25 miles wide. The transmission line must be constructed within the route designated by the Commission unless, after permit issuance, permission to proceed outside of the route is sought by the applicants and approved by the Commission. The "anticipated alignment" is the anticipated location of the structures and line within the ROW and route width.

An illustration summarizing the concepts of route width, ROW, and anticipated alignment is provided in Figure 3-5. The route width, in combination with the anticipated alignment, is intended to balance flexibility and predictability.

Figure 3-5 Route Width, ROW, and Anticipated Alignment Illustration



3.3.1 Route Width

The route width is typically larger than the actual ROW needed for the transmission line. This additional width provides flexibility in constructing the line yet is not to such an extent that the placement of the line is undetermined. The route width allows the applicants to work with landowners to address their concerns and to address engineering issues that could arise after a permit is issued. A route should be wide enough to provide flexibility for the permittee to work with landowners to address concerns and to address engineering issues that could arise after a route permit is issued.

For this project, except as otherwise noted below, the applicants generally requested a route width of 1,000 feet for all routing alternatives, with wider areas around locations with routing constraints. The applicants are requesting narrower route widths at other locations along the proposed routing alternatives near areas where natural resources and state conservation easements exist, which the applicants intend to avoid to the greatest extent practicable.

Map 6 illustrates where the route width deviates from the 1,000-foot-wide requested route width and Table 3-16 summarizes the variations in the widths requested as part of the route permit application.

Table 3-16 Summary of Route Width Variations

Region and Subregion	Applicable Routes	Route Width	Reason for Route Width Modification
South Region; Big Stone Subregion	BSSR01, BSSR03, BSSR05, BSSR07, BSSR09	Ranges from 800 to 5,700 feet	Known existing flooding and erosion concerns near existing infrastructure near S2 in the paralleling corridor.
	BSSR01, BSSR03, BSSR06, BSSR07, BSSR10	535 feet	Avoids USFWS grassland easement.
	BSSR01, BSSR04, BSSR06, BSSR08, BSSR09, BSSR11	Ranges from 3,200 to 3,420 feet	Allows for flexibility in final design due to irregular parcel boundaries.
	BSSR02, BSSR04, BSSR05, BSSR08, BSSR09	500 feet	Avoids USFWS grassland easement and USFWS fee title land.
	BSSR02, BSSR03, BSSR05, BSSR07, BSSR10, BSSR12	515 feet	Avoids USFWS wetland easement.
	BSSR02, BSSR03, BSSR05, BSSR07, BSSR10, BSSR12	715 feet	Avoids USFWS wetland easement.
	BSSR02, BSSR03, BSSR05, BSSR07, BSSR10, BSSR12	500 to 870 feet	Avoids USFWS wetland easement.
South Region; Swift Subregion	SSR01	580 feet	Avoids USFWS fee title land.
	SSR01	500 feet	Avoids USFWS grassland easement.
	SSR02	630 feet	Avoids USFWS grassland easement.
	SSR02	630 feet	Avoids USFWS grassland easement.
Central Region; Hancock Subregion	HSR02	550 feet	Avoids USFWS fee title land.
	HSR02	Ranges from 5,850 to 5,950 feet	Allows for flexibility in final design due to multiple routing constraints in the area.
Central Region; Cyrus Subregion	CSR01, CSR02	Ranges from 6,290 to 6,375 feet	Allows for flexibility in final design due to multiple routing constraints in the area.
North Region; Alexandria Subregion	ASR01	600 feet	Avoids USFWS fee title land.
	ASR01	Ranges from 1,800 to 3,150 feet	Multiple landowners and a township board requested additional flexibility for routing in final design.
	ASR02	500 feet	Avoids USFWS wetland easement.
	ASR02	485 feet	Avoids USFWS wetland easement.
	ASR02	Ranges from 600 to 700 feet	Avoids USFWS fee title land.
	ASR02	500 feet	Avoids USFWS wetland easement.

Region and Subregion	Applicable Routes	Route Width	Reason for Route Width Modification
	ASR02	Ranges from 1,300 to 1,700 feet	Flexibility for final design of engineering and substation configuration to tie-in to the substation.

3.3.2 Right-of-Way

The ROW is the land interest required within a route for the construction, maintenance, and operation of a high-voltage transmission line (Minnesota Rules 7850.1000, subpart 15). It includes the specific area required for the safe construction and operation of the transmission line, where such safety is defined by the NESC and the NERC reliability standards. The ROW must be within the designated route and is the area for which the applicants obtain rights from private landowners to construct and operate the line.

If the Commission issues a route permit, the applicants would negotiate easement agreements with landowners for the final ROW. These easements are subject to eminent domain. This process is described in Section 2.6. Staff understands that agreements are also negotiated with landowners adjacent to the final ROW, at the discretion of the landowner, to provide access or temporary construction workspace. The applicants would conduct detailed survey and engineering work including, for example, soil borings. Additionally, the applicants would contact landowners to gather information about their property and their concerns and discuss how the transmission line ROW might best proceed across the property.

The applicants indicate that the new 345 kV line would require a 150-foot-wide ROW. When paralleling existing road rights-of-way, the applicants propose to place structures on adjacent private property, at an approximately 20-foot offset from the existing road ROW, subject to easements with landowners, as well as road authority design requirements that could affect the offset distance. Structure placement and offset distances may vary in areas such as highway interchanges due to county or state design requirements and in areas of planned future road expansion. Data pertaining to ROW paralleling is presented in Chapters 5 through 7.

3.3.2.1 Right-of-Way Acquisition

If a route permit is issued, the applicants would acquire an easement from each of the landowners along the permitted transmission line route. The rights would consist primarily of permanent electric transmission easements, providing a 150-foot-wide easement area. In addition, there would be ancillary rights, including access (temporary and permanent) and additional temporary construction workspace, as necessary to support construction and ongoing operation and maintenance.

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

The ROW agent would collect area land value data to determine the amount of compensation to be paid for the rights to construct, operate, and maintain the transmission line in the easement. Based on this data, a fair market value offer would be developed, necessary documents to acquire the easement would be prepared, and an offer made to the landowner. In most cases, the applicants and owners reach voluntary easement (or other) agreements.

Sometimes a landowner and an applicant(s) are unable to reach a voluntary or negotiated easement agreement. In those cases, public service corporations, such as the applicants, may exercise the right of eminent domain pursuant to Minnesota law. See Section 2.6 for additional information regarding eminent domain and the condemnation process.

Once a ROW is acquired, and prior to construction, the ROW agent would contact each landowner to discuss the construction schedule and requirements. To allow for safe construction, special considerations might be needed for fences, crops, or livestock. Fences or livestock, for example, might need to be moved or temporary or permanent gates might need to be installed. In each case, the ROW agent would coordinate with the landowner, who would be compensated for any project-related construction damage.

3.3.3 Anticipated Alignment

The anticipated alignment is the anticipated placement of the transmission line within the route and ROW, that is, where the transmission line is anticipated to be built.

The applicants developed an alignment for the routes, route segments, and route connectors in the route permit application. Similarly, the routing alternatives proposed during scoping also include anticipated alignments.

After coordinating with landowners and completing detailed engineering plans, the applicants would establish the final alignment for the project and designate structure placements. These final plans, known as "plan and profiles," must be provided to the Commission so that the Commission can confirm that the applicants' plans are consistent with both the route permit and all permit conditions prior to project construction.

3.4 Construction and Maintenance Procedures

Project construction would not begin until all necessary federal, state, and local approvals have been obtained, easements have been acquired for rights-of-way, and final plans and profiles have been approved by the Commission. Construction typically progresses as follows:

- Establish construction staging areas/laydown yards
- Survey marking the ROW
- ROW clearing and access preparation
- Grading or filling if necessary
- Installing concrete foundations
- Installing poles, insulators, and hardware
- Conductor stringing
- Installing any aerial markers required by state or federal permits
- Site restoration

Once the project is operational, the applicants would follow standard maintenance procedures.

3.4.1 Construction Staging Areas/Laydown Yards

Construction staging areas/laydown yards are usually established for transmission projects. For the project, the applicants could establish new staging areas/laydown yards and/or might use existing staging areas/laydown yards. Staging areas/laydown yards are typically 20 to 30 acres in size and near major roads. Agreements may be obtained from certain landowners for additional access and/or temporary construction or staging areas.

Staging involves delivering the equipment and materials necessary to construct the new transmission line facilities. Structures are delivered to staging areas along the ROW for each work location and materials are stored until they are needed for the project. Activities involved to prepare the laydown yard include installation of erosion control and sediment BMPs, any leveling of uneven surfaces, stripping and stockpiling of topsoil (if necessary), and installation of gravel, tracking pads near entry/exit, if needed, installation of culvert(s), power and fencing.

3.4.2 Survey Marking of the Right-of-Way

Prior to the arrival of construction crews, surveyors would stake the limits of disturbance for the construction corridor. The limits of disturbance would encompass the ROW and structure locations along the approved alignment of the transmission line. The construction contractor would also request utility locates prior to the start of ROW clearing.

The Gopher State One-Call system would be used to locate and mark existing underground utilities prior to the start of ROW clearing to avoid impacts on existing utilities. If crossing an underground utility is required, the applicants would protect existing infrastructure while using heavy equipment during construction, such as construction matting, and would coordinate with the utility owner.

3.4.3 Right-of-Way Clearing and Access Preparation

Construction crews would begin preparing the ROW by clearing vegetation to comply with NESC standards (that is, trees and other tall-growing vegetation would be removed), to allow for safe, debris-free access to the construction site. Vegetation will be cut at or slightly above the ground surface using mechanized mowers, sky trims, processors, harvesters, or by hand. Rootstocks will generally be left in place, except in areas where stump removal is necessary to facilitate the movement of construction vehicles, or when reasonably requested by the landowner. Side trimming the ROW would happen shortly after the clearing is completed. Following the side trimming, a final mowing of debris and stump cleanup will be completed. Where permission of the landowner has been obtained, stumps of tall-growing species will be treated with herbicide to discourage re-growth. Trees that could present a danger to the safe operation of the project will also be removed or pruned for safety and to maximize reliability, including trees outside of the project ROW that could hit the transmission line should they fall.

Transmission line structures are typically designed for installation at existing grades, meaning soil grading for installing structures would be minimal. In certain areas (typically on slopes exceeding 10 percent), working areas could be graded or leveled with fill to create a safe working area around the structure location.

The applicants would evaluate construction access opportunities by identifying existing transmission line easements, roads, or trails that exist near the permitted route. In most cases, construction activities can be limited to the easement area. In certain circumstances, additional off-easement access could be required. Permission would be obtained from landowners prior to using off-easement access.

Improvements to existing access or construction of new access could be required to accommodate construction equipment. Field approaches and roads could be constructed or improved. Where applicable, the applicants would obtain permits for new access from local road authorities. The applicants would also work with appropriate road authorities to properly maintain roadways traversed by construction equipment. The applicants would be required to comply with the requirements of their Stormwater Pollution Prevention Plan (SWPPP) and Vegetation Management Plan (VMP), as required by their NPDES/SDS construction stormwater permit and Commission route permit, respectively, to prevent the spread of invasive species.

3.4.4 Construction Activities

Construction would require the use of many different types of construction equipment including tree removal equipment, mowers, cranes, backhoes, digger-derrick line trucks, drill rigs, dump trucks, front-end loaders, bucket trucks, bulldozers, flatbed tractor-trailers, flatbed trucks, pickup trucks, concrete trucks, helicopters, and various trailers or other hauling equipment. Excavation equipment is often set on wheeled or track-driven vehicles. Construction crews would attempt to use equipment, when opportunities are available, that minimize impacts.

3.4.4.1 Foundation and Pole Installation

After ROW clearing and access preparation has been completed, existing facilities would be located with Gopher State One Call, and structure and foundation installation would begin. Most project structures would require a drilled pier, concrete foundation. Drilled pier foundations, which consist of large diameter concrete cylinders and reinforced steel, are typically between seven to fourteen feet in diameter and are typically 25 to 80 feet deep. The actual diameter and depth of the hole (and foundation) depend on structure design and soil conditions that are determined during the initial survey and soil testing phases. Concrete would be brought to the site by concrete trucks from a local concrete batch plant and filled around a steel rebar support cage and anchor bolts. Once the foundation is cured, the structure is installed and bolted to the foundation.

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

For the substations, installation of concrete foundations and embedments for equipment would require the use of concrete trucks and pumpers, vibrators, forklifts, boom trucks, and large cranes. The limit of disturbance would be contained within the footprint of the substations for both the foundation equipment and the concrete delivery trucks. Topsoil from the substation footprints would be removed to a pre-established location suitable for storage. The storage area would be near the site where the soil was removed, accurately located (global positioning system [GPS] boundary, soil depth) and graded to facilitate stabilization by revegetation. Subsoil would be removed, if necessary, to an acceptable pre-established and approved area for storage.

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

3.4.4.2 Conductor Stringing

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

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

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

3.4.4.3 Aerial Marker Installation

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

3.4.5 Restoration and Cleanup Procedures

The applicants indicate that crews would attempt to minimize ground disturbance whenever feasible, but areas would be disturbed during the normal course of work. Once construction is completed in an area, disturbed areas would be restored to their original condition to the maximum extent feasible and in accordance with the VMP as provided in the applicants' route permit application. Temporary restoration before the completion of construction in some areas along the ROW may be required per NPDES/SDS construction stormwater permit requirements.

After construction activities have been completed, a representative would contact the property owner to discuss any damage that has occurred as a result of the project. This contact may not occur until after the applicants have started restoration activities. If fences, drain tile, or other property have been damaged, the applicants would repair damages or reimburse the landowner to repair the damage.

The applicants would restore or compensate farmers for crops, fences, or other property damaged during construction, including future year crop loss due to soil compaction. The damaged area would be measured, yield determined in consultation with the farmer, and paid at current market rates.

Ground-level vegetation that is disturbed or removed from the ROW during project construction would be allowed to naturally reestablish pre-construction conditions. Vegetation that is consistent with substation site operation outside the fenced area would be allowed to reestablish naturally. Areas with significant soil compaction or other disturbance from construction activities would require additional assistance in reestablishing the ground-level vegetation and controlling soil erosion. In these areas, the applicants would use seed that is noxious weed-free to reestablish vegetation.

Another aspect of restoration relates to the roads used to access staging areas or construction sites. After construction activities are complete, the applicants would restore township, city, and county roads used for purposes of access during construction to their prior conditions. The applicants would coordinate with township road supervisors, city road personnel, or county highway departments to document existing road conditions and address any issues that arise with roadways during construction for adequate road restoration, if necessary, after construction is complete.

3.4.6 Maintenance Procedures

The applicants would be responsible for the operation and maintenance of this project. Regular maintenance and inspections would be performed throughout the life of the project to continue providing safe and reliable performance. The typical service life of a high-voltage transmission line is 50 to 80 years, but they are seldom completely retired.

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

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

3.4.6.1 Outages and Emergency Response

Transmission infrastructure has few mechanical elements and is built to withstand normal weather extremes. Except for outages due to severe weather such as tornadoes and heavy ice storms, transmission lines rarely fail.

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

However, unplanned outages of transmission facilities can happen for a variety of reasons. Unplanned outages can occur due to mechanical failures or severe weather like heavy ice, wind, and lightning. In the event an unplanned outage along the project occurs, the applicants would be responsible for returning the line to service.

3.5 Project Costs

The applicants developed route-specific costs (using 2022 dollars) based on the estimates developed for the certificate of need application.

There are several main components of the cost estimates, including (1) transmission line structures and materials; (2) transmission line construction and restoration; (3) transmission line permitting and design; and (4) transmission line ROW acquisition. In addition, a risk reserve is also included in the estimate. To calculate an appropriate risk reserve, the applicants identified potential risks that could result in additional costs. These risks could include, for example: a higher than expected cost of land for acquiring ROW, a higher than expected rate of eminent domain and/or Buy-the-Farm elections (see Minnesota Statute § 216E.12, subd. 4), additional mitigations for environmental sensitivities and market fluctuations in material pricing. Once these risks were quantified, they were added to the base project cost to develop a range of costs for the project.

On May 28, 2024, the applicants provided an updated cost estimate based on updates to the design that were not known at the time the certificate of need application was filed and increased labor and material costs since the previous estimate was developed. Based on this updated estimate, the capital cost of the project is anticipated to be between \$465 million and \$535 million, escalated to the anticipated year and depending on the alignment selected. These costs include approximately \$300,000 to \$500,000 for establishing a fiber optic regeneration station along the project. Additional details are provided by routing alternative within each subregion throughout Chapters 5 through 7.

Based on historic operations and maintenance costs for other 345 kV transmission lines on their systems, the applicants anticipate the operation and maintenance costs of the project to be between \$500 and \$1,000 per mile annually for routine activities such as line inspections and vegetation management. Actual line-specific maintenance costs will depend on a variety of factors, such as repairs and replacements of damaged equipment, the amount of vegetation management necessary, storm damage occurrences, structure types, materials used, and the age of the line.

3.6 Project Schedule

It is anticipated that the Commission will make its decision on the applicants' route permit application in spring 2026. The applicants expect that additional project permitting will be complete by the first quarter of 2028, including all federal, state, and local agency permits. Following permitting, ROW clearing would begin, with construction expected to begin shortly after in the second quarter of 2028. The transmission line is anticipated to be operational between the fourth quarter of 2030 and the fourth quarter of 2031.

4 Affected Environment, Potential Impacts, and Mitigation Measures

This chapter provides a general understanding of the resources in the project area, an overview of the general human and environmental resources that could be impacted by construction and operation of the project, and ways to avoid, minimize, and mitigate these impacts. It prepares the reader for Chapters 5 through 7 which discuss potential impacts relative to the routing alternatives within each subregion of the project.

4.1 Describing Potential Impacts and Mitigation

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

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

Direct impacts are caused by the proposed action and occur at the same time and place. An indirect impact is caused by the proposed action but is further removed in distance or occurs later in time. This EIS considers direct and indirect impacts that are reasonably foreseeable, which means a reasonable person would anticipate or predict the impact. Cumulative potential effects (Chapter 10) are the result of the incremental impacts of the proposed action in addition to other projects in the environmentally relevant area.

4.1.1 Terms and Concepts

Understanding the impacts of the proposed and alternative routes involves contextualizing their duration, size, intensity, and location. This form of contextual information serves as the basis for assessing the overall project impacts on resources. To provide appropriate context, the following terms and concepts are used to describe and analyze potential impacts:

> **Duration** Impacts vary in length. Short-term impacts are temporary and generally associated with construction. Long-term impacts are associated with operation and usually end with decommissioning and reclamation. Permanent impacts extend beyond the decommissioning stage.
>
> **Size** Impacts vary in size. To the extent possible, potential impacts are described quantitatively, for example, the number of impacted acres or the percentage of affected individuals in a population.

Uniqueness Resources are different, varying in type, extent, quality, and quantity. Common resources occur frequently, while uncommon resources are not ordinarily encountered.

Location Impacts are location dependent. For example, common resources in one location might be uncommon in another.

This EIS analyzes potential impacts of the project on various resources. The context of an impact – in combination with its anticipated on-the-ground effect – is used to determine an impact intensity level, which can range from highly beneficial to highly harmful.

Impact intensity levels are described using qualitative descriptors, which are explained below. These qualitative terms do not convey value judgments; rather, they serve as a mechanism to establish a shared understanding among readers and facilitate the comparison of potential impacts between different routing alternatives.

Negligible impacts do not alter an existing resource condition or function and are generally not noticeable to an average observer. These short-term impacts affect common resources.

Minimal impacts do not considerably alter an existing resource condition or function. Minimal impacts might, for some resources and at some locations, be noticeable to an average observer. These impacts generally affect common resources over the short- or long-term.

Moderate impacts alter an existing resource condition or function and are generally noticeable to the average observer. Impacts might be spread out over a large area making them difficult to observe but can be estimated by modeling or related simulation. Moderate impacts might be long-term or permanent to common resources, but generally short- to long-term to uncommon resources.

Significant impacts alter an existing resource condition or function to the extent that the resource is impaired or cannot function. Significant impacts are likely noticeable or predictable to the average observer. Impacts might be spread out over a large area making them difficult to observe but can be estimated by modeling. Significant impacts can be of any duration and affect common or uncommon resources.

Also discussed in this chapter are opportunities to mitigate by avoiding, minimizing, or rectifying for potential impacts. Collectively, these actions are referred to as mitigation.

Avoiding an impact means to eliminate it altogether, for example, by not undertaking parts or all of a project, or relocating the project.

Minimizing an impact means to limit its magnitude, for example, by reducing project size or moving a portion of the project.

Rectifying an impact means fixing it by repairing, rehabilitating, or restoring the affected resource, or compensating for it by replacing it or providing a substitute resource elsewhere. Rectifying an impact can be used when an impact cannot be avoided or further minimized.

Some impacts can be avoided or minimized; some might be unavoidable but can be minimized; others might be unavoidable and unable to be minimized but can be rectified. The level at which an impact can be mitigated might change the impact intensity level.

4.1.2 Regions of Influence

Potential impacts on human and environmental resources are analyzed within specific geographic areas (ROI). The ROI is the geographic area where the project might exert some influence and is used as the basis for assessing potential impacts. ROIs vary by resource and potential impact, as shown in Table 4-1. As necessary, the EIS discusses potential impacts and mitigation measures beyond the identified ROI to provide appropriate context. Direct impacts within the ROI might cause indirect impacts outside the ROI.

This EIS uses the following ROIs:

Right-of-way – the ROW is 150 feet wide (75 feet on each side of the anticipated alignment) and is described in Section 3.3.2.

Route width – the route width is generally 1,000 feet wide (500 feet on each side of the anticipated alignment). The route width varies for the new fiber optic regeneration station, to accommodate various easements, and for flexibility in areas with routing constraints (Map 6; Section 3.3.1). Any varying route width requested by the applicants was reviewed as part of the analysis of routing alternatives and the summary of potential impacts. However, in order to make a like for like comparison of routes, the 1,000 feet wide route, centered on the anticipated alignment, was used for comparison. Varying route width areas were reviewed on a case-by-case bases to identify resources in those areas that may be impacted.

Local vicinity – within 1,600 feet of the anticipated alignment (in other words, a 1,600-foot buffer measured from the anticipated alignment creating a 3,200-foot-wide area centered on the anticipated alignment).

Project area – within one mile of the anticipated alignment (in other words, a one-mile buffer measured from the anticipated alignment creating a two-mile-wide area centered on the anticipated alignment).

Five-county area – term used to collectively describe the five counties in which the project would be constructed (including Big Stone, Swift, Stevens, Pope, and Douglas counties).

Table 4-1 Regions of Influence

Resource Type	Resource Element	Region of Influence
Human settlement	Aesthetics	Local vicinity
	Cultural values	project area
	Displacement	ROW
	Electronic interference	ROW
	Environmental justice	Route width
	Land use and zoning	ROW
	Noise	Local vicinity
	Property values	Local vicinity
	Recreation	Route width
	Socioeconomics	Five-county area
	Transportation and Public Services	Roadways and rail – local vicinity Public utilities – ROW Emergency services – five-county area Airports – project area
Human health and safety	Electromagnetic fields	ROW
	Implantable medical devices	ROW
	Public and worker safety	ROW
	Stray voltage	ROW
	Induced voltage	ROW
Land-based economies	Agriculture	Route width
	Forestry	Route width
	Mining	Route width
	Tourism	Local vicinity
Archaeological and historic resources	Archaeological and historic resources	Route width

Resource Type	Resource Element	Region of Influence
Natural environment	Air quality	Project area
	Climate	Five-county area
	Geology and topography	ROW
	Greenhouse Gases	Five-county area
	Groundwater	Route width
	Public and designated lands	Route width
	Rare and unique natural resources	Protected species - project area Sensitive ecological resources – route width
	Soils	ROW
	Surface water	Route width
	Vegetation	ROW
	Wetlands	Route width
	Wildlife (except birds)	Route width
	Wildlife (birds)	Local vicinity
	Wildlife habitat	Route width

4.2 Use or Paralleling of Existing Rights-of-way

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

Opportunities for ROW sharing or paralleling for the project include those associated with public roads and existing transmission lines. The feasibility of the project sharing different types of rights-of-way varies. There is minimal opportunity (less than 5 miles) for ROW sharing with pipelines, mostly in the Alexandria Subregion (Map 7-8 and Map 7-9). ROW sharing with pipelines would require further studies to understand potential AC interference impacts. Exact locations for ROW sharing would be finalized after a route is selected and would be determined through further coordination efforts as described below.

When paralleling existing road rights-of-way, the applicants propose to place structures on adjacent private property with a 20-foot offset from the existing road ROW, subject to easements with landowners and road authority design requirements that could affect the offset distance. Placing transmission line structures adjacent to and outside public road ROW can reduce the amount of new ROW required on adjacent land parcels while minimizing the potential relocation of the transmission line in the future due to road projects. Such ROW sharing is subject to the applicable road authority's approval. The amount of ROW overlap is typically determined by the space needed to safely operate the roadway and transmission line, and to safely provide maintenance access to both the roadway and transmission line.

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

Several opportunities exist for sharing or paralleling existing ROW— transmission line, road, or railway. Specific analysis and comparisons of ROW paralleling between the different routing alternatives are discussed in the relevant sections of Chapters 5 through 7.

4.3 Human Settlement

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

Impacts to human settlements resulting from the project are anticipated to range from minimal to significant depending on the route selected. Impacts to human settlements could be minimized by prudent routing (that is by choosing routing alternatives that avoid residences, businesses, and other places where citizens congregate). Impacts could also be mitigated by limiting the aesthetic impacts of the structures themselves and by using structures which are, to the extent possible, harmonious with human settlements and activities.

4.3.1 Aesthetics

The ROI for aesthetics is the local vicinity. Because aesthetic impacts are subjective, the potential impacts can vary widely and be unique to each person. Impacts are largely assessed by reviewing the number of nearby residences and opportunities for ROW paralleling. Potential impacts might dissipate over time depending on the individual. Impacts will be short- and long-term as well as localized. Potential impacts are unavoidable but can be minimized.

4.3.1.1 Existing Conditions

Aesthetics refers to the visual quality of an area as perceived by the viewer and forms the impression a viewer has of an area. Aesthetics are unique to the human subject or population, meaning their relative value, held individually or communally, depends upon several factors that may include perception, and the strength of values, history, and memory, held either individually or communally resulting in potentially varied and unique responses. Impacts from aesthetic changes are expected to be equally diverse, depending upon individual perception of impact, degree of aesthetic change, strength of commitment to the unimpacted aesthetic, and acceptance of the project. This means that how an individual values aesthetics and reacts to their change, especially perceived impacts to a viewshed, can vary greatly.

The aesthetic and visual resources of a landscape are defined as the existing natural and built features which affect the visual quality and character of an area. Determining the relative scenic value or visual importance in any given area depends, in large part, on the individual viewer, or community of viewers, whose perceptions are shaped by their values and experiential connection to the viewing area, as well as their physical relationship to the view, including distance to structures, perspective, and duration of the view. Viewsheds might be important regardless of whether they are considered beautiful by the observer, for example, a scattered stone foundation of a historical resource.

For this document, it is assumed that landscapes which are, for the average person, harmonious in form and use are generally perceived as having greater aesthetic value. Infrastructure which is not harmonious with a landscape or affects existing landscape features reflects a change in the aesthetic view that for some, or many, could negatively affect a viewer's perception and expectation of the area. Assessing visual quality reflects the difference between the landscape change and the individual or communal reaction to that change. As noted above, individual or communal perspectives are complex, affected by individual or shared values and experiences with the land. As such, some viewers could perceive the project setting as having high visual quality while others might perceive the area to have less visual quality. Perceived aesthetics can carry more weight when they are tied to a specific feature, like residential properties, scenic byways, or historic/archaeological/natural features. This is a key reason among those that prefer to co-locate new infrastructure in the built environment (utility corridors, road, railways, pipelines).

Aesthetic impacts would be greater for residential properties partially or wholly surrounded by the addition of new transmission lines. This would occur when a residential property has one or more existing transmission lines either paralleling the property boundaries or otherwise crossing the property, and the project would add a transmission line to one or more additional sides of the parcel boundary. Potential aesthetic impacts to properties including areas where the new project transmission line would box in a property or areas where the proximity of two or more structures create a pinch point are discussed further in Section 5.2.2.1 (Big Stone Subregion), Section 5.3.2.1 (Swift Subregion), Section 6.2.2.1 (Hancock Subregion), and Section 7.2.2.1 (Alexandria Subregion).

Throughout the local vicinity, the topography is generally flat, with areas of rolling plains and occasional hills and sloping near major waterbodies. The vegetation is uniformly low, primarily consisting of cultivated crops and meadows, which could cause some areas to be more susceptible to visual disruptions. There are watercourses (streams and rivers) in the project area that create some diversity in landscape, including the Minnesota River. Rural residences and farmsteads are scattered across the project's viewshed and along rural county roads.

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

Horizontal elements, such as highways and county roads, are consistent with the long and open viewsheds along most of the open spaces within the project area. Vertical elements such as transmission lines and wind turbines are visible from considerable distances and are the tallest and most dominant visual feature on the landscape where present. Large wind (generally 25 MW or greater) and solar (generally 50 MW or greater) projects that require a site permit from the Commission are not near the project. Other buildings that stand out on the landscape but are less dominant visual features include grain handling systems, silos, communication towers, and the like.

Scenic byways are public roadways in areas of regionally significant scenic, natural, recreational, cultural, historic, or archaeological resources (reference (10)). A Scenic byway corridor is managed to protect its character and to encourage economic development through tourism and recreation. The routing alternatives cross three scenic byways, including the Highway 75 King of Trails Scenic Byway (consisting of Highway 75), the Glacial Ridge Trail Scenic Byway (consisting of CSAH 28 and MNTH 29), and the Minnesota River Valley Scenic Byway (consisting of Highway 7 and 75). Potential aesthetic impacts to these three scenic byways are discussed in Section 5.2.2.1 (Big Stone Subregion) and Section 7.2.2.1 (Alexandria Subregion).

The Minnesota River is the only wild, scenic, and recreational river to cross any of the routing options for the project. The Minnesota River crosses S104, South 1, and South 2 in the Big Stone Subregion near the start of the route.

4.3.1.2 Potential Impacts

The project's transmission line structures and conductors would create aesthetic impacts. The proposed structures would typically range in height from approximately 120 to 180 feet tall; where existing transmission lines are crossed, structure heights could be up to 180 feet tall. Transmission lines with new ROW will be designed such that vegetation clearing will use the typical 150-foot ROW width. The degree of aesthetic impacts depends on the following factors.

- Proximity to homes, schools, churches, etc., where relatively more observers are present to experience aesthetic impacts.
- Views valued by the public at large, for example, scenic overlooks or scenic byways;
- Residential properties where a new transmission line would result in the parcel being boxed in.
- Locations where people recreate or otherwise enjoy leisure activities.
- Proximity to natural features like watercourses, waterbodies, wetlands, trees, prairie, or other areas free from human disturbance.

- The types of structures and structure designs used for the project.
- Placing structures on the opposite side of a road from existing transmission structures introducing an additional visual element.
- Paralleling and/or sharing ROW with existing transmission lines would minimize impacts relative to existing human modifications to the landscape.
- Paralleling and/or sharing other types of existing ROW where the project would have an incremental impact relative to existing horizontal elements, such as highways and county roads.

4.3.1.3 Mitigation

4.3.1.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.3.7, contains the following mitigation related to aesthetics:

- "The Permittee shall consider input pertaining to visual impacts from landowners or land management agencies prior to final location of structures, rights-of-way, and other areas with the potential for visual disturbance."
- "The Permittee shall use care to preserve the natural landscape, minimize tree removal and prevent any unnecessary destruction of the natural surroundings in the vicinity of the Transmission Facility during construction and maintenance."
- "The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads."
- "The Permittee shall place structures at a distance, consistent with sound engineering principles and system reliability criteria, from intersecting roads, highways, or trail crossings."

4.3.1.3.2 Other Proposed Mitigation

In their scoping comment letter for the project, (scoping comment #71; reference (2)), MNDOT recommended site-specific assessments be conducted during project design depicting photo and visual simulations for users of scenic byways to minimize impacts.

The primary strategy for minimizing aesthetic impacts is prudent routing—that is, choosing routes where a transmission line is most harmonious with the landscape. Other minimization and mitigation measures include:

- Maximizing ROW sharing and/or paralleling with existing linear rights-of-way (for example, transmission lines, roadways, and railroads) to minimize incremental aesthetic impacts.
- Avoiding routing through areas with high-quality, distinctive viewsheds.
- Crossing rivers and streams using the shortest distance possible (that is, perpendicular to the waterbody).

- Reducing structure heights to minimize impacts within scenic areas.
- Using structures and structure designs that minimize impacts.
- Using construction methods that minimize damage to vegetation near the transmission line.
- Including specific conditions in individual easement agreements with landowners along the route (for example, requiring vegetative buffers or other landscaping).
- Using the protections of Minnesota Statute § 216E.12, subdivision 4 (commonly known as the "Buy the Farm" statute), where available, to move residents away from potential aesthetic impacts.

4.3.2 Cultural Values

The ROI for cultural values is the project area. Impacts associated with rural character and sense of place are expected to be dependent on the individual. These impacts would be localized, short- and long-term, but might diminish over time. For nearby residents that place high value on rural character and a sense of place, impacts within view such as new infrastructure on private property could be more moderate. Impacts to community unity are not anticipated to occur. Impacts are unavoidable but expected to be minimal. Impacts to cultural values are independent of the route selected.

4.3.2.1 Existing Conditions

Cultural values can be described as shared community beliefs or attitudes that define what is collectively important to the group. These values provide a framework for both individual and communal thought and action. Cultural values can be informed by history and heritage, local resources, economy, local and community events, and common experiences. Cultural values are also informed by the work and recreational pursuits of residents and by geographical features.

The highly visible, industrial look and feel of utility projects can erode the rural feeling that is part of a resident's sense of place. Infrastructure projects believed inconsistent with cultural values can deteriorate community character. Those found consistent with these values can strengthen it. Projects can invoke varying reactions and can, at times, weaken community unity.

The project traverses land that has been home to a variety of people and cultures over time. The project area was populated primarily by Dakota and Ojibwe peoples in the early to mid-1800s. Most lands in the local vicinity of the project were ceded to the U.S. government over the course of the three treaty areas that the project intersects: the 1847, 1851 and 1858 treaties. Existing conditions are discussed below for both the pre-contact period (prior to European settlement of the project area) and the post-contact period.

4.3.2.1.1 Tribal and Indigenous Peoples – Historical

In 1847, two treaties were signed between the United States government and several bands of the Ojibwe, resulting in significant land cessions in what are now the states of Minnesota and Wisconsin.

These treaties were negotiated under pressure from growing settler expansion and U.S. government interests in the region's natural resources, particularly white pine forests and access to navigable waterways.

The first treaty, signed at Fond du Lac, ceded lands in the western portion of Lake Superior, including areas near the St. Louis River. The second treaty, signed at Leech Lake and later amended in Washington, D.C., involved the cession of approximately 10 million acres of land across north-central Minnesota and northern Wisconsin. These lands were central to Ojibwe lifeways, supporting traditional hunting, fishing, and gathering practices tied to the region's waterbodies, rivers, and forests.

While the treaties transferred title to the federal government, they also explicitly reserved the rights of the Ojibwe to continue using the ceded lands for hunting, fishing, and gathering. These reserved (usufructuary) rights have been reaffirmed through case law and are vital to the continuation of Ojibwe cultural and subsistence practices. From a tribal resources perspective, these treaty rights are not merely historical. They remain active, legally protected, and essential to the exercise of tribal sovereignty and stewardship today.

The Treaty of Traverse des Sioux in 1851, between the Sisseton and Wahpeton bands of the Dakota and the U.S. government, ceded much of the southeastern portion of the Minnesota territory. The Sisseton and Wahpeton bands were in areas that had been overhunted and depleted of animals. While many of the Sisseton and Wahpeton Dakota leaders had concerns and did not support the treaties, a consensus was eventually reached that they believed would help supplement their struggling hunting and gathering economy as the land cession treaty offered annuity payments and a way to get through the hard times (reference (6)). When signed, the treaty ceded 24 million acres for $1,665,000. A reservation, consisting only of a ten-mile-wide area on each side of the Minnesota River, was retained for the tribes (reference (7)). In addition, the U.S. government kept more than 80 percent of the money, leaving the Dakota to receive the interest on the amount, at five percent for 50 years (reference (8)). The Dakota Leaders also signed the "Traders Papers," which unfairly siphoned substantial funds from the treaty to pay alleged Dakota debts to settler fur traders (reference (6)).

After the Treaty of Traverse de Sioux was signed by the upper bands of the Dakota, the treaty delegation travelled to the lower bands of the Dakota. The Treaty of Mendota was also signed in 1851, between the Mdewakanton and Wahpekute bands of Dakota. At the time, the Mdewakanton and Wahpekute were not as in need of food and goods to support their tribes as the upper bands were. The Mdewakanton and Wahpekute leaders asked that annuity from the Treaty of 1837 be paid before further discussion could occur and attempted to change the boundaries of the proposed reservation. Under this treaty, the bands were to receive annual annuities of $1,410,000 (reference (9)). The bands were given one year to move to the same reservation land along the Minnesota River outlined in the Treaty of Traverse des Sioux (reference (7)).

The 1858 Land Cession Treaties with the Mdewakanton, Wahpekute, Sisseton and Wahpeton Dakota bands happened one month after Minnesota became the 32nd state to join the Union. Dakota leaders were summoned to Washington, DC, and then "they were detained until they signed another treaty relinquishing all land north and east of the Minnesota River to the United States (reference (8))."

In 1858, the United States government entered into treaties with the Mdewakanton and Wahpekute Dakota (Treaty of June 19, 1858) and separately with the Sisseton and Wahpeton Dakota (Treaty of June 20, 1858). These agreements were negotiated under intense political pressure and economic coercion, amid a backdrop of rapid settler encroachment and statehood ambitions for Minnesota (reference (10)). In exchange for ceding their lands, the Dakota were promised permanent reservations along the Minnesota River, along with annuities, goods, and services (reference (11)). However, the federal government's repeated delays, mismanagement, and failure to uphold treaty obligations contributed to severe hardship for the Dakota people and growing unrest in the following years.

These treaties therefore represent a pivotal moment of profound loss for the Dakota people, as they required ceding most of their remaining lands in southern Minnesota, including significant portions of the Minnesota and Mississippi River valleys—lands that had sustained the Dakota for generations.

4.3.2.1.2 Tribal and Indigenous Peoples – Present Day

There are currently 11 federally recognized American Indian Tribes with reservations in Minnesota. These include seven Ojibwe reservations and four Dakota reservations (reference (12)). The four Dakota communities include: Shakopee Mdewakanton located south of the Twin Cities near Prior Lake; Prairie Island located near Red Wing; Lower Sioux located near Redwood Falls; and Upper Sioux whose lands are near the city of Granite Falls. As discussed in Section 4.3.2.1.1, the original Dakota reservation was established by treaty in 1851 and included a 10-mile-wide strip of land on both sides of the Minnesota River. However, following the U.S.-Dakota War of 1862, Congress revoked all treaties made with the Dakota, who were then forcibly removed from the state. The four present-day Dakota reservations were reestablished in their current locations by acts of Congress in 1886 (reference (12)).

The seven Ojibwe reservations include: Grand Portage in the northeast corner of the state; Bois Forte in extreme northern Minnesota; Red Lake in extreme northern Minnesota west of Bois Forte; White Earth in northwestern Minnesota; Leech Lake in the north central portion of the state; Fond du Lac in northeast Minnesota west of the city of Duluth; and Mille Lacs in the central part of the state, south and east of Brainerd (reference (12)).

Minnesota tribes are sovereign nations, meaning they have the inherent authority to govern themselves within U.S. borders (reference (13)). This sovereignty predates the formation of the United States and is rooted in the fact that tribes were self-governing long before European contact. In practice, tribal sovereignty supports Native nations' rights to preserve their cultures, protect natural resources, and pursue community development according to their own priorities.

The eleven tribes in Minnesota operate their own natural resource departments that reflect their commitment to environmental preservation for future generations. Various restoration projects have been aimed at revitalizing resources such as bison, lake trout, sturgeon, and plant populations. Traditional ecological knowledge emphasizes that caring for the land means it will care for you in return. This belief is deeply rooted in the spiritual and cultural importance of flora and fauna, as well as sacred burial sites. Plants such as cedar, sage, sweetgrass, and tobacco, are considered sacred and used for ceremonial purposes and their healing properties (reference (13).

Outside of the 11 federally recognized tribes in Minnesota, there are additional tribes with ancestral ties to Minnesota. According to the United States Department of Housing and Urban development Tribal Directory Assessment Tool (reference (14)), Tribes with historic cultural interest or ancestral ties in the project area include the following:

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

While there is no federally recognized tribal land (i.e., reservations) in the project area, the Minnesota River Valley is an area of cultural significance for the Upper Sioux and Lower Sioux Indian Communities, as well as other Tribal Nations whose ancestors previously inhabited the project area. The Upper Sioux Community and Lower Sioux Community reservations are the closest reservations to the project area.

The Upper Sioux Community is a federally recognized Indian tribe in Yellow Medicine County, approximately six miles southwest of the city of Granite Falls. There are around 600 enrolled members (reference (15)). The Upper Sioux Community refers to the area surrounding the Minnesota River as Pezihutazizi Kapi (the Place where they dig for yellow medicine). The Upper Sioux Community holds a traditional Wacipi (that is, powwow) annually in Granite Falls on the first weekend in August. Wacipi is a cultural tradition that brings generations together to dance, sing, and celebrate their heritage. The Upper Sioux Community also has Native American Heritage nights, where for example community members can bus together to a Timberwolves game (reference (16)).

The Lower Sioux Indian Community is a federally recognized Indian tribe in Redwood County, approximately two miles south of the city of Morton. There are around 930 enrolled members, and over half reside on Tribal lands. The Lower Sioux Indian Community manages the Lower Sioux Agency Historic Site in Morton, which is the site where the U.S.-Dakota War started in 1862. The Lower Sioux Indian Community government website lists many community-focused events throughout the year. The Lower Sioux Indian Community holds an annual Wacipi in the Land of Memories Park in Mankato during the third weekend in September, and also coordinates the Cansa'yapi Food Pantry, Little Crow Spiritual Run, Valentines Day UNITY Bake Sale, 3-Man scramble golf tournament, learning events, and other holiday events (reference (17)).

4.3.2.1.3 Local Counties

Today, the project area is predominantly in a rural setting with agriculture-based economies. Corn and soybean crop production, livestock operations, and associated industries drive the local agricultural economy. Protection of the land and the ability to continue to farm are strong values in farming and agricultural communities. Commenters have noted that farming and ranching are part of the cultural fabric of the region (reference (2)).

Big Stone, Douglas, Pope, Stevens, and Swift counties are in the west-central region of Minnesota. The ecosystems transition from prairie to forests as you travel west to east. The region still contains remnants of tallgrass prairie (e.g., Big Stone Lake State Park prairie SNA) amid rolling farmland, lakes, and wetlands (reference (18)). It features rolling hills, hundreds of lakes, and a blend of prairie, savanna, and deciduous forest ecosystems.

Big Stone County's community and culture are rooted in its rural heritage and natural landscape. Cultural institutions such as the Big Stone County Museum in Ortonville preserve and showcase regional history, Indigenous artifacts, and pioneer life (reference (18)). The local arts scene is anchored by events like the Big Stone Lake Regional Art Crawl, featuring open studios and community engagement in the visual arts. Annual community events, including the Big Stone County Fair in Clinton, Big Stone Lake Days in Ortonville, and the long-standing Corn Fest, celebrate agriculture, recreation, and local traditions through live music, family activities, and cultural programming (reference (19); reference (18)). Locally significant attractions such as the Big Stone National Wildlife Refuge, Big Stone Lake State Park, and the nearby Jeffers Petroglyphs offer ecological, educational, and cultural value, reflecting the area's deep connection to both the natural environment and its layered human history.

Douglas County supports a rich community and cultural infrastructure centered around its lake heritage, agricultural traditions, and Scandinavian roots. Key institutions such as the Legacy of the Lakes Museum in Alexandria and the Douglas County Historical Society preserve and interpret regional maritime and settler histories (references (20); (21)). The area hosts numerous community events, including the Douglas County Fair in August, the Vikingland Band Festival, and the Art DeTour open-studio tour, which collectively celebrates music, visual arts, and local talent. Cultural attractions such as the Kensington Runestone, the Big Ole Viking statue, and the Danebod Historic Complex reflect the county's deep Nordic cultural influence (reference (22)). These sites, alongside hundreds of lakes and associated trail systems, provide year-round educational and recreational opportunities for residents and visitors alike.

Pope County is defined by its lakes (notably Lake Minnewaska) and long-standing agrarian traditions (reference (23)). Cultural values in Pope County are exemplified in its largest city, Glenwood, where institutions like the Pope County Museum and Historical Society preserve and promote the region's settler, Indigenous, and Scandinavian heritage through exhibits, archival collections, and public programs (reference (24)). Annual community events such as the Pope County Community Expo showcase local businesses, arts, and family activities, while Pope County Museum events include historical lectures and Norwegian Hardanger fiddle concerts that celebrate the area's cultural roots. Notable attractions include the restored Urjans Iverson House, an 1866 log cabin listed on the NRHP, and the architecturally significant Pope County Courthouse (references (25); (26)). These landmarks, along with Lake Minnewaska's recreational amenities and the county's support for agritourism (defined in the county's land use ordinance (reference (27)) as including activities like "farm stays", "harvest-your-own", "gleaning", and "seasonal agricultural events"), form a rich and actively engaged landscape.

Stevens County's cultural identity is rooted in its agricultural heritage. Annual events such as the Stevens County Fair - featuring livestock shows, a PRCA rodeo, grandstand entertainment, and carnival attractions - serve as major community gatherings that reflect rural traditions and civic pride (reference (28)). Additional seasonal events, including Prairie Harvest Fest, Summer Auto Expo, and horticulture nights at the University of Minnesota's West Central Research and Outreach Center (WCROC), highlight the significance of agriculture to the county's identity (reference (29)). Locally significant attractions include the Stevens County Historical Society & Museum, housed in a restored 1905 Carnegie library in Morris, community art and history installations, and the WCROC Horticulture Display Gardens, which draw thousands of visitors each year (references (30); (31)).

Swift County reflects cultural values tied to its agricultural roots, immigrant heritage, and small-town community traditions. The Swift County Historical Museum in Benson offers historical exhibits, genealogical resources, and community programming such as its annual Christmas Open House featuring Scandinavian arts, music, and food (reference (32)). Cultural attractions include the historic Swift County Courthouse and the Christian F. Uytendale Farmstead, both NRHP-listed for their architectural and ethnic significance (references (33); (34)). Residents and visitors also engage with the county's natural heritage through nearby parks like Monson Lake State Park and Swift Falls Park, which offer opportunities for outdoor recreation and environmental education (reference (35)). These community institutions, seasonal events, and heritage sites play a central role in shaping the local identity of Swift County residents.

The project area contains numerous natural amenities, including native prairie, lakes, and public lands, that attract local and regional recreational users (discussed further in Sections 4.3.9 and 4.7.6). These areas provide a variety of outdoor recreational opportunities, like fishing, hunting, boating, hiking, and snowmobiling, which also contribute to the identity of area residents.

4.3.2.2 Potential Impacts

Lands within the project area were ceded to the U.S. government over the course of the 1847, 1851, and 1858 treaties. The 1847 treaty gave tribal members usufructuary rights to hunt, fish, and gather on the ceded land. BMPs during construction would be used to avoid degradation of land and water quality. The project would not interfere with ongoing treaty rights to hunt, fish, and gather.

Transmission line and substation projects have the potential to impact community and regional events during construction, primarily due to the presence of equipment and supplies on local roadways and potential temporary road closures or detours. Impacts would be minor and temporary if they occur.

Impacts associated with rural character and sense of place are expected to depend on the individual. For some residents, constructing the project might change their perception of the area's character, thus potentially eroding their sense of place. This tension between infrastructure projects and rural character creates real tradeoffs. For those residents that place a high value on rural character and a sense of place, impacts are anticipated to be moderate to significant. These impacts would be localized, short- and long-term, and may diminish over time depending on the individual.

4.3.2.3 Mitigation

4.3.2.3.1 Commission Draft Route Permit

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

4.3.2.3.2 Other Proposed Mitigation

The applicants indicated in their application that they would continue to coordinate with Tribal Nations and other potentially affected parties regarding potential impacts to cultural resources.

4.3.3 Displacement

The ROI for displacement is the ROW. Potential displacement impacts are assessed by identification of buildings within the ROW, which is based on the anticipated alignment. Residential structures within the route are quantified by subregion as part of the aesthetics assessments in Chapters 5 through 7. If non-residential buildings are within the ROW, they could be subject to displacement depending upon site-specific considerations and coordination with the applicants.

4.3.3.1 Existing Conditions

Displacement is the removal of a residence or building to facilitate the operation of a transmission line. For electrical safety code and maintenance reasons, utilities generally do not allow residences or other buildings within the ROW of a transmission line. Any residences or other buildings within a ROW have the potential to be removed or displaced. Displacements are relatively rare and more likely to occur in highly populated areas where avoiding all residences and businesses is not feasible.

There is one residence within the ROW of the routing alternatives based on anticipated alignments (Section 5.3.2.3). There are 8 non-residential structures (for example, agricultural outbuildings or animal production structures) within the ROW of the routing alternatives based on anticipated alignments.

4.3.3.2 Potential Impacts

If a residence is displaced due to the transmission line ROW route, impacts would be significant. Structures within the ROW could be displaced by the project. Though the general rule is that buildings are not allowed within the ROW of the transmission line, there are instances where the activities taking place in these buildings are compatible with the safe operation of the line. This is determined on a case-by-case basis.

4.3.3.3 Mitigation

4.3.3.3.1 Commission Draft Route Permit

The draft route permit does not have specific conditions on displacement; however, there are related conditions. In condition 5.3.7, it states, "The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads."

In condition 5.5.1, it states, "The Permittee shall design the transmission line and associated facilities to meet or exceed all relevant local and state codes, the NESC, and North American Electric Reliability Corporation requirements. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, strength of materials, clearances over roadways, right-of-way widths, and permit requirements."

4.3.3.3.2 Other Proposed Mitigation

Displacement of residential and non-residential buildings can be avoided by adjusting the placement of transmission line structures, using specialty structures, increasing structure height, or by modifying the ROW location or width. The applicants would work with landowners on a case-by-case basis to address potential displacement. The applicants might need to conduct a site-specific analysis to determine if the building would need to be displaced. Building owners would be compensated by the applicants for any buildings that are displaced.

4.3.4 Electronic Interference

The ROI for electronic interference is the ROW. Transmission lines do not generally cause interference or impacts. If electronic interference does occur, in most cases it can be mitigated by either increasing the distance or adjusting the placement of the device relative to the transmission line or other transmission line structure. If ongoing interference due to a transmission line does occur, the applicants would be required to take feasible actions to restore electronic reception to pre-project quality. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

4.3.4.1 Existing Conditions

Electronic interference refers to the disturbance of electrical circuits or equipment caused by electromagnetic radiation emitted from external sources, in this case, high-voltage transmission lines.

Transmission lines generate electric and magnetic fields (EMFs) depending on the distance from sources and the type of line configuration. The EMFs decrease as the distance increases from the conductors as discussed in Section 4.4.1 (reference (36)).

There are a number of frequency modulation (FM) and amplitude modulation (AM) radio broadcasting stations that operate or can be heard within the project area, such as KLKX-LP (98.5 FM Alexandria), KSWJ (90.9 FM Alexandria), KULO (93.3 FM Alexandria), KXRZ (99.3 FM Alexandria), KRVY-FM (97.3 FM Starbuck), KXRA (1490 AM Alexandria). There are also many television channels that broadcast throughout the project area. These channels are received from cable, satellite providers and/or digital antennas.

Several cellular towers are located within the area. Wireless internet and cellular phones use frequencies in the 900 MHz ultra-high frequency (UHF) range. There are a few microwave service towers in the area. Microwave service towers use a beam of radio waves in the microwave frequency range to transmit video, audio, or data between two locations.

GPS are used in daily life, aviation, vehicle navigation, surveying, aerial drones, and agricultural activities throughout the project area. GPS works by sending radio-frequency signals from a network of satellites to the receiver. Because of this, buildings, trees, and other physical structures have the potential to interfere with a GPS signal. GPS provides locational information for navigation between endpoints, as well as geographic orientation for farm and other equipment.

4.3.4.2 Potential Impacts

No communications structures are in the project’s ROI (the ROW) that could cause electronic interference; thus impacts are not expected. Two registered antenna structures are within the route width of the Alexandria Subregion, two microwave service towers are within the route width of the Swift Subregion, and no cellular towers are within any route width.

No GPS impacts are expected from the construction or operation of the project. Research evaluating the potential for interference in the use of GPS satellite-based microwave signals under or near power line conductors indicates it is unlikely that there would be electronic interference while using GPS (reference (37)). Interference would be more likely near a transmission line structure, and unlikely under a transmission line (reference (38)) due to shadow effects. Shadow effect is described and discussed below.

Electronic interference from transmission lines can impact electronic communications like radios, television, and microwave communications in three ways: corona noise, shadowing effect and gap discharge.

Corona is a small electrical discharge along the surface of the conductor that ionize surrounding air molecules. Corona on transmission line conductors can also generate electromagnetic noise at similar frequency bands that are utilized for radio and television signals, which can result in radio and television interference. Corona interference from transmission lines causes the greatest disturbance in a relatively narrow frequency spectrum, in the range of about 0.1 to 50 megahertz (MHz) (reference (39)). Because most communication and media signals including Wireless internet and cellular phones use frequencies in the 900 MHz UHF range, impacts to these communication signals would be limited.

Corona "noise" primarily occurs in the radio frequency range of AM signals. This generated noise typically occurs underneath a transmission line. It dissipates rapidly as the distance increases from the transmission line. FM radio receivers usually do not pick up interference from transmission lines because corona-generated radio frequency noise currents decrease in magnitude with increasing frequency and are quite small in the FM broadcast band (reference (40)). In most cases, the strength of the radio or television broadcast signal within a broadcaster's primary coverage area is great enough to prevent interference. Additionally, due to the higher frequencies of television broadcast signals (54 MHz and above) a transmission line seldom causes reception problems within a station's primary coverage area. Anticipated electric fields are below levels expected to produce significant levels of corona.

Shadowing effect occurs when communication signals are physically blocked. This primarily can impact two-way mobile radio communications and television signals. Digital and satellite television transmissions are more likely to be affected by shadowing generated by nearby towers. Interference could occur if the device was located immediately adjacent to a tower structure, blocking its signal. While television interference is rare, it can happen when a structure is aligned between a receiver and a weak, distant signal. Telecommunication towers can be susceptible to the shadowing effect; however, impacts are not anticipated given no telecommunication towers are located in the ROW.

Gap discharge interference is the most noticed form of power line interference with radio and television signals, and typically the most easily fixed. Gap discharges are usually caused by hardware defects or abnormalities on a transmission or distribution line causing small gaps to develop between mechanically connected metal parts. As sparks discharge across a gap, they create the potential for electrical noise, which, in addition to audible noise, can cause interference with radio and television signals. The degree of interference depends on the quality and strength of the transmitted communication signal, the quality of the receiving antenna system, and the distance between the receiver and the power line. Because gap discharges are a hardware issue, they can be repaired relatively quickly once the issue has been identified. Thus, interference impacts from gap discharge are expected to be minimal.

4.3.4.3 Mitigation

4.3.4.3.1 Commission Draft Route Permit

The draft route permit condition 5.4.3, contains the following mitigation related to electronic interference: "If interference with radio or television, satellite, wireless internet, GPS-based agriculture navigation systems or other communication devices is caused by the presence or operation of the Transmission Facility, the Permittee shall take whatever action is necessary to restore or provide reception equivalent to reception levels in the immediate area just prior to the construction of the Transmission Facility. The Permittee shall keep records of compliance with this section and provide them upon the request of Commerce or Commission staff."

4.3.4.3.2 Other Proposed Mitigation

The applicants committed to the following mitigation measures:

- Project hardware would be designed and maintained to minimize corona and gap discharges.
- If television or radio interference is caused by or from the operation of the project in those areas where good reception was available prior to construction of the project, the applicants would evaluate the circumstances contributing to the impacts and determine the necessary actions to restore reception to the present level. Potential mitigation measures may include making the appropriate modifications to the receiving antenna system.
- In the unlikely event that the project causes interference within a television station's primary coverage area, the applicants would work with the affected viewers to correct the problem at the applicants' expense. This problem can usually be corrected with the addition of an outside antenna.

4.3.5 Environmental Justice

The ROI for environmental justice (EJ) is the route width. Potential EJ impacts are assessed by first identifying if any census tracts meet a definition of an EJ area based on its socioeconomic information. Census tracts meeting an EJ definition are reviewed to consider if those residents would be disproportionally affected by the project. The project is not expected to increase burden indicators in the EJ areas of concern within the ROI. For all EJ communities, impacts are expected to abate after construction, thus they will be localized and temporary. Therefore, disproportionate adverse impacts to these populations are possible but expected to be minimal.

4.3.5.1 Existing Conditions

Environmental justice is the "fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income, with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (reference (41))." The "fair treatment" goal is not to shift risks among populations, but to identify potential disproportionately high and adverse effects and identify alternatives that may mitigate these impacts. Two analysis methods were used to determine whether there were any EJ areas within the ROI, the MPCA's online mapping tool and a U.S. Census populations comparison.

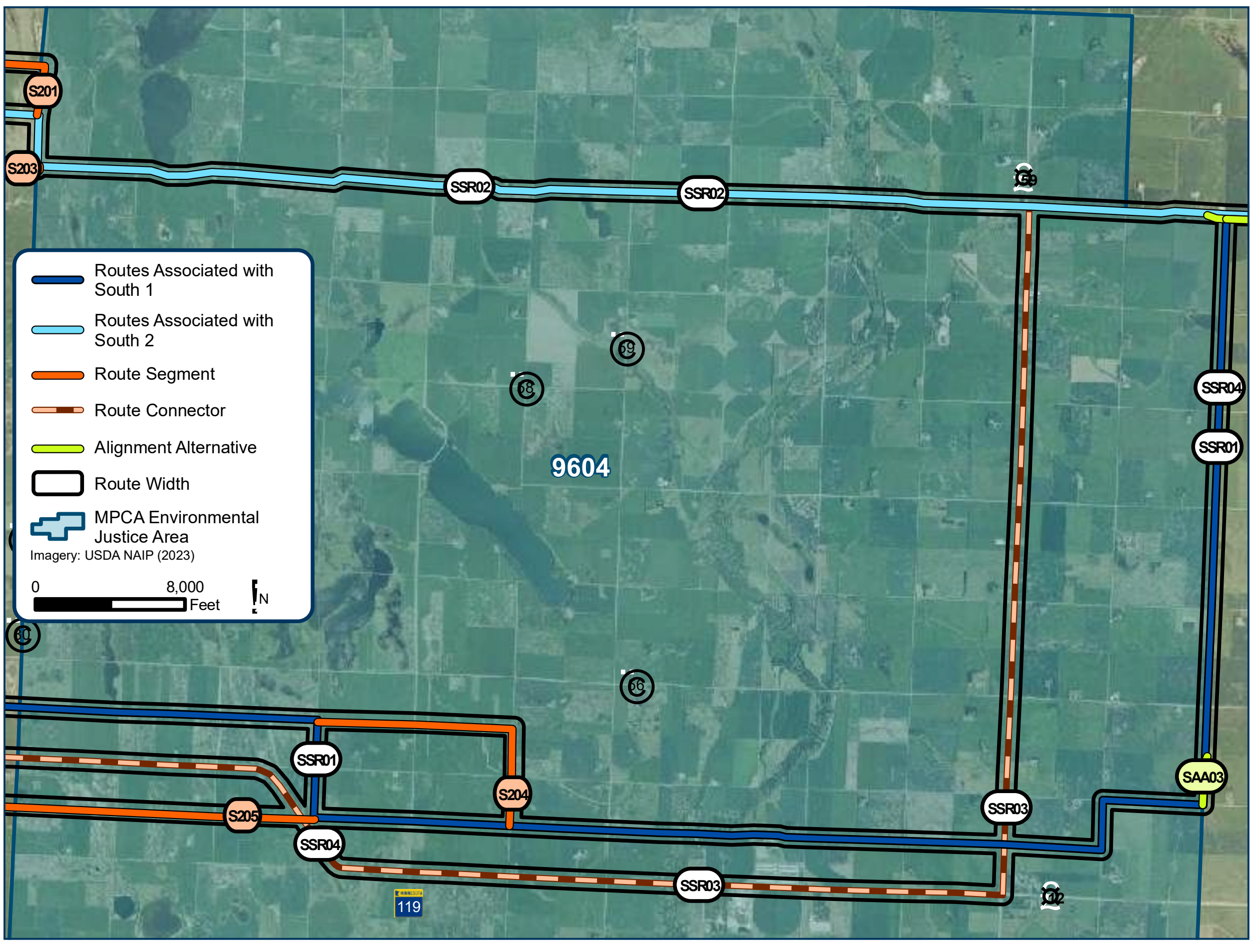
4.3.5.1.1 Minnesota Pollution Control Agency Analysis

The MPCA's map of environmental justice areas is an online mapping tool that uses census data to identify EJ areas for meaningful community engagement and additional evaluation for disproportionate effects from pollution (reference (42)). The tool identifies EJ areas of concern using the following four criteria based on the most recent census data published by the United States Census Bureau, which align with the definition of an environmental justice area in Minnesota Statutes § 216B.1691, subdivision 1(e):

1. 40 percent or more of the area's total population is nonwhite;
2. 35 percent or more of households in the area have an income that is at or below 200 percent of the federal poverty level;
3. 40 percent or more of the area's residents over the age of five have limited English proficiency; or
4. The area is located within Indian country, as defined in United State Code, title 18, section 1151.

Using the above criteria, only one EJ area of concern was identified within a routing alternative route width. Census Tract 9604 (Figure 4-1) in Swift County reported around 40 percent of the population as having an income that is less than 200 percent of the federal poverty level.

Figure 4-1 Census Tract 9604 - Environmental Justice Area of Concern



4.3.5.1.2 2020 U.S. Census Low Income and Minority Analysis

A demographic assessment of the census tracts in the ROI was conducted using the 2023 American Community Survey, 5-year estimates data. Low-income, race, and ethnicity population data were gathered from the counties and the census tracts that are crossed by the project.

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

As shown in Table 4-2, there are no meaningfully greater low-income or minority populations when comparing the census tracts to their respective counties.

Table 4-2 Environmental Justice Area Census Comparison Data Analysis

State, County, Census Tract	Population[1]	Total Minority Population (%)[1]	Persons in Poverty (%)[2]
Minnesota	5,713,716	23.3	9.2
Big Stone County	5,152	5.7	11.5
Census Tract 9503	2,035	4.8	10.7
Census Tract 9501	1,428	6.6	8.6
Swift County	9,787	13.3	10.8
Census Tract 9604	2,185	12.4	14.5
Census Tract 9603	1,563	9.1	6.5
Stevens County	9,686	17.6	10.3
Census Tract 4801	2,559	9.7	5.2
Census Tract 4803	3,432	17.6	12.3
Pope County	11,363	5.9	9.8
Census Tract 9704	3,312	5.0	14.8
Census Tract 9703	2,745	5.8	6.4
Census Tract 9702	2,880	6.2	9.5
Census Tract 9701	2,386	6.8	7.3
Douglas County	39,354	5.8	8.3
Census Tract 4509	3,634	2.6	2.5
Census Tract 4508	3,774	4.7	10.3
Census Tract 4507.03	2,794	6.4	13.7

[1] Source: reference (43)
[2] Source: reference (44)

4.3.5.2 Potential Impacts

Utility infrastructure can adversely impact low-income, minority, or tribal populations. The factors that could impact the one EJ area of concern, Census Tract 9602 in Swift County, are generally construction-related impacts. These might include a temporary increase in traffic and noise. Transportation and traffic impacts are further discussed in Section 4.3.11.1. Noise from construction activities would be short-term, temporary and would occur during daytime hours. Further impacts from noise are discussed in 4.3.7.

There are potential impacts on air quality due to construction and operation of the project. The EJ community could experience increased exposure to air pollution during construction, temporarily exacerbating existing air impacts.

The project would not result in disproportionate adverse impacts to the EJ areas of concern within the ROI.

4.3.5.3 Mitigation

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

4.3.5.3.1 Commission Draft Route Permit

The draft route permit does not include mitigation measures specific to EJ.

4.3.5.3.2 Other Proposed Mitigation

EJ impacts are not anticipated; therefore, no other mitigation measures are proposed.

4.3.6 Land Use and Zoning

The ROI for land use and zoning is the route width. If a route permit is issued, it would supersede and preempt zoning restrictions and building or land use rules. To assess human settlement impacts, potential land use and zoning impacts are addressed by evaluating the project against local land use and zoning ordinances. Impacts to planning and zoning are anticipated to be negligible throughout the ROI.

4.3.6.1 Existing Conditions

Minnesota authorizes counties and cities to create their own zoning ordinances to implement and work in conjunction with their comprehensive plans. Zoning is a method to regulate the way land is used and create patterns in the way they are used. Zoning is a regulatory device used by local governments to geographically restrict or promote certain types of land uses. Minnesota Statutes provide local governments with zoning authority to promote public health and general welfare.

This project is subject to Minnesota's Power Plant Siting Act (Minnesota Statute § 216E). Under this Statute, the route permit issued for a transmission line "shall be the sole site or route approval required to be obtained by the utility. Such permit shall supersede and preempt zoning restrictions, building or land use rules, regulations or ordinances promulgated by regional, county, local and special purpose government." Therefore, the applicants are not required to seek permits or variances from local governments to comply with applicable zoning codes. Nonetheless, impacts to local zoning can impact human settlements, and the Commission considers impacts to human settlements as a factor in selecting transmission line routes.

Publicly available zoning information was reviewed for each county and municipality crossed by the routing alternatives. The project would cross five counties, including: Big Stone, Swift, Stevens, Pope, and Douglas. Map 8-1 through Map 8-9 shows the zoning district data that was gathered for the project. Transmission lines are defined in their applicable zoning ordinances in the project area as an essential service and found to be either a permitted or conditional use.

Land cover throughout the ROI consists primarily of cultivated crops, with scattered areas of developed land, wetlands, and native plant communities, such as prairies and forests (Section 4.7.7). The southern portion of the project near Big Stone City, South Dakota is in a more developed area that quickly becomes more rural as the proposed routes head east where farmsteads, agricultural fields, and agricultural support facilities are more prevalent. As the routes continue, the portion in the Central Region continues to be rural with primarily agricultural areas. The portion of the routes in the North Region continue to pass through agricultural areas before terminating in a more developed area near Alexandria.

4.3.6.1.1 County Plans and Ordinances

The Big Stone County Comprehensive Plan was adopted in 2002 (reference (45)). The plan outlines the specific approaches the county should take to guide land use decisions. There are 11 goals that help guide these decisions. Each goal is used as a framework for their associated objectives and policy guidelines that help to guide the decisions that will be made by the county on a day-to-day basis. The Big Stone County Land Management Ordinance was established in 2011 (reference (46)). This includes Big Stone County zoning districts including agricultural, open space, urban, commercial, industrial, and shoreland management districts. The project routes go through primarily agricultural lands, with some urban residential and shoreland areas. The project goes through the city of Ortonville in the western-most portion of Big Stone County, near the Minnesota/South Dakota state border.

The city of Ortonville has its own Comprehensive Plan, which was adopted in 2008 (reference (47)). The vision statement within its plan highlights the natural area where Ortonville is located, within the Upper Minnesota Valley and Big Stone Lake, as well as its commitment to community values. The Ortonville Zoning Ordinance (reference (48)) lists the districts within the County, which include: agricultural-open space, residential (traditional and medium density), manufactured home park, business (central, general, and highway), and industrial (limited and general). The project routes go through the general industrial district in Ortonville.

Swift County does not have a comprehensive plan publicly available on its county website. Its county website states its mission as to "strive to develop and maintain services which connect people with opportunities to enhance their quality of life, provide for their safety and promote community growth". Swift County's Code of Ordinances (reference (49)) includes its zoning and land regulation code. The zoning districts within the county include the agricultural #1, agricultural #2, urban development, floodplain, and shoreland districts. The project routes go through agricultural and shoreland zoning districts in Swift County.

The Pope County Comprehensive Plan was adopted in 2018 (reference (50)). The plan lists numerous goals and policies that guide Pope County's land use decisions. The goals are separated into the following categories: economy/economic development, agriculture, residential/housing, land use compatibility, cultural, natural resources/open space, shoreland management environmental, transportation/infrastructure/public facilities, and governmental/general governance/intergovernmental coordination. The Pope County Land Use Controls Ordinance was last revised in 2025 (reference (27)). This ordinance includes the six overarching zoning districts of shoreland, residential, non-intensive agriculture, agriculture protection, commercial & industrial, and specific zoning districts. The project routes go through primarily agriculture protection and non-intensive agriculture districts in Pope County, with some shoreland areas.

The Stevens County Comprehensive Plan was adopted in 2017 (reference (51)). Within the plan, it is stated that Stevens County "envisions a future where its people have the freedom and resources necessary to pursue productive lives, healthy families, a vibrant community life and meaningful opportunities for work and income. In achieving these goals, the County's residents will continue to enjoy and sustain the quality of the County's many natural resources". The plan also has individual visions for land use, economic development, housing, transportation, natural resources, and intergovernmental cooperation, with accompanying goals and policies. The Stevens County Zoning Ordinance was most recently adopted in 2024 (reference (52)). Stevens County has nine zoning districts, including the floodplain, shoreland management, agricultural, rural residence, highway service business, limited industry, orderly annexation agreement, airport, and closed landfill restricted districts. The project routes go through primarily agricultural with some shoreland areas in Stevens County.

The Douglas County Comprehensive Plan was most recently published in 2011 (reference (53)). The county used a natural resource-based planning approach for the comprehensive plan. The county is committed to following community values and wishes to be stewards of the county's natural resources by balancing future development with natural resource protection. The Douglas County Zoning Ordinance details the six zoning districts within the county (reference (54)). The zoning districts include the agricultural, rural residential, residential, residential shoreland, commercial, and industrial districts. The project goes through agricultural, rural residential, residential, commercial, industrial, natural environment shoreland lakes, and recreational development lakes districts within Douglas County. The project also goes through the city of Alexandria, which has its own comprehensive plan and zoning ordinance.

The city of Alexandria 2040 Comprehensive Plan guides future growth for the city and is a tool to frame growth, set direction, and give high-level guidance (reference (55)). Within the plan, the future land use in the project area is generally residential, commercial, park/open space, and largely urban reserve. Urban reserve means that it is on the fringe of the city and not planned to be developed within the term of the plan. The Alexandria City Code was most recently updated in 2025 (reference (56)). The code includes the zoning district provisions, which include the agricultural-open space, residential (single family, single family affordable, single and two family, medium density, low density), mobile home park, residential-business, vacant/agricultural residential, business (general, regional, central, airport), industrial (light, heavy, business), flood plain management, wetland systems, shoreland, planned unit development, and wellhead protection districts. The project routes travel through general business and single-family zoning districts in Alexandria.

4.3.6.2 Potential Impacts

Transmission line and substation projects have the potential to be incompatible with existing land use patterns, local zoning requirements, and the future land use planning of local governments. Based on review of the zoning information for the counties crossed by each route, the likelihood of future residential, commercial, or industrial development within the ROI of the routing alternatives is generally low. Elsewhere, the project is anticipated to be consistent with authorized uses within the affected zoning districts crossed by any routes and compatible with future land use planning goals of local governments. Therefore, the project's construction and operation are not expected to have significant impacts on land use.

However, should a transmission line be built, it would preclude future development not identified in this EIS within that transmission line's ROW. For example, a new, currently unplanned home or business could not be constructed in the ROW. Depending on the parcel, it could eliminate all options for construction. Depending on the proximity of a development area to the ROW, it could also impede growth of communities in the direction of the transmission line, that is, it could strongly influence future growth. For example, planning around the transmission line would be needed if the city of Hancock wished to extend west past the project.

Existing land uses along the transmission line would experience short-term impacts during the period of construction. When transmission line construction is complete, project workspaces would be restored. Land uses which are consistent with the safe and reliable operation of the project would be allowed to continue as before. Constructing the transmission line and new fiber optic regeneration station will cause changes to the underlying land use from mostly agricultural areas to a utility corridor. Constructing the route is not anticipated to wholly transform existing land use. For example, planting agricultural crops or using the right-of-way for grazing land is generally not precluded. Any land that is currently residential that will be used for the project will not displace residents, although the applicants have the power of eminent domain to place the project on residential property. Changes in the underlying land use are unavoidable.

The project predominantly crosses areas zoned as agricultural within the ROI. Transmission lines and associated facilities are typically either permitted or conditional uses in areas zoned as agricultural, and transmission lines and substations currently exist in some of these areas. In places where the project crosses sensitive environmental features, such as larger perennial watercourses, shoreland and floodplain districts or overlays are crossed as well.

The project passes through scenic river, shoreland, and floodplain management districts throughout the counties it crosses. Minnesota Statute § 103F defines protection of water resources, including floodplain management, wild and scenic rivers, and shoreland areas, and describes limitations on uses and locations of structures in those areas. These limitations are established through special land use provisions to maintain and restore the natural beauty and attractiveness of shoreland and to provide environmental protection for the water resources. These overlay districts were established to protect and enhance shoreland and floodplain areas by establishing additional restrictions and requirements for development and use of these resources.

Currently, construction details for the project and exact locations of structures and associated facilities are not known. The project would be designed to span waterbodies and floodplains where practicable and to minimize the number of structures in surface water resources where these resources cannot be spanned. Furthermore, no impacts to the overall function of shoreland or floodplains are expected. Any impact that might occur from installation of structure foundations would be minimal and localized. The potential placement of transmission line structures in floodplains is not anticipated to alter the flood storage capacity of the floodplain based on the minimal size of individual transmission line structures.

A few smaller pockets of residential and industrial zoning areas are crossed by the project, in particular, where the project routes near municipalities. Transmission lines and substations are typically permitted as conditional use in areas zoned as industrial or commercial because these facilities are similar to other infrastructure that is already established.

4.3.6.3 Mitigation

4.3.6.3.1 Commission Draft Route Permit

The draft route permit does not include mitigation measures specific to land use and zoning.

4.3.6.3.2 Other Proposed Mitigation

Project impacts to zoning and to current and future land uses can be mitigated by selecting routing alternatives that are compatible, to the extent possible, with community zoning and land-use plans. Land-use impacts can be mitigated by minimizing aesthetic impacts of the project, to the extent that zoning and land-use plans address aesthetics (for example, landscaping). Land-use impacts can also be mitigated by using existing ROW to the maximum extent possible. Impacts to other parcels can be mitigated through negotiated easement agreements, which are outside of the scope of this EIS. The proposed transmission line is generally compatible with local planning and zoning ordinances and is expected to be consistent with authorized uses. Impacts to planning and zoning are anticipated to be negligible.

4.3.7 Noise

The ROI for noise is the local vicinity. Short-term and intermittent noise impacts would occur during construction, resulting in minimal impact across the ROI. Although the applicants would be required to comply with state noise standards, impacts could be more moderate for residences within 1,600

feet of the project when heavy equipment is operating consistently, albeit temporary. Construction will occur during daytime hours except for limited circumstances such as line outages.

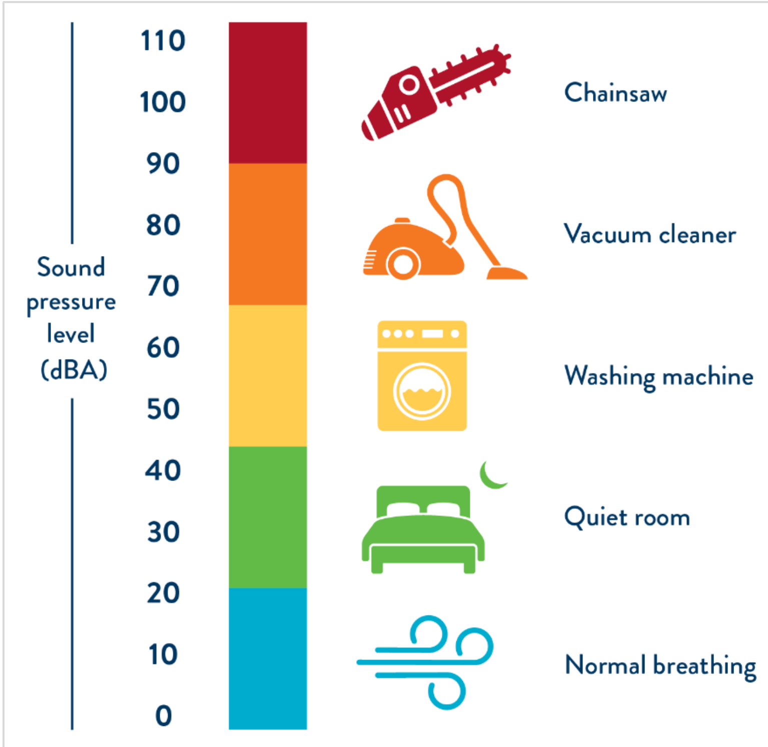
Noise impacts during operation would be negligible except for perceptible noise during periods of foggy, damp, or light rain conditions, which would be intermittent and thus minimal. Operation of the project would meet state noise standards. Impacts would be minimized by selecting the route with the least receptors nearby; receptors are quantified by subregion as part of the aesthetics assessment in Chapters 5 through 7.

The ROI for noise is the local vicinity, which is the area within 1,600 feet of the anticipated alignment. Noises from the project are associated with construction and operation. Construction activity would occur within a specified time during the day, at a specific portion of the project for a few days to weeks at a time, and over the course of three and four years. The noise at a single location would be more temporary and dissipate as construction crews progress along the route. While impacts are expected to be compliant with state noise standards, there could be times when heavy construction equipment that exceeds the standard dBA noise measurement is used nonconsecutively, which would not constitute a violation because it would not be continuous for 6 minutes. Noise created by construction activities is anticipated to be minimal for all routing alternatives because the impacts are temporary and intermittent; where receptors are within 1,600 feet, noise impacts could be more moderate for the limited time heavy equipment is operating in one area of the project.

4.3.7.1 Existing Conditions

Noise can be defined as any undesired sound. It is measured in units of decibels on a logarithmic scale. Because sounds levels are measured on a logarithmic scale, they are not directly additive. The A-weighted scale (dBA) is used to duplicate the sensitivity of the human ear (reference (57)). Human hearing is not equally sensitive to all frequencies of sound, so certain frequencies are given more weight. The scale puts more weight on the range of frequencies that the average human ear perceives, and less weight on those we don’t, like higher or lower frequencies. A three dBA change in sound is barely detectable to average human hearing, whereas a five dBA change is clearly noticeable. A 10 dBA change is perceived as a sound doubling in loudness. Noise perception is dependent on a number of factors including wind speed, wind direction, humidity, and natural and built features between the noise source and the receptor. Figure 4-2 illustrates common noise levels at various levels of the dBA scale.

Figure 4-2 Common Activity Noise Levels



All noises produced by the project must be within state noise standards set forth in Minnesota Rules 7030.0050, which sets noise limits for different land uses Table 4-3. Noise standards in Minnesota are based on noise area classifications (NACs) that correspond to the location of the listener—referred to as a receptor. These classifications are not necessarily synonymous with zoning classifications. NACs are assigned to areas based on the type of land use activity occurring at that location. Noise standards are expressed as a range of permissible dBA over a one-hour period. L10 may be exceeded 10 percent of the time, or six minutes per hour, while L50 may be exceeded 50 percent of the time, or 30 minutes per hour. Standards vary between daytime and nighttime hours. There is no limit to the maximum loudness of a noise.

The primary noise receptors within the local vicinity are residences and farmsteads. These receptors are assigned to the most stringent standards, or NAC 1. Noise receptors could also include individuals working outside or using recreational facilities nearby. A complete list of all land use designations assigned to the NAC categories are available at Minnesota Rules 7030.0050.

Table 4-3 Minnesota Noise Standards

Noise Area Classification	Daytime Limit (dBA) (7:00 a.m. to 10:00 p.m.)		Nighttime Limit (dBA) (10:00 p.m. to 7:00 a.m.)	
	L10	L50	L10	L50
1: Residential and Other Sensitive Uses	65	60	55	50
2: Non-Residential Uses (typical Commercial)	70	65	70	65
3: Non-Residential Uses (typical Industrial, Agricultural)	80	75	80	75
4: Undeveloped Uses	NA	NA	NA	NA

Source: Minnesota Rules 7030.0050

The state noise standards are public health standards. That is, they protect people from noise generated by all sources at a specific time and place. The total sum of noise at a specific time and location cannot exceed the standards. The MPCA evaluates whether a specific noise source is in violation by determining if the source causes or significantly contributes to a violation of the standards.

The project is primarily in rural areas. Background noise has the potential to be higher in the northern portion of the project due to the proximity to more populated areas. Ambient noise levels for the entire project are in the range of 30 to 50 dBA, with temporary, higher noise levels associated with high wind, vehicular traffic, and the use of gas-powered equipment (for example, recreational vehicles, tractors, or chainsaws). Community noise levels are usually closely related to the intensity of human activity. Noise levels are generally considered low when below 45 dBA, moderate in the 45 to 60 dBA range, and high above 60 dBA. In wilderness areas, ambient noise levels can be below 35 dBA. In small towns or wooded and lightly used residential areas, noise levels are more likely to be around 50 or 60 dBA. Daytime noise levels in rural areas with no significant noise sources might be in the 30 to 40 dBA range (reference (58)). Levels around 75 dBA are more common in busy urban areas, and levels up to 85 dBA occur near major freeways and airports.

4.3.7.2 Potential Impacts

4.3.7.2.1 Construction Noise

Distinct noise impacts during construction are anticipated to vary between minimal to significant depending on the activity, duration, and equipment being used. Construction noise impacts will be temporary, localized, limited to daytime hours, and intermittent. Heavy equipment and increased vehicle traffic are expected to cause most noise impacts along the ROW during daytime hours. Transmission line construction activity and crews would be present at a particular location during daytime hours for a few days at a time but on multiple occasions throughout the period between initial ROW clearing and final restoration. Substation noise would be localized and present at a particular location for the duration of the project. Major noise producing activities are associated with clearing and grading, material delivery, auguring foundation holes, driving foundations, setting structures, and stringing conductors.

The majority of construction equipment that will be used on site, such as grading equipment and digger derricks, are considered heavy equipment. Noise associated with heavy equipment can range between 80 and 90 dBA at full power 50 feet from the source (reference (59)). Heavy equipment generally runs at full power up to 50 percent of the time. Point source sounds such as construction equipment decrease 6 dBA at each doubling of distance (reference (57); therefore, 90 dBA at 50 feet is perceived as 72 dBA at 400 feet and 60 dBA at 1,600 feet. If heavy equipment noise exceeds 65 dBA for over six consecutive minutes, or 60 dBA for over 30 consecutive minutes, there is potential to violate state noise standards at residences within 1,600 feet (e.g., the local vicinity) of the project.

Helicopters may also be used to string wire once each structure is erected. Helicopters are the loudest noise expected from construction, but also one of the most temporary sources as they travel frequently between structures and staging yards relative to other construction equipment. The most time-consuming portion of stringing a line is clipping the new circuit to the structure, which would require the helicopter to hover for approximately 15 minutes.

Construction noise could temporarily affect residences, schools, businesses, libraries, parks, recreational areas, and related public spaces that are close to the ROW. Noise standard exceedances need not occur for a negative impact to occur, such as with the disruption caused by rhythmic pounding of foundations posts. For example, interference with human speech begins at about 60 dBA; 70 dBA interferes with telephone conversations, and 80 dBA interferes with normal conversation (reference (60)).

There is one residence within 75 feet of the alignment of a routing alternative, meaning construction noise could be a significant over 80 dBA. There are 41 additional residences within 250 feet of the alignment of a routing alternative, meaning construction noise could be significant over 70 dBA. There are 305 additional residences within 1,600 feet of the alignment of a routing alternative, meaning construction noise could be significant over 60 dBA. Since the construction noise would be temporary and intermittent, it is not expected to exceed state noise standards; however, the impact intensity would be moderate for these residents.

Construction noise might exceed state noise standards for short intervals at select times and locations. Exceedances would be short-term, likely not continuous enough to violate state noise standards, and confined to daytime hours. Nighttime construction work may be required during outages, the accommodation of customer schedules, or other operational limitations that may cause construction to occur outside of daytime hours or on weekends. The applicants will work with applicable stakeholders if construction becomes necessary outside of these hours and will be required to maintain compliance with state noise standards. Construction of nighttime work will avoid NAC-1 areas to the extent practicable.

Other noise standards in Minnesota include MnDOT, which are specific to noise levels on roads, and local noise ordinances. Most local noise ordinances in Minnesota are referred to as nuisance noise ordinances and are dependent on the city or county. Not all local units of government have specific noise ordinances along the project alignment. The applicants would be expected to coordinate helicopter work in time periods allowed by the local jurisdiction’s code or to consult with relevant jurisdictions to minimize impacts if time-sensitive work would need to occur outside of established time periods.

4.3.7.2.2 Operational Transmission Line Noise

Operational noise levels produced by a transmission line (electrical conductors) are generally less than outdoor background levels and are therefore not usually perceptible. Audible transmission line noise is created by small electrical discharges along the surface of the conductor that ionize surrounding air molecules. This phenomenon—common to all power lines—is known as corona and is often described as a "crackling" sound or perceptible hum. However, any imperfection on the surface of the conductor might be a source for corona. Examples include dust and dirt or nicks and burrs in the equipment.

The level of noise from corona discharge depends on conductor conditions, voltage levels (corona noise increases as voltage increases), and weather conditions. Noise emissions are greatest during heavy rain events when the conductors are consistently wet; conductors are generally the least perceptible, although possible, in dry weather. During heavy rains, the background noise level is usually greater than the noise from the transmission line. As a result, audible noise is typically not noticeable during heavy rains. In foggy, damp, snowy, or light rain conditions, transmission lines might produce audible noise higher than background levels.

The applicants state that noise generated by operation of the transmission line would not exceed 45 dBA directly beneath the transmission line, thus even the closest residents are not expected to be impacted by noise above the Minnesota noise standards. Operational noise level impacts from the project are anticipated to be minimal.

4.3.7.2.3 Operational Substation Noise

Noise contributions from substations are dependent on the layout of buildings and equipment within the fence. Transformers or shunt reactors produce a consistent humming sound, resulting from magnetic forces within the transformer core. This humming is the dominant noise source at substations if it is present, nearly constant whenever the transformer is energized. Variations in transformer noise may occur due to the operation of cooling pumps and fans at higher loading levels. Noise emissions from this equipment have a tonal character that often sound like a hum or a buzz that corresponds to the frequency of the alternating current (AC). This sound does not vary with transformer load.

Noise from indoor equipment is not expected to propagate outside the building. Typical substation design is such that noise produced by these sources does not reach beyond the substation property. Other sources include switchgears which produce infrequent, short-term noises during activation of circuit breakers or an emergency generator. The substation is expected to be designed to promote noise levels that are compliant with Minnesota noise standards at the property boundary.

4.3.7.3 Mitigation

4.3.7.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.3.6, contains the following mitigation related to noise: "The Permittee shall comply with noise standards established under Minnesota R. 7030.0010 to 7030.0080. The Permittee shall limit construction and maintenance activities to daytime working hours to the extent practicable."

4.3.7.3.2 Other Proposed Mitigation

During construction, common ways to mitigate noise impacts include sound control devices such as mufflers on vehicles and equipment; conducting construction activities during daylight hours, and normal business hours, as practicable; and running vehicles and equipment only when necessary. If necessary, impacts to state noise standards can be mitigated by timing restrictions.

Proper design and construction of the transmission line in accordance with industry standards will ensure that noise impacts are minimized. The best option for helicopter noise mitigation would be for the applicants to work directly with homeowners, especially those nearest to the anticipated alignment, and schedule work for when they would be away from their homes.

In the uncommon case that space is limited and substation design alone cannot abate noise, placing sound walls around transformers or planting shelter belts around substations can reduce the distance the sound can travel. Regularly performing proper maintenance practices on converter transformer components such as the cooling fans and pumps generally abate common noise issues.

4.3.8 Property Values

The ROI for property values is the local vicinity. Property values are impacted by many interconnected factors. Reductions in property value could occur, but changes to a specific property's value are difficult to predict. If effects do occur due to transmission lines, research has shown these effects to be almost always less than 10 percent, and usually in the range of 3 to 6 percent. Because of this uncertainty, impacts are anticipated to be minimal and dissipate rapidly with distance. However, it is acknowledged that every landowner has a unique relationship and sense of value associated with their property. Potential impacts would be minimized by selecting the route with the least properties nearby; residences and non-residences are quantified by subregion as part of the aesthetics assessment in Chapters 5 through 7.

4.3.8.1 Existing Conditions

Residences within the local vicinity of routing alternatives are summarized in the aesthetics sections by subregion (Chapters 5 through 7). The number of residences within the ROI varies by subregion, due to proximity to municipalities. For a general sense of the number of residences throughout the project, there are 347 residences within the ROI of all routing alternatives for the project. Residences within the ROI of the routing alternatives are depicted in Map 9-1 through Map 9-9 and are shown in more detail in Appendix F.

4.3.8.2 Potential Impacts

Impacts to property values that result from power line construction have been studied for over 50 years. These studies have focused primarily on residential, agricultural, and undeveloped properties as opposed to commercial or industrial properties. While the research demonstrates that property value impacts vary, the majority indicates that transmission lines have “no significant impact or a slight negative impact on residential properties” (reference (61)).

The presence of a transmission line becomes one of many interacting factors that could affect a specific property value. Potential impacts of overhead transmission lines on property values are generally connected to three main factors. First, how the transmission line affects the viewshed and aesthetics of a property, which is largely based on individual perceptions. Second, the real or perceived risks that buyers have of EMF. Third, the effects to agricultural production on properties that are used for farming operations.

The aforementioned factors are only some of the many interconnecting factors that affect property values. Because of this, it is difficult to measure how much and the numerous ways that transmission lines and property values are correlated. The change in a property’s value alone may not capture the overall loss or gain. For example, utilities provide owners with one-time payments not reflected in sales prices. In addition, nearby landowners that have unobstructed view of the new transmission line but do not host them do not receive compensation.

A variety of methodologies have been used to research the relationship between transmission lines and property values. Some general conclusions can be drawn from this body of literature. This discussion highlights relevant outcomes of property value research with additional detail provided in Appendix G. Research does not support a clear cause-and-effect relationship between property values and proximity to transmission lines, but has revealed trends that are generally applicable to properties near transmission lines:

- When negative impacts on property values occur, the potential reduction in value is in the range of one to 10 percent.
- Property value impacts decrease with distance from the line; research varies with distances of no effect observed at 200 feet to 1.0 mile.
- Impacts are usually greater on smaller properties than on larger ones.
- Negative impacts diminish over time, typically five years or more after construction.
- Other amenities, such as proximity to schools or jobs, lot size, square footage of the home, and neighborhood characteristics tend to have a greater effect on sale price than the presence of a transmission line.
- The value of agricultural property is likely to decrease when transmission line structures are placed in an area that inhibits farming operations; recent research demonstrates this effect is decreasing, perhaps due to technological adaptations.

- Vacant properties adjacent to power lines experience more property value impacts, and non-adjacent properties with visibility within 1,000 feet to a lesser extent.

Commenters noted that agricultural property values would likely be impacted if the transmission line constrains current or future farming methods such as aerial spraying, equipment maneuvering, and center pivot irrigators. Depending on the impact, this could preclude the ability to grow certain crops such as sweet corn and beets. While studies specific to these impacts were not identified, staff believe these concerns to be legitimate.

Every landowner has a unique relationship and sense of value associated with their property. Thus, a landowner's assessment of potential impacts to their property's value is often a deeply personal comparison of the property "before" and "after" a proposed project is constructed. These judgments, however, do not necessarily influence the market value of a property. Rather, appraisers assess a property's value by looking at the property "after" a project is constructed. Moreover, potential market participants likely see the property independent of the changes brought about by a project; therefore, they do not take the "before" and "after" into account the same way a current landowner might. Staff acknowledges this section does not and cannot consider or address the fear and anxiety felt by landowners when facing the potential for negative impacts to their property's value (references (62); (63)).

The nearest resident to any possible transmission line route is within 75 feet of the alignment in the Swift Subregion along US Highway 12 (SSR03). There are four route possibilities in this subregion. While there is potential for impacts to be greater for this property, there isn't significant evidence in the research to determine that a transmission line would impact the property value more than minimally. However, when impacts have been observed in the research, they tend to be greater for properties that are nearer to transmission lines. If route SSR03 were to be chosen for the project, the transmission line is unlikely to be constructed within 75 feet of a residence due to the ROW needed to ensure safe operation of the line. If this residence were able to see the structures, encumbered by the ROW easement, and was within 100 feet of the ROW, the likelihood of property value impacts would increase (reference (64)).

4.3.8.3 Mitigation

4.3.8.3.1 Commission Draft Route Permit

The draft route permit does not include any specific mitigation related to property values.

4.3.8.3.2 Other Proposed Mitigation

Impacts to property values can be mitigated by reducing aesthetic impacts such as with landscape screening, perceived health risks, and encumbrances to future land use. Routing the transmission line away from residences would reduce aesthetic impacts. Co-locating the transmission line with existing infrastructure would reduce aesthetic impacts and potential land use conflicts.

The applicants would be responsible for any construction-related damages and for returning affected property to its original condition, which would help maintain property value. As discussed in

Section 3.4.5 for properties crossed by the ROW, the applicants would develop a fair market value offer and once ROW is acquired, would contact the landowner to discuss any special considerations that might be needed (for example, fences, crops, or livestock).

Impacts could also be mitigated by using the protections offered through Minnesota Statute § 216E.12 (commonly known as the "Buy the Farm" statute), where available, to move away from potential property value impacts. Consistent with the scoping decision, landowner agreements are outside the scope of this EIS.

4.3.9 Recreation

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

4.3.9.1 Existing Conditions

Recreation within the route width consists primarily of outdoor recreational opportunities including bird watching, fishing, hunting, canoeing/kayaking, hiking, and snowmobiling. Recreational activities in the project area are primarily associated with rivers, lakes, scenic byways, and trails (Map 10-1 through Map 10-9). Publicly accessible lands also provide opportunities for recreational activities such as hunting (Section 4.7.6). No local public parks, state forest campgrounds, or golf courses were identified within one mile of any routing alternative. Other public access lands, including Wildlife Management Areas and Waterfowl Production Areas, are present within the ROI and further discussed in Section 4.7.8.

Watercourses provide opportunities for recreation throughout the project area. Some watercourses hold special designations, such as state water trails and state Wild and Scenic Rivers. State water trails are miles of waters publicized for canoeing, kayaking, and camping (reference (65)). State Wild and Scenic River designations preserve certain rivers with outstanding natural, cultural, and recreational values in a free-flowing condition for the enjoyment of present and future generations (reference (66)). The Minnesota River (Map 10-1; Section 5.2.2.8) is designated as a state water trail and a state wild and scenic river in the Big Stone Subregion. The Pomme de Terre River (Map 10-4; Section 5.3.2.8) is designated as a state water trail in the Swift Subregion. No national wild and scenic rivers are present.

The routing alternatives cross three state scenic byways, the Minnesota River Valley Scenic Byway and the Historic Highway 75 King of Trails in the Big Stone Subregion (Map 10-1; Section 5.2.2.8) and the Glacial Ridge Trail in the Alexandria Subregion (Map 10-8 and Map 10-9; Section 7.2.2.8). The Minnesota River Valley Scenic Byway also has a national designation. National and state scenic byways are alternative road corridors to major highways that have regionally outstanding scenic, natural, recreational, cultural, historic or archaeological significance (reference (67)).

Public water accesses, typically managed by the DNR, are designated spots along lakes and rivers that allow the public to launch boats and other watercraft for recreational purposes. One public water access, Pomme De Terre River Hwy 12 Public Water Access Site, is present in the Swift Subregion (Map 10-4).

Several snowmobile trails traverse the project area and are discussed in more detail in their applicable subregional impact and mitigation assessments. Snowmobile trails are mapped by the DNR and managed locally by each county and their respective snowmobile clubs. These trails are maintained by Ridge Runners, Big Stone Lake Sno-Riders, Northern Lights, West Central Trail Blazers, and Douglass Area Trail Association.

4.3.9.2 Potential Impacts

Effects on recreation due to construction of the project are anticipated to be minimal and temporary in nature, lasting only for the duration of construction and would include short-term disturbances, such as increased noise and dust, as well as visual impacts. They could also detract from nearby recreational activities and could, depending on the timing, affect nearby hunting or wildlife viewing opportunities in public spaces by temporarily displacing wildlife. Wildlife, however, is expected to return to the area once construction is complete. Temporary and minimal disruptions to snowmobile trails use could occur during construction in winter months.

Once constructed, the project would result in visual impacts caused by new built features introduced to the landscape which could change the aesthetic of a recreational destination in a way that reduces visitor enjoyment or use. Operational noise is expected to be negligible and will not affect recreationalists. Because direct long-term impacts are primarily aesthetic in nature, indirect long-term impacts to recreation are expected to be subjective and unique to the individual. These unavoidable impacts might affect unique resources. Potential impacts can be minimized through prudent routing.

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

4.3.9.3 Mitigation

4.3.9.3.1 Commission Draft Route Permit

There is no mitigation related to recreation in the draft route permit. Various conditions in the draft route permit indirectly address impacts to recreation, such as noise, aesthetics, soils, and others.

4.3.9.3.2 Other Proposed Mitigation

Impacts to recreation can be mitigated by selecting routing alternatives that avoid resources used for recreational resources. The project generally avoids public lands used for recreational resources. Impacts can also be mitigated by reducing impacts to natural landscapes during construction. Maintaining more natural barriers around the project after construction would also mitigate noise.

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

4.3.10 Socioeconomics

The ROI for socioeconomics is the five-county area. Impacts are qualitatively assessed based on the influx of workers during construction activities. Economic factors related to construction and operation of the project are anticipated to be short-term and positive, but minimal, for all routing alternatives. Positive impacts may come from increased expenditures at local businesses during construction, the potential for some materials to be purchased locally, and the use of local labor.

4.3.10.1 Existing Conditions

The project is in western Minnesota. Labor force and unemployment data was analyzed from the 2019-2023 American Community Survey, 5-Year Estimates from the US Census Bureau and the Minnesota Department of Employment and Economic Development. Table 4-4 shows the compiled population and economic data on counties within the ROI (the five-county area).

Table 4-4 Population, Income, and Employment

County	Population[1]	Population Density (population/ sq. miles)[1]	Labor Force Participation (%)[2]	Labor Force[2]	Labor Force Unemployment Rate (%)[2]	Per Capita Income[2]	Median Household Income[2]
Minnesota	5,713,716	71.7	68.4%	3,146,576	2.1%	$46,530	$85,086
Big Stone	5,152	10.3	57.1%	2,349	1.7%	$39,923	$65,475
Swift	9,787	11.5	60.6%	4,718	2.4%	$36,519	$62,601
Stevens	9,686	17.2	65.7%	5,119	1.0%	$40,441	$71,060
Pope	11,363	16.9	62.6%	5,782	0.6%	$40,027	$72,205
Douglas	39,354	47.3	63.8%	20,271	1.7%	$43,543	$77,264

[1] Source: reference (43)
[2] Source: reference (44)

County populations across the five-county area range from 5,152 to 39,354. The highest population and population density within the five-county area is Douglas County, which is closest to a more urban area. The five-county area comprises less than 10 percent of the state's total population. Minnesota experienced a 7.6 percent increase in population between the 2010 Decennial Census and the 2020 Decennial Census (reference (68)).

The labor force unemployment rate in the five-county area ranges from 0.6 percent in Pope County to 2.4 percent in Swift County, which is the only county in the five-county area with an unemployment rate higher than the state of Minnesota. Per capita income in the five-county area ranges from $36,519 to $43,543, with the highest per capita income in Douglas County. The median household income ranges from $62,601 in Swift County to $77,264 in Douglas County. All the counties in the five-county area had a median income lower than the state of Minnesota, which has a median income of $85,086.

According to the 2019-2023 American Community Survey, 5-Year Estimates from the US Census Bureau, each county's largest industry in terms of employment is "educational services, health care and social assistance". "Manufacturing" is the second largest industry in terms of employment in Pope and Douglas counties, while in Big Stone and Stevens County it is "Agriculture, forestry, fishing and hunting, and mining." In Swift County both "Manufacturing" and "Agriculture, forestry, fishing and hunting, and mining" are the second largest industries in terms of employment.

In the State of Minnesota, all personal property owned by the utility, including high-voltage transmission lines, are assessed for property tax by the Minnesota Department of Revenue (MDOR). To value utility property, the MDOR uses the unit appraisal method, which combines all operating utility assets and values them together (Minnesota Rules 8100). The project would be included in the state's unit value and assessed no differently than other property. The state-assessed value determined by the MDOR is then allocated to the local governments based on the original cost. Based on their portion of the allocated value, the local government bills the utility, and the property tax is paid by the applicants.

4.3.10.2 Potential Impacts

Potential socioeconomic impacts would be short-term due to an influx of construction jobs and personnel, delivery of construction material, temporary housing, and other purchases from local businesses. Slight increases in retail sales in the project area are expected. These would include purchases of lodging, food, fuel, construction materials (lumber, concrete, aggregate), and other merchandise, which would generate local sales tax. The project is not expected to disrupt local communities or businesses. No long-term impacts are expected from the project.

Per the route permit application, project construction would employ approximately 100 to 150 workers. Construction personnel would primarily consist of contracted labor and require specialized skills and expertise. Some positions, both skilled and unskilled, could be filled by qualified individuals near the project. Construction is anticipated to take place over the course of three to four years. Workers would likely be commuting to the area instead of relocating. Construction workers traveling to the area might find temporary housing over the span of the project and move with construction as it advances through the project area. Construction and operation of the project is not anticipated to create or remove jobs over the long term or result in the permanent relocation of individuals to the area.

The project, if constructed, would provide new tax revenue to the communities where it is present due to incremental increases in revenues from utility property taxes. The project is not expected to have adverse impacts and to have a positive impact on local tax revenue.

4.3.10.3 Mitigation

4.3.10.3.1 Commission Draft Route Permit

The draft route permit does not include mitigation measures specific to socioeconomics.

4.3.10.3.2 Other Proposed Mitigation

Adverse impacts are not expected; thus, no other mitigation measures are proposed.

4.3.11 Transportation and Public Services

The ROI for transportation and public services varies. For roadways and rail, the ROI is the local vicinity. For public utilities, the ROI is the ROW. For emergency services, the ROI is the five-county area. For airports, the ROI is the project area. Impacts are expected to be primarily related to construction activities and would be short-term, localized, and minimal. Negative impacts, such as traffic delays, should be negligible. Impacts are unavoidable but can be minimized and mitigated. During operation, negligible traffic increases would occur for maintenance. Long-term impacts are primarily associated with petroleum pipelines in the Central and North Regions and are expected to be minimal, but impacts would depend on the route selected for the project.

This section summarizes the project's potential impacts on transportation including local transportation networks such as roadways, railroads, airports, and airstrips. These impacts are usually temporary, for example, road congestion associated with material deliveries.

This section also summarizes the project's potential impacts on emergency services and public services including public communications such as internet, radio, and television. Public services are services provided by a governmental or regulated private entity for public health, safety, and welfare. These services can include police, fire, hospitals and ambulance, water and wastewater, school districts, utilities, and other public utility infrastructure. Transmission lines can impact public services, such as roads or buried utilities. These impacts are typically temporary in nature (for example, the inability to fully use a road or utility while construction is in process). Impacts can be long-term if they change the area in a way that precludes or limits public services.

4.3.11.1 Transportation

The ROI for transportation is the local vicinity. This section discusses roadways and railroads.

4.3.11.1.1 Existing Conditions

The project is located primarily in rural areas. Major roadways within the project area include US Highways 12, 59, and 75, Minnesota Highways 9, 28, 29, 55, 114, and 119, as well as numerous other county, city, and township roads.

The project would cross railroads operated by Burlington Northern Santa Fe and Soo Line Railroad at several locations.

4.3.11.1.2 Potential Impacts

Construction could cause moderate, localized impacts to roadways that would be short-term in nature. Construction activities occasionally cause lanes or roadways to be closed. These closures would last for the duration of the construction activity in a given area. Construction equipment and delivery vehicles would increase traffic along roadways during project construction, with effects lasting from a few minutes to a few hours, depending upon the complexity and duration of the construction activities. Drivers could experience increased travel times as a result. Construction vehicles could temporarily block or alter public access to streets and businesses.

Vehicles and equipment that would be used for construction of the transmission line (for example, overhead line cranes, concrete trucks, and material delivery trucks) are generally heavy load vehicles and can cause more damage to road surfaces compared to passenger vehicles. Oversized/overweight load permits must be obtained from the MnDOT when size and/or weight limits would be exceeded.

During operation, severe weather, including high winds, ice, snowstorms, and tornadoes, could result in structure damage. If structures and lines fall over or otherwise reach the ground, they would create safety hazards on any roadways within the designed fall distance of an overhead transmission line parallel to existing roadways. Snow and ice accumulation and high winds could make the transmission line more susceptible to failure or collapse Section 4.7.2. The applicants indicated that their design standards exceed NESC requirements for safe design and operation of transmission lines. These standards include designing transmission lines to withstand severe winds from summer storms and the combination of ice and strong winds from winter weather.

Traffic backups may occur where railroads intersect project construction areas, but impacts would be minimal and temporary. Potential impacts to railways would be limited to short-term construction impacts and would be coordinated directly with the railroad operator. For instance, the applicants will schedule electrical conductor stringing over the rail line for safety of construction personnel and rail line operations. Negligible impacts during operation would be anticipated to railroads. The applicants would need to obtain all necessary railroad crossing permits from Burlington Northern Santa Fe and Soo Line Railroad for crossing their rail lines.

4.3.11.1.3 Mitigation

4.3.11.1.3.1 Commission Draft Route Permit

In the draft route permit, conditions 5.3.4 and Section 5.3.14, contains the following mitigation related to transportation:

- “The Permittee shall cooperate with county and city road authorities to develop appropriate signage and traffic management during construction.”
- “The Permittee shall keep records of compliance with this section and provide them upon the request of Commerce or Commission staff.”
- “The Permittee shall advise the appropriate governing bodies having jurisdiction over all state, county, city, or township roads that will be used during the construction phase of the Transmission Facility. Where practical, existing roadways shall be used for all activities associated with construction of the Transmission Facility. Oversize or overweight loads associated with the Transmission Facility shall not be hauled across public roads without required permits and approvals.”

- "The Permittee shall promptly repair private roads or lanes damaged when moving equipment or when accessing construction workspace, unless otherwise negotiated with the affected landowner."

4.3.11.1.3.2 Other Proposed Mitigation

The applicants committed to ongoing coordination with MnDOT, local road authorities, and railroad companies.

Any utility occupation of road and railroad ROW would need to be designed to meet MnDOT and rail operator design guidelines, respectively, and a permit from MnDOT would be required for the use of any state highway ROWs. MnDOT has a formal policy and procedures for accommodating utilities within or as near as feasible to highway ROWs. The applicants would continue to work with MnDOT to confirm that the project meets all applicable guidelines during permitting, final design, and construction and have committed to coordinating with county and township road departments to minimize impacts on local roads and highways.

4.3.11.2 Emergency Services

The ROI for emergency services is the five-county area. This section discusses ambulance, police, and fire services, as well as the Allied Radio Matrix for Emergency Response (ARMER) System.

4.3.11.2.1 Existing Conditions

Emergency services in the five-county area are provided by local law enforcement and emergency response entities, fire departments, and ambulance services of various counties and communities. Sheriffs' offices and municipal police departments provide regional law enforcement. Ambulance districts provide emergency medical response services throughout the five-county area. Emergency medical response is available from local hospitals. Appendix H lists fire and law enforcement agencies within the five-county area.

ARMER is Minnesota's two-way 700-800 MHz trunked public safety radio system for all state agencies as well as local and tribal emergency services (reference (69)). There are active ARMER towers in the cities of Glenwood, Starbuck, Benson, Holloway, and Correll that are near the project (reference (70)).

4.3.11.2.2 Potential Impacts

The project is not anticipated to impact emergency services. Temporary road closures required during construction would be coordinated with local jurisdictions to provide for safe access of police, fire, and other emergency service vehicles. Accidents that might occur during construction of the project would be handled through local emergency services. Given the limited number of construction workers involved in the project and the low probability of a construction-related accident, the existing emergency services should have sufficient capacity to respond to emergencies. During operation, emergency services providers could receive 911 phone calls in the event of a fallen transmission line or structure. The applicants have committed to working with the appropriate emergency services to determine where appropriate facilities exist and how best to ensure the proper safety precautions are being met.

The ARMER system is not expected to be impacted by construction or operation of the project because broadcast frequencies range from 851 MHz to 859 MHz.

4.3.11.2.3 Mitigation

4.3.11.2.3.1 Commission Draft Route Permit

The draft route permit does not include mitigation measures specific to emergency services.

4.3.11.2.3.2 Other Proposed Mitigation

The applicants committed to coordinating with local emergency services to maintain emergency access to areas near construction activities. The applicants also committed to working with the appropriate authorities (including emergency services) and utility providers to determine where facilities exist and how to best ensure the proper safety precautions are being met. The applicants may meet with residents and utility providers to prevent direct or indirect impacts to them or their services.

4.3.11.3 Airports

The ROI for airports is the project area. This section discusses airports, airstrips, and private airstrips.

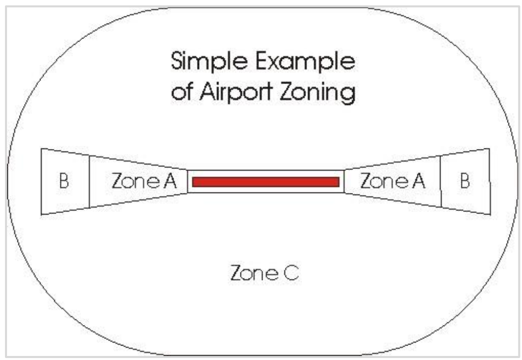
4.3.11.3.1 Existing Conditions

Transmission line structures and conductors can conflict with the safe operation of an airport or hinder the maneuverability of aircraft if they encroach on applicable safety zones. Different classes of airports have different safety zones depending on several characteristics, including runway dimensions, classes of aircraft they can accommodate, and navigation and communication systems (reference (71)). These factors determine the necessary take-off and landing glide slopes, which in turn determine the setback distance of transmission line structures.

The FAA and MnDOT have each established development guidelines on the proximity of tall structures to public-use airports. The FAA has also developed guidelines for the proximity of structures to very high frequency omni-directional range (VOR) navigation systems and Automated Weather Observation Stations. Transmission lines near public airports are limited by FAA height restrictions, which prohibit transmission line structures above a certain height, depending on the distance from the specific airport. Regulatory obstruction standards only apply to those airports that are available for public use and are listed in the FAA airport directory. Per Minnesota Rules 8800.2400, private airstrips and personal use airstrips cannot be used in commercial transportation or by the public and are not subject to FAA regulatory obstruction standards. The FAA may also require strobing lights on structures of certain heights and within certain proximities of airports.

In addition, MnDOT has established separate zoning areas around airports as shown in Figure 4-3. The most restrictive safety zones are safety zone A, which does not allow any buildings, temporary structures, places of public assembly, or transmission lines, and safety zone B, which does not allow places of public or semi-public assembly such as churches, hospitals, or schools. Permitted land uses in both zones include agricultural uses, cemeteries, and parking lots. Safety zone C, the horizontal airspace obstruction zone, encompasses all land enclosed within the perimeter of the imaginary horizontal plane 150 feet above the established airport elevation, the perimeter of which is constructed by swinging arcs of specified radii (5,000 to 10,000 feet) from the center of each end of the primary surface of each runway, and which is not included in zone A or zone B. As with FAA regulations and per Minnesota Rules 8800.2400, Subpart 1, MnDOT zoning requirements only apply to public airports and are recommended for private airports (reference (72)).

Figure 4-3 Minnesota Department of Transportation Example of Airport Zoning



Source: reference (73)

There is one FAA-listed, public-use airport within the ROI. The Ortonville Municipal-Martinson Airport is within one mile of several routes in the Big Stone Subregion (BSSR01, BSSR02, BSSR10, BSSR03, BSSR04, BSSR05, and BSSR09; Map 7-1).

There is one identified private use airport within the ROI, Brown's Private Airport. It is within one mile of routes in the Hancock Subregion (HSR01, HSR02, and HSR03) and Cyrus Subregion (CSR01, and CSR02) (Map 7-6). No public or private heliports were identified within the ROI, the nearest being heliports operating from hospitals in Alexandria and Ortonville.

Crop-dusting operations servicing agricultural fields near the project are registered with the Minnesota Agricultural Aircraft Association. Impacts to agricultural fields that use aerial spraying are discussed in Section 4.5.1.

4.3.11.3.2 Potential Impacts

Potential impacts to airports, as they exist today and based on preliminary analysis of the project area, are not expected as there are design measures that are expected to be employed to avoid these impacts, such as routing away from the airport, the use of appropriate height structures to avoid impact to glide or approach slopes, and structure marking or lighting.

The applicants committed to notifying the FAA to analyze potential impacts from the project on airspace for structure locations and heights once a specific route is permitted. A FAA Determinations of No Hazard will be obtained prior to construction as needed. Potential impacts to public airports could occur if the project is of a certain height and in close proximity thereby limiting the potential for safe operations, including aircraft takeoff and landing. Potential impacts to public airports would be determined in relation to safety zones and through adherence to FAA design criteria and recommended setbacks. Potential impacts to private airstrips would be determined through an analysis of proximity and location in relation to the airstrips, as well as discussions with landowners.

Crop-dusting operations servicing agricultural fields crossed by existing transmission lines will have already accommodated the presence of a transmission line. Crop-dusting operations not crossed by existing transmission lines have the potential to be impacted by the project; however, there appear to be none within the ROI (reference (74)).

4.3.11.3.3 Mitigation

4.3.11.3.3.1 Commission Draft Route Permit

The draft route permit does not include mitigation measures specific to airports.

4.3.11.3.3.2 Other Proposed Mitigation

The applicants committed to ongoing coordination with the FAA and landowners with private airstrips in the route permit application. If issued a route permit the applicants would need to file notice with the FAA and work with both FAA and MnDOT for compatibility between the transmission line and any airport and to identify appropriate mitigation measures. Once a final route is determined, it is recommended communication occur with Browns Private Airport to avoid direct impacts to the private airstrip.

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

Near airports and airstrips, in or near fields where aerial applications of pesticides or fertilizers occur, or where tall machinery are frequently operated, markers could be installed on overhead transmission line conductors. This could help improve visibility to pilots and lessen the risk of collision (reference (75)). The applicants will mail notice of the application filing to aerial applicators registered with the Minnesota Agricultural Aircraft Association in the project area.

4.3.11.4 Local and Regional Utilities

The ROI for public utilities is the ROW. This section discusses local and regional electric, natural gas pipelines, petroleum pipelines, sewer, and water utility services.

4.3.11.4.1 Existing Conditions

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

- Agralite Cooperative
- Alexandria Light and Power
- Ortonville Water and Light
- Otter Tail Power
- Runestone Electric Association
- Xcel Energy

Natural gas services in the project area are provided by several utilities including CenterPoint Energy, Minnesota Energy, and others.

There are 18 crossings of natural gas and petroleum pipelines within the ROW of the routing alternatives operated by Alliance Pipeline System and Northern Natural Gas Co. Twelve of these crossings are in the Central Region, and six are in the North Region.

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

4.3.11.4.2 Potential Impacts

In some areas, the project could cross over existing transmission lines, follow existing transmission line rights-of-way, or cross or parallel electric distribution lines. Potential impacts to the electrical grid and other utilities during construction are anticipated to be short-term, intermittent, and localized. Construction may require short transmission line outages for safety while crews are maneuvering over or under other existing transmission lines. The applicants would coordinate with the owner of the existing lines that need to be crossed and access granted in accordance with the requirements of MISO. It should be noted that a line outage needed for a utility line crossing does not result in an outage to customers. Due to the multiple interconnections and redundancy of the broader transmission grid, transmission line outages will be managed to avoid customer outages. An overarching project objective is to relieve electrical grid congestion and provide an increased ability to support additional renewable generation in the region. Operation of the project would therefore have long-term beneficial impacts by providing additional transmission line capacity in the project area.

Although unlikely, damage to existing pipelines could occur during grading activities. The applicants would utilize the Gopher State One-Call system to locate and mark all existing underground utilities prior to construction to avoid impacts on pipelines. If crossing an underground utility is required, the applicants would use BMPs such as construction matting to protect existing infrastructure while using heavy equipment during construction.

If needed, the applicants would work with the existing underground utilities on a case-by-case basis. Some of these utilities may require evaluation of project plans and profiles to address potential impacts from alternate current on their pipeline or other impacts determined by an integrity engineer before any activity can occur. Encroachment agreements with pipelines are generally required for all encroachments, including construction vehicles and equipment on or within pipeline easements. Municipal utilities such as wells and sewer are discussed in Section 4.7.5.

4.3.11.4.3 Mitigation

4.3.11.4.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.3.4, contains the following mitigation related to public services and utilities: "During Transmission Facility construction, the Permittee shall minimize any disruption to public services or public utilities. To the extent disruptions to public services or public utilities occur these shall be temporary, and the Permittee shall restore service promptly. Where any impacts to utilities have the potential to occur the Permittee would work with both landowners and local entities to determine the most appropriate mitigation measures if not already considered as part of this route permit."

4.3.11.4.3.2 Other Proposed Mitigation

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

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

4.4 Human Health and Safety

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

4.4.1 Electric and Magnetic Fields

The ROI for EMF is the ROW. Members of the public would be subject to EMF if living or working (for example, operating their farming equipment) near the line. Impacts to human health from possible exposure to EMFs are not anticipated. The transmission line would be constructed to maintain proper safety clearances and the substations would not be accessible to the public. EMF associated with the project are below Commission permit requirements, and state and international guidelines. Potential impacts would be long-term and localized. These unavoidable impacts would be minimal and can be mitigated. Impacts would be minimized by prudent routing and adhering to electric field standards for transmission lines.

4.4.1.1 Existing Conditions

The term "EMF" is typically used to refer to electric and magnetic fields that are coupled together. EMFs are invisible forces that result from the presence of electricity. EMFs are associated with natural sources such as lightning, sunlight, and the geomagnetic field. EMFs also surround electrical devices (for example, cell phones, microwaves, power lines, and electrical wiring) and are produced through the generation, transmission, and use of electric power (reference (76)).

EMFs are characterized and distinguished by their frequency, that is, the rate at which the field changes direction each second. For lower EMF frequencies associated with power lines, electric and magnetic fields are relatively decoupled. Electrical lines in the United States have a frequency of 60 cycles per second or 60 hertz, which is extremely low frequency EMF (ELF-EMF). Generally, electric fields are dependent on the *voltage* of a transmission line and magnetic fields are dependent on the *current* carried by a transmission line.

Electric fields are the result of electric charge, or *voltage*, on a conductor. Using a garden hose as an analogy, voltage is equivalent to the pressure of the water moving through the hose. The intensity of an electric field is related to the magnitude of the voltage on the conductor and is measured in kV per meter (kV/m). Magnetic fields are created and increase from the strength of the flow of *current* through wires or electrical devices. Using the same analogy, current is equivalent to the amount of water moving through the garden hose. The intensity of a magnetic field is related to the magnitude of the current flow through the conductor and is measured in units of Gauss (G) or milliGauss (mG).

Because the EMF associated with a transmission line is proportional to the amount of electrical current passing through the power line it will decrease as distance from the line increases (reference (77)). The strength of an electric field decreases rapidly as it travels from the source. This means that the strength of EMF that reaches a house adjacent to a transmission line ROW will be significantly weaker than it would be directly under the transmission line. Electric fields are easily shielded by conducting objects, such as trees and buildings, further shielding electric fields.

Magnetic fields, like electric fields, rapidly decrease in strength with increased distance from the source. Unlike electric fields, magnetic fields are not shielded or weakened by materials that conduct electricity (for example, trees, buildings, and human skin). Rather, they pass through most materials. Electric and magnetic fields are invisible just like radio, television, and cellular phone signals, all of which are part of the electromagnetic spectrum (reference (78)).

Electric and magnetic fields are found anywhere there are energized, current-carrying conductors, such as near transmission lines, local distribution lines, substation transformers, household electrical wiring, and common household appliances. The frequency from transmission lines is considered "non-ionizing, low-level radiation which is generally perceived as harmless to humans" (reference (76)). Table 4-5 provides the typical ranges of electric and magnetic fields of frequently and commonly used appliances that would be in a home (reference (76)).

Table 4-5 Electric and Magnetic Field Ranges for Common Household Appliances

Electric Field [1]		Magnetic Field [2]			
Appliance	kV/m	Appliance	mG		
	1 foot		1 inch	1 foot	3 feet
Stereo	0.18	Circular saw	2,100 to 10,000	9 to 210	0.2 to 10
Iron	0.12	Drill	4,000 to 8,000	22 to 31	0.8 to 2
Refrigerator	0.12	Microwave	750 to 2,000	40 to 80	3 to 8
Mixer	0.10	Blender	200 to 1,200	5.2 to 17	0.3 to 1.1
Toaster	0.08	Toaster	70 to 150	0.6 to 7	< 0.1 to 0.11
Hair Dryer	0.08	Hair dryer	60 to 200	< 0.1 to 1.5	< 0.1
Television	0.06	Television	25 to 500	0.4 to 20	< 0.1 to 1.5
Vacuum	0.05	Coffee maker	15 to 250	0.9 to 1.2	< 0.1

[1] German Federal Office for Radiation Safety
[2] Long Island Power Institute

Research on whether exposure to magnetic fields causes biological responses and health effects has been performed since the 1970s through epidemiological, animal, clinical, and cellular studies. To date, "no mechanism by which ELF-EMFs or radiofrequency radiation could cause cancer has been identified. Unlike high-energy (ionizing) radiation, EMFs in the non-ionizing part of the electromagnetic spectrum cannot damage DNA or cells directly." That is, the ELF-EMF that is emitted from HVTLs does not have the energy to ionize molecules or to heat them (reference (79)). Nevertheless, they are fields of energy and thus have the potential to produce effects.

The U.S. National Institute of Environmental Health Sciences and the World Health Organization's research does not support a relationship or association between exposure to electric power EMF and adverse health effects. The U.S. National Institute of Environmental Health Science evaluated numerous epidemiologic studies and comprehensive reviews of scientific literature regarding association of cancers with living near power lines, with magnetic fields in the home, and with exposure of parents to high levels of magnetic fields in the workplace. They concluded that "no consistent evidence for an association between any source of non-ionizing EMF and cancer has been found."

Researchers continue to study potential health effects related to EMF and potential causal mechanisms. Since 1969, the International Agency for Research on Cancer (IARC) has been evaluating the carcinogenic risks of chemicals and other agents, such as viruses and radiation. In 2001, the IARC convened a working group of scientists to evaluate possible carcinogenic risks to humans from exposure to EMF. These scientists concluded that ELF magnetic fields are possibly carcinogenic to humans (a "Group 2B carcinogen"). Group 2B carcinogens are agents for which there is limited evidence of carcinogenicity in humans and less than sufficient evidence for carcinogenicity in experimental animals (reference (80, 81)).

Minnesota, Wisconsin, and California have performed literature reviews and research examining EMF. In 2002, Minnesota formed an Interagency Working Group to evaluate EMF research and develop public health policy recommendations for any potential problems arising from EMF effects associated with high-voltage transmission lines. The Interagency Working Group included staff from a number of state agencies and published its findings in a White Paper titled *Electric and Magnetic Field Policy and Mitigation Options*. Their research found that some epidemiological studies have shown no statistically significant association between exposure to EMF or health effects, and some have shown a weak association. Existing laboratory studies have not substantiated this relationship nor have scientists been able to establish a biological mechanism for how magnetic fields could cause adverse effects (reference (82)).

Currently, there are no federal regulations regarding allowable ELF-EMF produced by power lines in the United States. The Commission has imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground (Appendix B). The Commission has not adopted a magnetic field standard for transmission lines. Appendix I provides detailed background on EMF health impact research. International organizations have also adopted standards for exposure to electric and magnetic fields Table 4-6).

Table 4-6 International Electric and Magnetic Field Guidelines

Organization	Electric Field (kV/m)		Magnetic Field (mG)	
	Public	Occupational	Public	Occupational
Institute of Electrical and Electronics Engineers	5.0	20.0	9,040	27,100
International Commission on Non-Ionizing Radiation Protection	4.2	8.3	2,000	4,200
American Conference of Industrial Hygienists	—	25.0	—	10,000/1,000[1]
National Radiological Protection Board	4.2	—	830	4,200

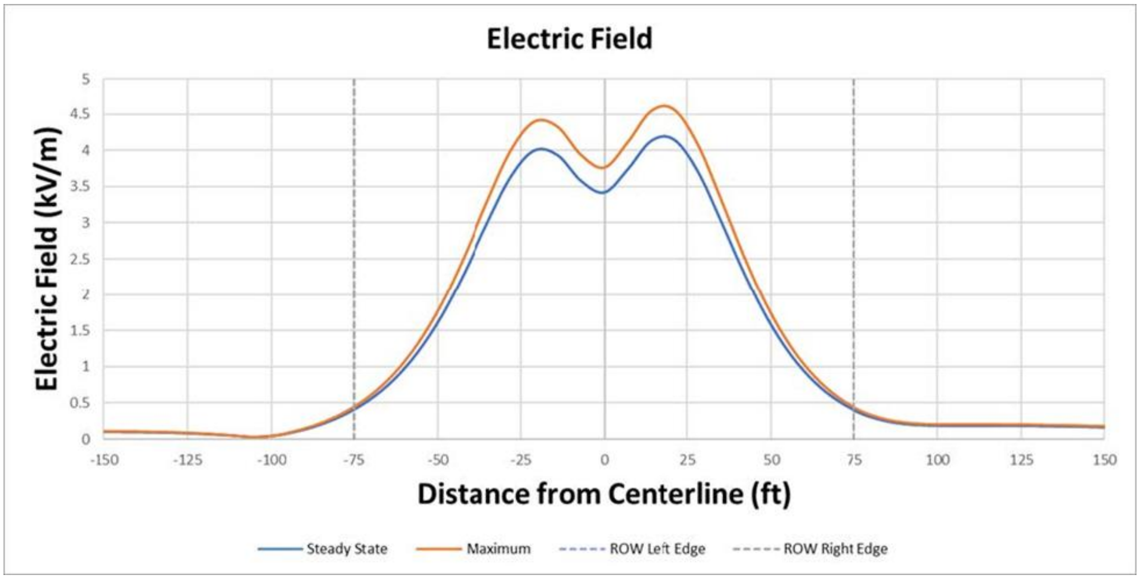
[1] For persons with cardiac pacemakers or other medical electronic devices

4.4.1.2 Potential Impacts

Potential impacts from EMFs are anticipated to be negligible and are not expected to negatively affect human health. The primary source of EMF from the project is the transmission lines.

Electric fields are dependent on the voltage of the HVTL. Figure 4-4 provides the electric fields at maximum conductor voltage for the proposed 345 kV transmission line. The magnitude of the voltage on a transmission line is near-constant and ideally within plus or minus ten percent of the designed voltage. Because of this the magnitude of the electric field will also be near constant regardless of the power flowing down the line. The maximum electric field associated with the project (nominal voltage plus ten percent), measured at one meter (3.28 feet) above the ground, is calculated to be 4.14 kV/m. As shown in Figure 4-4, the strength of electric fields diminishes rapidly as the distance from the conductor increases. The electric field values at the edge of the transmission line ROW and sample points beyond are shown in Table 4-7.

Figure 4-4 Electric Field Calculations for Proposed 345 kV Transmission Line



Source provided in Appendix C

Table 4-7 Electric Field Calculations for Proposed 345 kV Transmission Line (3.28 feet above ground)

Nominal Voltage – Maximum at 110%	Distance to Proposed Centerline (feet)												
	-300	-200	-100	-75	-50	-25	0	25	50	75	100	200	300
(kV/m)	0.05	0.09	0.07	0.40	1.87	4.00	3.77	4.10	1.84	0.40	0.21	0.12	0.06

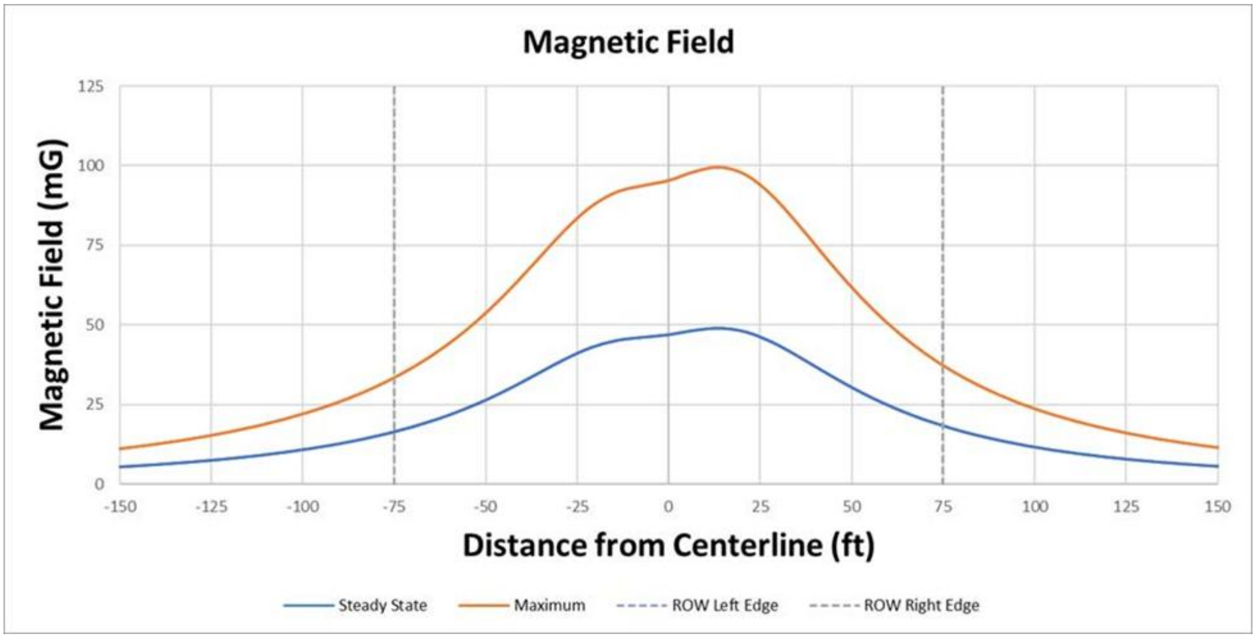
Source provided in Appendix C

Even at electric field level maximums demonstrated in Table 4-7, the project’s levels will be consistent with the Commission’s limit (less than 8.0 kV/m at one meter above the ground). Additionally, the nearest resident to any project infrastructure, in this case the transmission line, is about 75 feet. This resident would not be exposed to the maximum electric field associated with the project and would be exposed to electric fields under the Commission’s limit. Thus, potential health impacts from these electrical field levels are anticipated to be negligible.

The projected magnetic fields for the project are provided in Figure 4-5 and Table 4-8. Because magnetic fields are dependent on the current flowing on the line, calculations were based on two typical system conditions that are likely to occur during the project’s first year in service. The applicants calculated EMFs based on two estimated typical system conditions: steady state current and maximum current.

Steady state current represents the current flow on with the anticipated typical energy demand. Maximum current represents maximum operating flows with peak energy demand. For both scenarios, the magnetic field values were calculated at a point where the conductor is one meter above ground. Like electric fields, the data shows that magnetic field levels decrease rapidly as the distance from the source increases (Figure 4-5). In addition, because the magnetic field produced by the transmission lines is dependent on the current flow, the actual magnetic fields when the project is placed in service would vary as the current flow on the line changes throughout the day.

Figure 4-5 Calculated Magnetic Field Magnitudes (mG) for Double-Circuit 345 kV Transmission Line



Source provided in Appendix C

Table 4-8 Calculated Magnetic Field Magnitudes for Double-Circuit 345 kV Transmission Line (3.28 feet above ground)

	Distance to Proposed Centerline (feet)												
	-300	-200	-100	-75	-50	-25	0	25	50	75	100	200	300
steady state current of 476 A per line (mG)	1	3	11	16	27	39	47	45	31	18	12	3	2
maximum current of 968 A per line (mG)	2	6	23	32	55	80	95	91	63	36	25	7	3

Source provided in Appendix C

4.4.1.3 Mitigation

4.4.1.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.4.2, states, "The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms."

4.4.1.3.2 Other Proposed Mitigation

No health impacts from EMF are anticipated. The Commission has, however, adopted a prudent avoidance approach in routing transmission lines and, on a case-by-case basis, considers mitigation strategies for minimizing EMF exposure levels associated with transmission lines. Consistent with this approach, basic mitigation measures are prudent. EMF diminishes with distance from a conductor; therefore, mitigation of both electric and magnetic field strength would be achieved by increasing distance from the transmission line to the receptor, such as a residence or other location where citizens congregate, to the extent practicable.

4.4.2 Implantable Medical Devices

The ROI for implantable medical devices is the ROW. Magnetic fields produced by HVTLs are not high enough to interfere with these devices. Electric field strengths associated with the project are below American Conference of Governmental Industrial Hygienists recommended limits, the Commission's 8.0 kV/m route permit limit for electric fields, ICD manufacturers' recommended threshold, and the 5.0 kV/m interaction level that could cause interference. If impacts occur, they can be mitigated. Impacts would be minimized by appropriate grounding and adherence to electric field standards for transmission lines.

4.4.2.1 Existing Conditions

Implantable medical devices, such as implantable cardioverter defibrillator or a pacemaker, are battery powered devices that help keep a person's heartbeat in a regular rhythm. These devices are implanted into the heart tissue and can deliver electrical shocks to correct the heart's rhythm to prevent sudden cardiac issues and help people at risk for recurrent, sustained ventricular tachycardia or ventricular fibrillation (reference (83)). Instances of interference attributed to EMF are commonly referred to as electromagnetic interference (EMI). EMF exposure produced by transmission lines generally does not affect implantable devices.

Electromechanical implantable medical devices, such as cardiac pacemakers, implantable cardioverter defibrillators (ICDs), neurostimulators, and insulin pumps could be subject to interference from EMF, which could mistakenly trigger a device or inhibit it from responding appropriately (reference (75)). While EMI can result in either inappropriate triggering or inhibition of a device from responding properly, only a small percentage of these occurrences are caused by external EMI. Electrical interference at levels above 5.0 kV/m have the potential to interfere with modern, bipolar pacemaker behavior, but some models have been unaffected at as high as 30 kV/m (reference (84)). There is the potential for interference at lower levels, as differing manufacturers vary in susceptibility to EMI (reference (85)).

Workers who have cardiac pacemakers have separate guidelines for EMF exposure. The American Conference of Governmental Industrial Hygienists (ACGIH) recommended EMF exposure limits for workers who have ICDs are 1 G and 1 kV/m, respectively (reference (86)). While ICDs vary and questions and concerns should be directed to the specific manufacturer, ICD manufacturers' recommended threshold for modulated magnetic fields is 1 G (reference (75)). One gauss is five to 10 times greater than the magnetic field likely to be produced by a high-voltage transmission line (reference (75)).

4.4.2.2 Potential Impacts

During the peak hour of system-wide energy demand the calculated magnetic field levels for the project to be 0.1 G less than 25 feet from the centerline. The maximum electric field was measured to be 4.57 kV/m less than 25 feet from the centerline. EMF strengths decreases rapidly with distance from the centerline of the transmission line. At the edge of the ROW on either side, 75 feet away from the centerline, the electric field could be up to 0.4 kV/m and the magnetic field up to 0.36 G. (Table 4-7 and Table 4-8) These levels are significantly below ACGIH recommended limits, the Commission's 8.0 kV/m route permit limit for electric fields, ICD manufacturers' recommended threshold, and the 5.0 kV/m value that could cause interference.

While EMI can result in either inappropriate triggering or inhibition of a device from responding properly, only a small percentage of these occurrences are caused by external EMI. The project is under ACGIH and ICD manufacturer's recommended threshold for magnetic fields. Electrical fields associated with the project are below the 5.0 kV/m interaction level for modern, bipolar pacemakers. Modern pacemaker technology has greatly reduced the EMF interference potential. There is the potential for impacts to older, unipolar pacemakers directly underneath the project line. Workers with ICDs should consult with their doctors directly with concerns about work in electrical or magnetic environments (references (87); (78)). In the unlikely event ICDs are impacted by EMF, it generally results in a temporary asynchronous pacing (reference (75)). The pacemaker returns to its normal operation when the person moves away from the source of the interference. Therefore, health impacts or permanent impacts on implantable medical devices are anticipated to be negligible.

4.4.2.3 Mitigation

4.4.2.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.4.1, contains the following mitigation related to grounding, electric field and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes root mean square (rms) alternating current between the ground and any non-stationary object within the right-of-way, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the right-of-way, except electric fences that parallel or cross the right-of-way, shall be grounded to the extent necessary to limit the induced short-circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the NESC. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

Additionally, condition 5.4.2 limits the electric field by stating, "The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms."

4.4.2.3.2 Other Proposed Mitigation

Electric and magnetic field strength is mitigated by increasing the distance from the transmission line and structures. Electric fields causing interference are easily shielded by vehicles and buildings. Medical devices return to normal operation when the person moves away from the source of the EMF (reference (75)). The project would be designed in accordance with applicable NESC standards to keep electric fields below the 8 kV/m limit set by the Commission. Individuals are expected to follow the recommendations of their medical provider of the potential problems associated with EMI and their device.

4.4.3 Public and Worker Safety

The ROI for public and worker safety is the ROW. Any construction project has risks such as potential injury from falls, equipment and vehicle use, and electrical accidents. Risks for the public involve electrocution but are lower for HVTLs because the conductor is higher from the ground. Substations have potential electrocution risks if there is unauthorized entry. Potential impacts are anticipated to be minimal, short-and long-term, and can be mitigated. Impacts would be minimized by appropriate adherence to relevant local and state codes, the NESC, and NERC requirements.

4.4.3.1 Existing Conditions

The most recent data from the Bureau of Labor Statistics for injuries and illnesses was used to find the recent number of injuries and illnesses for Power and Communication Line and Related Structures Construction (North American Industry Classification System Code No. 23713 Power and Communication Line and Related Structures Construction). In the U.S. in 2023, there were a total of 3,900 nonfatal occupational injuries and illnesses and 33 fatal injuries, 12 of which were from transportation incidents (roadway accident or being struck by a vehicle) and 12 from harmful substances or environments (such as working with heavy machinery).

4.4.3.2 Potential Impacts

As with any construction project, there are construction related risks. These could include potential injury from falls, equipment and vehicle use, and electrical accidents. Additionally, construction can potentially disturb existing environmental hazards.

Electrocution is a risk that could occur with direct contact to lines. Between 2011 and 2015 power-line installers in the U.S. had 32 deaths related to electrocution, a rate of 29.7 deaths per 100,000 full time workers (reference (88)). Electrocution could also happen when working near power lines, like when using heavy equipment. Electrocution could occur when there is electrical contact between an object on the ground and an energized conductor, but this situation is most likely with distribution lines (reference (75)). There is also electrocution risk from unauthorized entry into the substation.

Any accidents that might occur during construction of the project would be handled through local emergency services. Existing emergency services should have sufficient capacity to respond to project-related emergencies.

4.4.3.3 Mitigation

4.4.3.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.5.1, contains the following mitigation related to safety: "The Permittee shall design the transmission line and associated facilities to meet or exceed all relevant local and state codes, the NESC, and NERC requirements. This includes standards relating to clearances to ground, clearance to crossing utilities, clearance to buildings, strength of materials, clearances over roadways, right-of-way widths, and permit requirements."

4.4.3.3.2 Other Proposed Mitigation

Proper safeguards would be implemented for the construction and operation of the transmission line and substation. The project would be designed to meet or exceed local, state, and the applicants' standards regarding clearance to the ground, clearance to crossing utilities, strength of materials, and ROW distances.

The project must comply with the NESC.89 and Occupational Safety and Health Administration standards (reference (89)). Construction crews and contract crews would also comply with local, state, and NESC standards for installation and construction practices. The applicants would use their established safety procedures, as well as industry safety procedures, during and after installation of the transmission line, including appropriate signage during construction.

The substations would be fenced and locked. Appropriate signage would be posted that identifies the hazards associated with the substation.

4.4.4 Stray Voltage

The ROI for stray voltage is the ROW. Potential impacts to residences and farming operations from stray voltage are not anticipated. Transmission lines do not produce stray voltage during normal operation, as they are not directly connected to businesses, residences, or farms. The project would be constructed to NESC standards, and impacts are anticipated to be minimal. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

4.4.4.1 Existing Conditions

"Stray voltage" is a condition that can potentially occur on a property or on the electric service entrances to structures from distribution lines connected to these structures. The term generally describes a voltage between two objects where no voltage difference should exist. The source of stray voltage is a voltage that is developed on the grounded neutral wiring network of a building and/or the electric power distribution system. Stray voltage is not created by transmission lines, as they do not directly connect to businesses or residences (reference (90)).

Where utility distributions systems are grounded, a small amount of current will flow through the earth at those points. This is called neutral-to-earth voltage (NEV), which is voltage that is associated with distribution lines and electrical wiring within building and other structures (reference (91)). Electrical systems that deliver power to end-users and electrical systems within the end-user's business, home, farm, or other buildings are grounded to the earth for safety and reliability reasons. Stray voltage could arise from neutral currents flowing through the earth via ground rods, pipes, or other conducting objects, of from faulty wiring or faulty grounding of conducting objects in a facility. Thus, stray voltage could exist at any business, house, or farm which uses electricity – independent of whether there is a transmission line nearby. For the project, site-specific mitigation measures are required to address potential stray voltage impacts.

Stray voltage and its effects on farms have been studied for nearly 30 years. Stray voltage is a natural phenomenon that can be found at low levels between two contact points at any property where electricity is grounded; it is measured between two points that livestock can simultaneously touch (reference (91)). More precisely, stray voltage exists between the neutral wire of either the service entrance or of the premise wiring and grounded objects in buildings such as barns and milking parlors. Numerous studies have found that though it is likely to exist on farms, it is rarely strong enough to affect the behavior or production of dairy cattle (reference (92)). The Commission issued a report in 1998 supporting the conclusion that no credible scientific evidence has been found to show that currents in the earth or associated electrical parameters such as voltages, magnetic fields, and electric currents, are causes of poor health and milk production in dairy herds (reference (92)).

4.4.4.2 Potential Impacts

Stray voltage is, generally, an issue associated with electrical distribution lines and electrical service at a residence or on a farm. Under normal operating conditions, transmission lines do not create stray voltage as they do not directly connect to buildings such as residences or farms. The project would not directly connect to buildings or change local electrical service. Accordingly, impacts due to stray voltage are anticipated to be negligible.

If stray voltage impacts were to occur after the transmission line was installed, landowners are encouraged to coordinate with their local electrical provider as outlined in the Minnesota Stray Voltage Guide (reference (90)). Should the local provider determine impacts are not a result of the distribution system, landowners are encouraged to contact Otter Tail Power Company and Western Minnesota Municipal Power Agency.

Though stray voltage impacts are not anticipated to be caused by the project, stray voltage could be of concern to livestock farmers, particularly on dairy farms. If stray voltage is prevalent in an agricultural operation it can affect livestock health. This concern has primarily been raised on dairy farms because of its potential to affect milk production and quality. Farmers are encouraged to coordinate with their local electrical provider as outlined in the Minnesota Stray Voltage Guide (references (90); (93); (94); (95)).

4.4.4.3 Mitigation

4.4.4.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.4.1, contains the following mitigation related to grounding, electric field and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes rms alternating current between the ground and any non-stationary object within the right-of-way, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the right-of-way, except electric fences that parallel or cross the right-of-way, shall be grounded to the extent necessary to limit the induced short-circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the NESC. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

In the draft route permit, condition 5.4.2, contains the following mitigation related to electric fields, "The Permittee shall design, construct, and operate the transmission line in such a manner that the electric field measured one meter above ground level immediately below the transmission line shall not exceed 8.0 kV/m rms."

4.4.4.3.2 Other Proposed Mitigation

No additional mitigation is proposed.

4.4.5 Induced Voltage

The ROI for induced voltage is the ROW. It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line. This could induce a voltage on the object. Smaller conductive objects near the line could cause a nuisance shock to a person, but it is not a potential safety hazard. Metal buildings within the ROW might require grounding. Impacts would be minimized by adhering to relevant local and state codes, the NESC, and NERC requirements.

4.4.5.1 Existing Conditions

It is possible for electric fields from a transmission line to extend to a conductive object near the transmission line. This might induce a voltage on the object; the magnitude of the voltage depends on several factors such as the size, shape and orientation of the object along the ROW. Smaller conductive objects near the transmission line that are insulated or semi-insulated from the ground could cause a nuisance shock to a person from a small current passing through the person's body to the ground. If there were insulated pipelines, electric fences, telecommunication lines, or other conductive objects such as tractors or automobiles—in part because tires are made electrically conductive to eliminate static discharge building up while in motion—with greater lengths and sizes, induced voltage from a transmission line could produce a larger shock (reference (96)). This larger shock has not been found to be a health safety hazard (reference (97)).

4.4.5.2 Potential Impacts

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

Shocks from induced voltage from transmission lines are considered more of a nuisance than a danger. The transmission line would follow NESC standards, which require the steady-state (continuous) current between the earth and an insulated object located near a transmission line to be below 5 milliamps (mA). A shock at 5 mA is considered unpleasant, not dangerous, and allows for a person to still release the energized object that they are holding that is causing the shock (reference (96)). In addition, the Commission imposed a maximum electric field limit of 8 kV/m measured at one meter above the ground. The standard is designed to prevent serious hazards from shocks when touching large objects parked under AC transmission lines of 500 kV or greater (reference (82)).

Additionally, insulated electric fences used in livestock operations can be charged with induced voltage from transmission lines if they are paralleled for a long enough distance. An induced charge on insulated electric fences may continuously drain to ground when the charger unit is connected to the fence. When the charger is disconnected for construction or maintenance, shocks may result. The local electrical utility can provide site-specific information about how to prevent possible shocks when the charger is disconnected if problems arise.

4.4.5.3 Mitigation

4.4.5.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.3.4, contains the following mitigation related to grounding, electric field and electronic interference: "The Permittee shall design, construct, and operate the transmission line in a manner so that the maximum induced steady-state short-circuit current shall be limited to five milliamperes rms alternating current between the ground and any non-stationary object within the right-of-way, including but not limited to large motor vehicles and agricultural equipment. All fixed metallic objects on or off the right-of-way, except electric fences that parallel or cross the right-of-way, shall be grounded to the extent necessary to limit the induced short-circuit current between ground and the object so as not to exceed one milliampere rms under steady state conditions of the transmission line and to comply with the ground fault conditions specified in the NESC. The Permittee shall address and rectify any induced current problems that arise during transmission line operation."

4.4.5.3.2 Other Proposed Mitigation

The applicants committed to meeting electrical performance standards. Appropriate measures would be taken to prevent induced voltage problems when the project parallels or crosses objects. Metal buildings might have unique issues due to induction concerns. For example, conductive buildings near power lines of 200 kV or greater must be properly grounded. Any person with questions about a new or existing metal structure or other conductive objects should contact the applicants for further information about proper grounding requirements. When fixed objects such as metal sheds or vehicles are subject to electric field induction, grounding through a ground rod is frequently sufficient.

4.5 Land-based Economies

The ROI for land-based economies is the route width except for tourism which is the local vicinity. The ROI for recreation is more localized (the route width) as potential impacts to the tourism economy would be experienced at a broader scale. The short and long-term impacts of land-based economies are assessed for agriculture, forestry, mining, and tourism.

Constructing and operating the project could potentially affect land-based economies in the project area. Transmission lines are a physical, long-term presence on the landscape which could prevent or otherwise limit use of land for other purposes. The primary land-based economic activity in the project area is agriculture. Other potential economic activities connected to land use in the project area include forestry, mining, and tourism. The primary means of mitigating impacts to land-based economies is prudent routing; that is, by choosing routing alternatives that avoid such economies.

4.5.1 Agriculture

The ROI for agriculture is the route width. Agriculture is the predominant land-use within the ROI, and when structures are placed within an agricultural field they could interfere with farming operations. Potential impacts are assessed through consideration of total agricultural land use, presence of prime farmlands, and agricultural practices (for example, aerial spraying and use of center pivot irrigation systems).

4.5.1.1 Existing Conditions

Agriculture is the predominant land cover in Big Stone, Douglas, Pope, Stevens, and Swift counties (Map 11-1 through Map 11-9). Principal crops include grains, oilseeds, dry peas, dry beans, and hay. Farmers in the area also raise livestock, including cattle and calves, hog and pigs, poultry, and cows (references (98); (99); (100); (101); (102)).

Barr requested information from the Minnesota Apiary Registry and, per the data received in June 2025, there are no beekeeping operations within the route widths of any routing alternatives. Based on the data in the MDA's DriftWatch map in August 2025, there are no beehives within the route width. DriftWatch is a voluntary communication tool that enables crop producers, beekeepers, and pesticide applicators to work together to protect specialty crops and apiaries through mapping.

Three categories of soils identified by the Soil Survey Geographic Database (SSURGO) database are subject to protection under the Farmland Protection Policy Act (FPPA): prime farmland, prime farmland if drained, and farmland of statewide importance. Prime farmland is defined by the NRCS as land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses (reference (103)). Prime farmland if drained includes soils that have the potential to be prime farmland but require drainage or hydrologic alteration to achieve high productivity. Farmland of statewide importance includes soils that are nearly prime, but are not as productive due to permeability, slope, erosion potential, or some other soil property.

The ROI includes areas of prime farmland, prime farmland if drained, and farmland of statewide importance (Map 12-1 through Map 12-9). Prime farmland is prevalent throughout the route widths of all the routing alternatives. 50% of land in the ROW is considered prime farmland.

Center pivot irrigation systems are present in the Swift Subregion, Hancock Subregion, Cyrus Subregion, White Bear Lake Subregion, and Alexandria Subregion. Identified center pivot irrigation systems are shown on Map 12-1 through Map 12-9.

The 2025 directory of Minnesota organic farms from the Minnesota Department of Agriculture (MDA) lists seven potential organic farms in the five-county area (reference (104)). However, because organic farmers are not required to register with the MDA, there could be additional, unregistered organic farms within the project area. In addition, organic farm registration does not give the precise location of organic fields, only the registrant's mailing address.

Due to the prevalence of agricultural production in the region, there are a number of private airports with airstrips that are likely used for aerial spraying businesses within five miles of the routing alternatives. However, none of these appear to be registered with the Minnesota Agricultural Aircraft Association. There is one private airstrip in the project area; it is within one mile of HSR01, HSR02, HSR03, CSR01, and CSR02 (Section 6.2.4.1 and Section 6.3.4.1).

Agriculture in this area also includes precision farming practices. Precision farming involves the use of GPS to guide farming equipment. One of the most precise types of GPS systems is known as a real-time kinematic GPS (RTK GPS). Precision farming minimizes the potential for waste from, for example, duplicate row seeding or overlap in fertilizer or pesticide application.

4.5.1.2 Potential Impacts

Transmission lines have the potential to impact agriculture both temporarily and permanently. Temporary impacts result from transmission line construction, the extent of which are usually limited to the duration of construction, and annual transmission line inspections, the extent of which are temporary and periodic during operation. Impacts could include limiting the use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Soil compaction would lower annual crop yields for longer than one year. Temporary impacts from annual transmission line inspections might include pedestrian or light vehicle access, which would be limited to the ROW and areas where obstructions might require access from off the ROW. Impacts associated with annual transmission line inspections are expected to be coordinated as part of easement negotiations between the applicants and the landowner before construction of the project.

Permanent transmission line impacts result from the placement of transmission line structures within crop, pasture, and other agricultural lands. The footprint of the transmission line structures is land that can no longer be used for agricultural production. This footprint can adversely impact farm income and property values (Section 4.3.8) depending on placement, structure type, and a variety of other factors. Permanent structures can have varying sized footprints due to the structure design and distance from each other. The project anticipates using steel monopole structures with concrete pier foundations and a typical span of 1,000 feet between structures (Section 3.2.2).

Both crop and livestock activities would be able to continue around structures after construction, however, structures placed in cultivated fields can impede the efficient use of farm equipment and significantly limit the management options for agricultural operations. Presence of structures can also impede efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields. These structures could also potentially impede or eliminate the use of irrigation systems such as center pivot irrigation systems, either by necessitating reconfiguration of an irrigation system to accommodate structures or by reducing crop revenue because all or a portion of a field could not be irrigated using the same practice. One commenter noted that aerial spraying, which is used on higher value specialty crops such as carrots, peas, sweet corn, and dry edible beans, would likely not be feasible with a transmission line so close to the crops. The commenter also noted that a transmission line may limit future irrigation options if a farmer wants to upgrade their current center pivot irrigation systems to newer methods, such linear irrigation and corner system irrigation (comment #50, reference (2)).

Transmission line structures could limit the use of the private airstrips used for agricultural fields within the ROI by reducing the coverage and effectiveness of aerial spraying. Structures could limit the ability of aerial applicators to reach specific areas of fields by restricting where applicators could safely fly. Additionally, if structures are constructed near airstrips, they could pose a hazard to aircraft during takeoff and landing (reference (75)). During operation, the presence of the transmission line could preclude installing new private airstrips in close proximity.

While the presence of the project on or near an unregistered organic farm would not directly affect a farm's organic certification, special construction and maintenance procedures would need to be followed to avoid impacts to these farms. For example, construction vehicles would need to be cleaned prior to entering organic farms to prevent tracking offsite soil or plant material onto the farm, and throughout operational maintenance of the ROW certain herbicides or pesticides could not be used on or near the organic farm. These measures would need to be coordinated on an individual basis between the applicants and the affected organic farm owner. Impacts could continue through operation, primarily with revegetation practices such as herbicide or pesticide drift from maintaining rights-of-way. The applicants have included a draft VMP as Appendix J that must be coordinated with and approved by a state interagency group as described in Section 4.7.7.

Developing specific construction, restoration, and operation plans with nearby apiaries as applicable could reduce potential for inadvertent bee mortality from accidental chemical drift due to ROW maintenance.

Livestock operations are present within the project area and could be temporarily affected during construction of the project by disrupting access to pasture lands or disruption caused by construction noise. In addition, poultry could be sensitive to disease caused by pathogens introduced by offsite soils tracked on-site during construction.

Though stray voltage impacts are not anticipated to be caused by the project (Section 4.4.4), stray voltage could be of concern to livestock farmers, particularly on dairy farms. If stray voltage is prevalent in an agricultural operation it can affect livestock health. This concern has primarily been raised on dairy farms because of its potential to affect milk production and quality. Stray voltage is by and large an issue associated with distribution lines and electrical service at a residence or on a farm (Section 4.4.4).

Transmission lines do not create stray voltage as they do not directly connect to businesses, residences, or farms (Section 4.4.4).

Transmission lines have the potential to interfere with RTK and standard GPS used for precision farming in two ways: (1) electromagnetic noise from a transmission line could potentially interfere with the frequencies used for RTK and standard GPS signals and (2) transmission line structures could cause line-of-site obstructions or create multi-path reflections such that sending and receiving of signals would be compromised. Interference could occur where the spectrum of transmission line electromagnetic noise overlaps the frequency spectrum used by RTK or standard GPS systems. As discussed in Section 4.3.4, no GPS impacts are expected from the construction or operation of the project.

Interference due to line-of-sight obstruction or multi-path reflection could occur in two ways: (1) obstruction of, or other reflection interference with, a GPS satellite signal and (2) obstruction of radio transmissions from an RTK base station to a mobile receiving unit. GPS uses information from multiple satellite signals to determine specific locations. Interference with one signal would not cause inaccurate navigation; however, simultaneous interference with two signals could lead to inaccurate navigation. Because simultaneous interference with two signals is relatively unlikely and any line-of-sight obstruction would be resolved with movement of the GPS receiver (for example, tractor) such that proper GPS reception would be quickly restored, line-of-sight obstruction impacts to precision farming systems are anticipated to be minimal and temporary.

A transmission line structure very near an RTK base station could cause a line-of-sight obstruction in the signal from a base station. A transmission line structure near an RTK base station (within 100 feet) could also cause multi-path reflections that interfere in the signal from a base station. If the project is to be constructed, an RTK base station would need to be at least outside of the transmission line ROW, or 75 feet away. Eleven non-residences and one residence are within 75 feet of the routes. Multi-path reflections can also be caused by other structures and landscape features including homes, trees, sheds, and sudden changes in ground elevation. However, trees that could interfere would not be within 75 feet of the routes, and the routes are on relatively flat elevations.

4.5.1.3 Mitigation

4.5.1.3.1 Commission Draft Route Permit

Mitigation and restoration measures for vegetation on landowner property are standard Commission route permit conditions. In the draft route permit, condition 5.3.7, contains the following mitigation related to land-based economies: “The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads.” Additionally, condition 5.3.17, contains the following additional mitigation related to land-based economies: “The Permittee shall avoid, promptly repair, or replace all drainage tiles broken or damaged during all phases of the Transmission Facility’s life unless otherwise negotiated with the affected landowner.”

4.5.1.3.2 Other Proposed Mitigation

Impacts on agricultural operations could be mitigated by prudent routing. Specifically, prudent routing could include selecting routing alternatives that prioritize paralleling existing infrastructure (including roads and transmission lines) to maximize potential opportunity for ROW sharing. ROW sharing would decrease the amount of land needed for the new ROW width and would minimize removal of prime farmlands and potential interruptions or impediments with farm equipment.

Prudent routing would secondarily prioritize following existing division lines (including field, parcel and section lines) where paralleling existing infrastructure is not an option. Following existing division lines could minimize impacts to the use of farm equipment if, for example, row crops start and stop along the division lines. However, in some cases, following a property line could still be burdensome to a farmer if the transmission line would cut through their field, as field lines might not follow parcel boundaries. The alignments for the routing alternatives generally do not cut through agricultural field lines and follow boundaries between separated fields when a parcel is cut through.

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

The applicants would work with individual landowners through the easement process to verify the locations of organic farms, center-pivot irrigation systems, apiaries, drain tile, specialty crops or CREP/RIM easements that could be affected by the project. The applicants would work with landowners to determine measures to avoid and minimize impacts on these agricultural resources and to avoid interfering with landowner participation in the CREP or RIM programs. Lastly, impacts can be mitigated by compensating individual landowners through negotiated easement agreements.

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

The applicants would continue to coordinate with privately-owned airstrip operators that use their airstrip for agricultural purposes, as described in 4.3.11.3. Large, brightly colored balls or markers could be installed on overhead transmission line conductors to improve their visibility to pilots and lessen the risk of collision. These markers are often employed near airports or airstrips, in or near fields where aerial applications of pesticides or fertilizers occur, and in areas where tall machinery, such as cranes, are frequently operated (reference (75)).

4.5.2 Forestry

The ROI for forestry is the route width. Potential impacts are assessed through identification of commercial operations. No forestry resources or state forest lands were identified in the ROI.

4.5.2.1 Existing Conditions

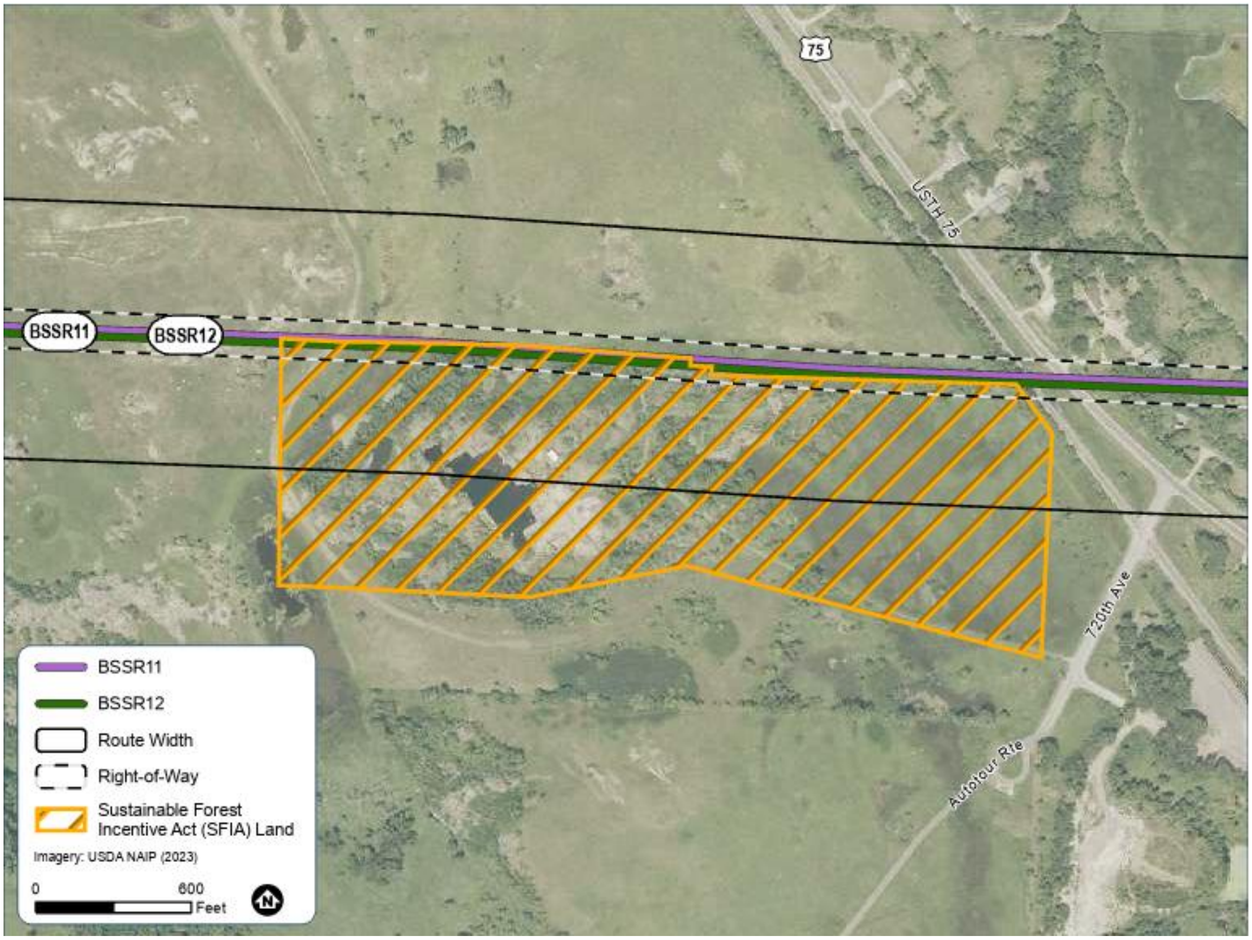
The DNR administers and manages lands for the state through its forestry division including state forests, school trust acres, and other forested lands (Minnesota Statute § 89.001) such as land gifted to the state. State forests were established to produce timber and other forest crops, provide outdoor recreation, protect watersheds, and perpetuate rare and distinctive species of native flora and fauna.

The applicants did not identify any commercial forest operations near the project area in the route permit application. Neither the applicants nor public commenters indicated that active forestry operations, such as commercial timber harvest or woodlots, are occurring near any of the routing alternatives. There are none of the following state-managed forest land in the ROI:

- DNR forestry lands
- State forests
- Forests for the future state conversation easement areas
- School Trust land

There is one type of state-managed forest land in the ROI: SFIA land. The SFIA provides annual incentive payments to private landowners who agree to keep their wooded areas undeveloped and follow an active woodland management plan (reference (105)). One parcel with approximately 33 acres of SFIA land is within the ROI in the Big Stone Subregion along BSSR11 and BSSR12 (Figure 4-6). If BSSR11 or BSSR12 were permitted for the project, the alignment could be adjusted within the route width to avoid placement within the SFIA land. Thus, impacts to forestry in SFIA lands are not expected.

Figure 4-6 Sustainable Forest Incentive Act land within BSSR11 and BSS12 ROI



Few forested areas are found in the ROI as most of the land cover is agricultural (Section 4.7.7) Less than one percent of the land cover within 500 feet of all routing alternatives are considered forested. According to the DNR forest inventory, a total of approximately 211 acres of forested land is within the ROI of the routing alternatives. The routing alternatives generally do not bisect large contiguous forested parcels, with Route Segment N10 in the Alexandria Subregion being the exception (Section 0). The regeneration station is expected to avoid impacts by avoiding construction in a forested area.

4.5.2.2 Potential Impacts

For safe operation of the project, trees and other tall-growing vegetation must be removed from the transmission line ROW. Cutting tall growing vegetation is also required during construction to clear land for the regeneration station. Ongoing maintenance following construction will continue to clear vegetation that grows into the ROW safety clearances. Tree clearing can impact current and future forestry operations.

Potential impacts to forestry resources or operations overall are not expected to occur due to the project as there are few notable forestry resources within the ROI. If BSSR11 or BSSR12 were permitted for the project, the alignment could be adjusted to the north within the route width to avoid routing within the SFIA land; based on the current alignment of BSSR11 or BSSR12, impacts from tree clearing would occur within the ROW as depicted in Figure 4-6. While this tree clearing would be relatively minimal, the clearing could impact the SFIA land by potentially violating its state managed forest land's status. Thus, impacts to SFIA could be significant. Moving the alignment to the north of the SFIA parcel is recommended to avoid these impacts. Impacts to this SFIA parcel is discussed furth in Section 4.7.6.

Route Segment N10 would result in the highest loss of trees within the ROW if chosen as the route in the route permit. While this would not affect forestry production, economy, or businesses, it would result in the highest removal of forested land of any routing alternative.

4.5.2.3 Mitigation

4.5.2.3.1 Commission Draft Route Permit

Mitigation and restoration measures for vegetation on landowner property are standard Commission route permit conditions. In the draft route permit, condition 5.3.7, contains the following mitigation related to land-based economies: "The Permittee shall work with landowners to locate the high-voltage transmission line to minimize the loss of agricultural land, forest, and wetlands, and to avoid homes and farmsteads."

4.5.2.3.2 Other Proposed Mitigation

Impacts on wooded lands can be reduced by prudent routing which minimizes tree clearing to the extent feasible. While personal use timber harvest may be occurring on personal or residential properties, potential impacts can be mitigated. The applicants indicate they will work with landowners to minimize damage and arrange compensation as applicable, thus it's possible that easement agreements can offset the impact to future timber harvest. These agreements are outside the scope of this EIS.

4.5.3 Mining

The ROI for mining is the route width. Potential impacts are assessed through identification of known, existing mining operations and assessing potential impacts to those operations given the potential introduction of the transmission line.

4.5.3.1 Existing Conditions

Mining and mineral resources are defined as areas with a concentration or occurrence of natural, solid, inorganic, or fossilized organic material in such form, quantity, grade, and quality that it has reasonable prospects for commercial extraction.

Mining does not comprise a major industry in the project area; however, there are active commercial aggregate (typically sand or gravel) mining sites in the ROI in the Big Stone Subregion (Section 5.2.4.3), Swift Subregion (Section 5.3.4.3), and Alexandria Subregion (Section 7.2.4.3). These mining sites are assessed on a subregional basis. These aggregates are primarily mined for local use in concrete for highways, roads, bridges, and other construction projects. There are no prospect mining sites in the ROI.

Construction of the project would require sand and aggregate for structure backfill, concrete, and to maintain reliable access routes. Some of the aggregate material could come from local sources. Although demand would temporarily increase during construction, it's anticipated that no new aggregate source facilities would be constructed, nor would any existing facilities be expanded.

4.5.3.2 Potential Impacts

Existing aggregate mines could be negatively impacted by transmission line structures if the structures interfere with access to aggregate resources or the ability to extract them. Impacts are most likely to occur during transmission line construction if resource extraction must be ceased temporarily to safely string a transmission line. To the extent there are potentially recoverable aggregate reserves in the project area, construction of the project could limit the ability to successfully mine these reserves depending on the route selected for the project and the location of these reserves.

The placement of electrical utility facilities would likely interfere with any future geophysical surveys because the surveying technology cannot accurately assess what is underground when transmission lines are above the survey location. Impacts during operation of the project could also occur if heavy equipment used to haul or extract these resources would be inhibited by the transmission line structures.

4.5.3.3 Mitigation

4.5.3.3.1 Commission Draft Route Permit

The draft route permit does not contain mitigation measures specific to mining.

4.5.3.3.2 Other Proposed Mitigation

If impacts to mining operations would occur, the applicants would coordinate those impacts with the mining operator. Impacts can be avoided by prudent routing, that is, choosing an alignment for routes that would avoid or increase distance from mining resources. The typical height of transmission line structures for the project is 100 to 160 feet; impacts with heavy equipment used by commercial mining operations could be avoided or reduced by increasing structure height at access points and ensuring long enough spans between structures to allow for safe entry and exit. Modifying the alignment away from the mine or using specialty structures could also decrease impacts.

4.5.4 Tourism

The ROI for tourism is the local vicinity. Potential impacts are assessed through identification of known resources utilized by non-residents that would likely be recreating in the area and bringing in non-local revenue (or tourism dollars) to the area. Impacts to the tourism economy are anticipated to be negligible to minimal and independent of the route selected.

4.5.4.1 Existing Conditions

Local economies benefit from tourists who travel from outside the region to enjoy recreational amenities. Recreational opportunities identified within the ROI include publicly accessible lands and waters used for outdoor activities (Section 4.3.9). Non-residents or tourists could visit the project area to take advantage of the area's hunting and fishing opportunities.

Tourism opportunities within the ROI beyond local events, outdoor activities, and those discussed in Section 4.3.9 were not identified. Human-built tourism in the counties crossed by the project include county fairs, arts and crafts fairs, farmers markets, battlefields, and smaller community events. These events and other opportunities for tourism are advertised in nearby incorporated towns and not within the ROI.

4.5.4.2 Potential Impacts

Electrical infrastructure can impact tourism by affecting visitor experiences at tourism sites, primarily with aesthetics or noise, or by degrading natural or human-made resources that provide these activities. The highest potential for impacts to tourism would occur during construction, which would be temporary and isolated to specific areas near tourist amenities. Impacts to the tourism economy are anticipated to be negligible to minimal. Because specific tourism opportunities were not identified within the ROI outside of general recreational activities that could occur along the entire project, anticipated impacts are independent of the route selected.

4.5.4.3 Mitigation

4.5.4.3.1 Commission Draft Route Permit

The draft route permit does not contain mitigation measures specific to tourism.

4.5.4.3.2 Other Proposed Mitigation

If the potential for temporary interference with public access to recreation areas used for tourism is identified, the applicants would be expected to coordinate with the owner or managing agency to minimize disruption to the extent practicable. The applicants would continue to work with the DNR to avoid and minimize impacts on recreational resources under DNR's jurisdiction such as publicly accessible lands and waters.

4.6 Archaeological and Historic Resources

The ROI for archaeological resources is the route width. The ROI for historic resources is the local vicinity as to include resources that may be outside of the route width but within visual range of the project. The applicants stated that they will consult with the SHPO and THPOs prior to construction to assess the potential impacts to undocumented cultural resources and determine whether further cultural resource investigations are warranted. Documented archaeological resources are concentrated near watercourses and waterbodies in the Big Stone, Swift, and Alexandria Subregions.

4.6.1 Existing Conditions

Cultural resources consist primarily of archaeological sites, historic architectural resources, and traditional cultural properties (TCPs). Archaeological sites are defined as the material remains of past human life or activities (reference (106)). Pursuant to the Minnesota Historic and Architectural Survey Manual (reference (107)), historic architectural resources are defined as sites, buildings, structures, or objects that are over 45 years in age and "create tangible links to the American past, whether in relation to historical events and people, traditional ways of life, architectural design, or methods of construction" (reference (108)). TCPs are defined as locations of significance to a community because of their association with important cultural practices and beliefs (reference (109)).

Federal laws and regulations, including Section 106 of the National Historic Preservation Act of 1966 (Section 106), its implementing regulations found in 36 CFR 800, and the Archaeological Resources Protection Act of 1979, provide the standards for cultural resources identification, evaluation, and mitigation of impacts. Pursuant to Section 106 of the NHPA, a historic property is any archaeological site, historic architectural resource, or traditional cultural property included in, or eligible for inclusion in, the NRHP. Resources that have not yet been evaluated for inclusion on the NRHP are considered potentially eligible. Potential cultural resources investigations that could be required under Section 106 include archaeological surveys, historic architectural surveys and/or surveys to identify TCPs.

Once identified through documentary research and/or fieldwork, archaeological sites and historic architectural resources are evaluated for NRHP eligibility based on the following criteria.

> "The quality of significance in American history, architecture, archaeology, engineering and culture is present in the districts, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:
>
> a. That are associated with the events that have made a significant contribution to the broad patterns of our history; or
> b. That are associated with the lives of persons significant in our past; or
> c. That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
> d. That have yielded or may be likely to yield, information important in prehistory or history (36 CFR 60.4)."

A cultural resource that is "eligible" for the NRHP has been evaluated by a qualified cultural resource professional and meets the criteria for listing due to its historical, architectural, archaeological, or cultural significance. However, it has not been formally nominated or officially entered into the NRHP. In contrast, a cultural resource that is "listed" in the NRHP has gone through a formal process, including public review and approval by state and federal officials, and has been officially recognized and recorded in the NRHP. Both types of resources are considered significant, and both receive similar consideration during project planning under Section 106. Cultural resources that have not been evaluated for NRHP eligibility are considered "unevaluated" and may or may not be eligible for the NRHP. Therefore, for evaluation purposes, "unevaluated" cultural resources are considered NRHP-eligible. Cultural resources that have been evaluated and lack integrity and/or significance have been determined "not-NRHP eligible".

The project is also subject to the Minnesota Historic Sites Act (Minnesota Statutes § 138.661 to 138.669) and the Field Archaeology Act (Minnesota Statutes § 138.31 to 138.42). The Minnesota Historic Sites Act (Minnesota Statutes § 138.661 to 138.669) requires that state agencies consult with the SHPO before undertaking or licensing projects that might affect properties on the State or National Registers of Historic Places. The Minnesota Field Archaeology Act (Minnesota Statutes § 138.31 to 138.42) establishes the position of State Archaeologist and requires State Archaeologist approval and licensing for any archaeological work that takes place on non-federal public property.

Under the Minnesota Private Cemeteries Act (Minnesota Statute § 307.08), consultation with the Office of the State Archaeologist (OSA) and the Minnesota Indian Affairs Council (MIAC) must occur prior to construction if any cemeteries and/or precontact burial sites (or suspected burial sites) are in or adjacent to the project area. Construction cannot proceed at the project location that is in proximity to the cemetery or burial site until authorized by the OSA and MIAC.

Coordination with THPO prevents impacts from the project to TCPs and other resources of tribal cultural significance. THPOs are officially designated by Tribes and serve the same function as a SHPO (reference (110)). THPOs assist with the preservation of Tribal historic properties and cultural resources. They are also available to advise federal, state and local agencies on the management of Tribal historic properties and instruct municipalities on Section 106 reviews to represent tribal interests. As noted in the route permit application, the applicants notified and engaged with the MIAC and multiple tribes, including THPOs, between April 2023 and July 2024. In addition, the applicants met with the Sisseton Wahpeton Oyate THPO in February 2024 to discuss updates to the project. The applicants will continue to engage with the Sisseton Wahpeton Oyate THPO and other interested tribes as the project progresses.

The Big Stone Subregion, Swift Subregion, Hancock Subregion, Cyrus Subregion, White Bear Subregion and the southwestern portion of the Alexandria Subregion fall into the Prairie Lakes Archaeological Region (Region 2). All routing alternatives cross into the Central Lakes Deciduous Archaeological Region (Region 4) east of Lowry, MN in the Alexandria Subregion (reference (111)).

The Prairie Lakes Archaeological Region covers the majority of southwestern and south central Minnesota, and contains Big Stone, Blue Earth, Brown, Carver, Chippewa, Cottonwood, Faribault, Freeborn, Jackson, Lac Qui Parle, Le Sueur, Lyon, McLeod, Martin, Nicollet, Redwood, Renville, Scott, Sibley, Stevens, Swift, Watonwan, and Yellow Medicine counties and portions of Douglas, Grant, Kandiyohi, Lincoln, Meeker, Nobles, Otter Tail, Pipestone, Pope, Rice, Steele, Traverse, and Waseca counties (reference (111)).

The Prairie Lakes Region contains the swell and swale of a typical ground moraine, with hilly end moraines found at the northern, eastern, and southern edges. The two major topographic features are the Minnesota River Valley which bisects the area, and the Coteau des Prairies highland to the west. Larger rivers within the region follow the path of glacial meltwater channels, and rivers in this region empty into the Mississippi River. Bison, elk, and white-tailed deer were historically present in this region, which is filled with many shallow prairie “pothole” lakes. Late Archaic components are limited and have been grouped into the Mountain Lake phase (3800-200 BC) (reference (111)). The transition into the Woodland Period (ca. 1000-500 BC to AD 1650) is generally defined by the introduction of distinctive ceramics; however, the ceramic assemblage of the Prairie Lakes Region remains poorly understood. The small number of assemblages in this region present pottery that have well-defined vertical cord-marking on the exterior surface, thick body walls, and fingernail impression decorations along the rim. Near the end of the Woodland Period, around AD 700, ceramic technology changed dramatically, and burial mounds were widespread. These changes mark the beginning of the Lake Benton Phase, a transitional phase from the Precontact era into the Contact era. The Prairie Lakes Region contains the largest concentration of Lake Benton sites south of the Minnesota River and east of the Blue Earth River (reference (112)).

The Central Lakes Deciduous Region covers most of central and east-central Minnesota and extends into west-central Wisconsin. It includes Anoka, Benton, Cass, Chisago, Crow Wing, Hennepin, Isanti, Mille Lacs, Morrison, Ramsey, Sherburne, Stearns, Todd, Wadena, Washington, and Wright counties and portions of Becker, Dakota, Douglas, Kandiyohi, Kanabec, Meeker, Otter Tail, Pine, Pope, and Swift counties (reference (111)).

The Central Lakes Deciduous Region is defined by its many rivers and waterways, including the Mississippi-Sauk River which flows through the eastern and central parts of the region, as well as the Lower St. Croix River which defines the eastern boundary. Additional important waterways include the Crow, Rum, Snake, and Red Rivers. Bedrock outcroppings are limited and are generally comprised of granite. Historically, the region has been dominated by elm, maple, and basswood trees with incursions of prairie and oak woods. The northern area of the region was predominately a mixed deciduous-coniferous forest, while the eastern portion was an oak forest. Precontact game animals in this region included deer, bison, elk, beaver, black bear, and moose (reference (111)). The Woodland Period (ca. 1000-500 BC to AD 1650) in this region is moderately well-defined by a variety of pottery assemblages that help establish time periods and geographic locations. This area also includes complex burials at an earlier date than the Prairie Lake Region. Common site types from the Lake Woodland Period (ca. AD 500-700 to 1650) in the Central Lakes Deciduous Region include semi-sedentary villages, wild rice harvesting and fishing stations, and a variety of hunting and gathering sites (reference (112)).

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

Regionally, archaeological sites are generally found in proximity to established water resources. Early prehistoric sites could be deeply buried in the colluvium and alluvium along major river valleys. Middle to late precontact sites can be found on the islands and peninsulas of moderate to large-sized lakes, as well as in the wooded areas of galley forests along the major rivers. Late precontact sites include large agricultural village sites located on terraces of the major river systems. Small campsites and special activity sites from all periods are scattered throughout the region. Some deeply buried late precontact period sites might also be present in the Minnesota River valley. Common ceramic complexes during this time period included Sandy Lake in the north, Oneota in the south, and Plains Village in the southwest. Historic village sites associated with the Dakota are concentrated along the Minnesota River. Euro-American occupation of the region began with fur traders in the late 1600s, who established posts along the major lakes and rivers. At contact, Santee Dakota groups were present in the east and the Yankton, Yanktonai Dakota occupied the west. In the mid-1700s, the Ojibwe began to occupy the northern portion of the region (reference (112)).

Because proximity to fresh water and food resources were vital to the survival of the early inhabitants of Minnesota, archaeological sites are typically concentrated on well-drained upland terraces along bodies of water, such as the Minnesota River in Big Stone County, and along lakeshores in Big Stone, Douglas, Pope, Stevens, and Swift counties.

To determine potential impacts on cultural resources, known archaeological and historic sites in or adjacent to the project were identified through a review of the OSA's online portal and the Minnesota Statewide Historic Inventory Portal (MnSHIP). MnSHIP is a comprehensive database of documented historic architectural resources for the entire state, while the OSA portal is a database of previously recorded archaeological sites in the state. The OSA portal was also reviewed for estimated locations of historic cemeteries, as recorded in 2011 by Vermeer and Terrell (reference (113)). This study identified historic cemeteries based on various forms of documentation, such as historic maps and aerial imagery. These cemeteries are often mapped to a much larger area, such as section or township level, than their actual locations, as the exact locations might not be known or verified. Therefore, even in cases where an unrecorded historic cemetery appears to intersect a route's route width, the project may not impact this resource. As a result, unrecorded historic cemeteries are discussed as an added precaution. These impacts are described in subsequent chapters based on subregion for each route.

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

- In the Big Stone Subregion, archaeological sites are primarily along the Minnesota River.
- Archaeological resources are concentrated along the Pomme de Terre River and in the Artichoke lakes area in the Swift Subregion.
- The Hancock Subregion contains a very low density of known archaeological sites, none of which intersect the ROI.
- The Cyrus and White Bear Lake Subregions also contain low densities of documented archaeological sites, likely due to the dearth of major waterbodies.
- In the Alexandria Subregion, the highest density of sites is around the shores of the major lakes in Pope and Douglas counties.

Historic architectural resources present within the study area include bridges, culverts, roadways, residential buildings, commercial and industrial structures, government buildings, churches, schools, town halls, farmsteads and associated structures, railroads, etc. Most of these resources fall outside of the route widths but may have the potential to be impacted by the project in terms of viewshed alteration.

4.6.2 Potential Impacts

Impacts to archaeological and historic resources could result from construction activities such as ROW clearing, new structure placement, the new fiber optic regeneration station, new access roads, temporary construction areas, and vehicle and equipment operation. Although unexpected, impacts could also result from the accidental removal of historic buildings or structures.

Additional impacts can result from transmission line location and operation, such as placement within view of a resource (typically a historic building, structure, or TCP) that results in a negative effect on the setting, feeling, and/or association of the resource in the viewshed. This issue is especially pertinent when considering cultural resources for which the surrounding environment plays a crucial role in defining their character and significance.

4.6.3 Mitigation

4.6.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.3.15 contains the following mitigation related to archaeological and historic resources:

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

4.6.3.2 Other Proposed Mitigation

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

If unanticipated archaeological or historic resources are discovered during construction, Commission route permits require that construction activities cease at that location and that SHPO and the State Archaeologist be contacted to assist in the development of appropriate measures to protect the resource. In addition, if human remains or suspected burial sites are discovered during construction, the state archaeologist and local law enforcement would be contacted, and construction would cease at the location until the applicants and the state archaeologist have completed all requirements pursuant to Minnesota Statute § 307.08. The applicants stated in their application that an Unanticipated Discovery Plan will be developed to avoid impacts to unknown cultural resources that would provide relevant contact information for THPOs.

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

4.7 Natural Environment

The Commission must consider effects on the natural environment, including effects on air and water quality resources and flora and fauna when designating transmission lines routes and making a decision on a route permit. Electric infrastructure, such as transmission lines, can impact the natural environment. Impacts are dependent upon many factors, such as how the project is designed, constructed, and maintained. Other factors, such as the environmental setting, influence potential impacts.

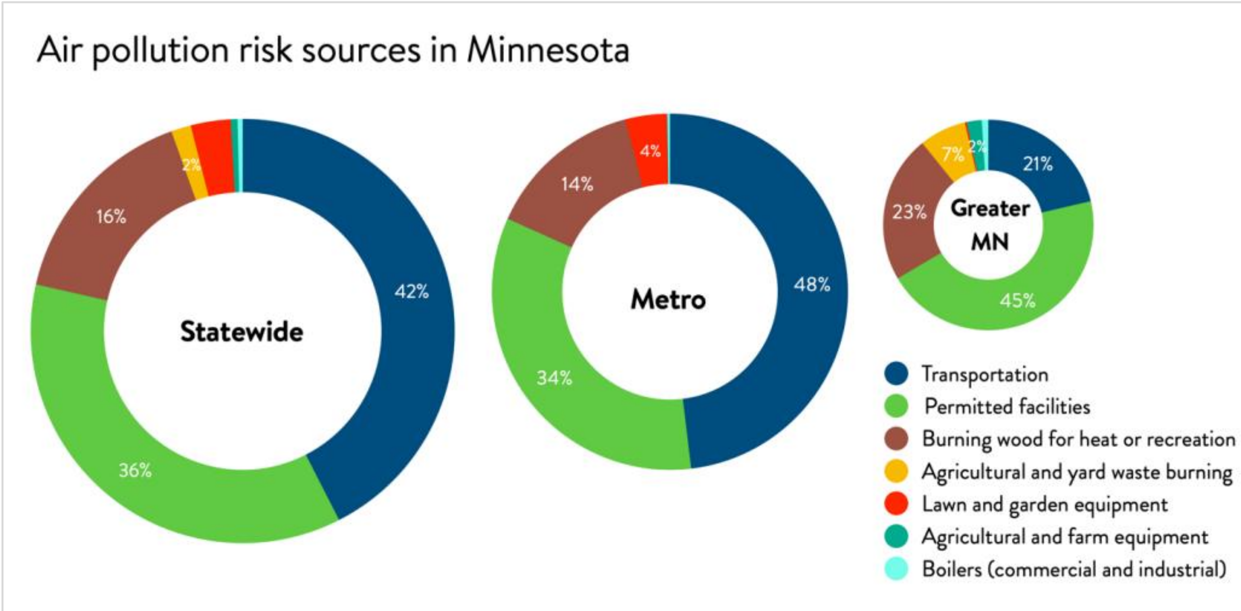
4.7.1 Air Quality

The ROI for air quality is the project area. Impacts can occur during construction and operation of a transmission line and regeneration station. Potential impacts to air quality during construction would be intermittent, localized, short-term, and minimal. Impacts are associated with fugitive dust and exhaust and can be mitigated. Long-term impacts to air quality would also be minimal and are associated with the creation of ozone and nitrous oxide emissions along the transmission line. These localized emissions would be below state and federal standards. Impacts are unavoidable and do not affect a unique resource.

4.7.1.1 Existing Conditions

Air quality is a measure of how pollution-free the ambient air is and how healthy it is for humans, animals, and plants. Air pollution can contribute to impacts to human health. Most pollution in Minnesota comes from human activities such as transportation creating energy and heat and from industry (reference (114)). Air quality in the project area is relatively better than more populated areas of the state such as the Twin Cities metro region (Figure 4-7).

Figure 4-7 Air Pollution Risk Sources in Minnesota



Source: reference (114)

The Clean Air Act is a federal law that regulates air emissions from stationary and mobile sources. The Clean Air Act requires the U.S. Environmental Protection Agency (EPA) to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants, referred to as “criteria pollutants”. The six criteria pollutants are ground-level ozone (O_3), particulate matter (PM_{10} and $PM_{2.5}$), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), and lead (Pb) (reference (115)). NAAQS are set to address the public health and welfare risks posed by certain widespread air pollutants (references (116); (117)).

The Clean Air Act identifies two classes of NAAQS: primary standards, which are limits set to protect the public health of the most sensitive populations, such as asthmatics, children, and the elderly; and secondary standards, which are limits set to protect public welfare, such as protection against visibility impairment or damage to vegetation, wildlife, and structures. Compliance with the national and state air quality standards in the state of Minnesota is assessed at the county level. Minnesota’s state air quality standards align with NAAQS. The EPA designates all counties traversed by the routing alternatives to be in attainment for all NAAQS.

In Minnesota, air quality is monitored with stations throughout the state. The MPCA uses data from these monitoring stations to calculate the Air Quality Index (AQI) on an hourly basis for O_3, $PM_{2.5}$, SO_2, NO_2, and CO (reference (118)). The AQI is used to categorize the air quality of a region as one of five levels: good, moderate, unhealthy for sensitive groups, unhealthy, or very unhealthy. There are no air quality monitors near enough to the project to accurately represent the area, the nearest being in St. Cloud. However, the state in general sees the fewest number of good AQI days in the Twin Cities, whereas all of the other regions had a majority of good AQI days annually in the past five reported years (reference (119)). In that timeframe statewide, the 2021 reporting period had the largest number of moderate or worse AQI days (77 percent). Although this is a significant portion of days, most of the AQIs in that category are rated moderate rather than unhealthy for sensitive groups or worse. Many of the unhealthy days in the dataset are attributed to the increase of wildfires and drought in recent years (reference (114)). The increased occurrence of wildfire and drought in Minnesota is attributed to climate change (Section 4.7.2), and thus the number of unhealthy air quality days are expected to remain elevated. Air quality impacts from project construction could be exacerbated when unhealthy air quality days occur.

4.7.1.2 Potential Impacts

Emissions of air pollutants will occur during construction and operation of new infrastructure for the project. Air emissions associated with construction are highly dependent upon weather conditions and the specific activity occurring. Adverse effects on the surrounding environment are expected to be negligible due to the temporary disturbance during construction and the intermittent nature of the emission- and dust-producing construction phases.

The main source of air emissions during construction would be equipment and vehicles which produce CO_2, nitrogen oxides (NO_x), and PM. Exhaust emissions, primarily diesel-fueled construction equipment, would vary according to the phase of construction. Emissions from construction vehicles could be minimized by using modern equipment with lower emissions ratings. Any adverse impacts are anticipated to be localized, minimal, and temporary.

All projects that involve movement of soil or exposure of erodible surfaces generate fugitive dust emissions. Dust generated from earth disturbing activities gives rise to PM_{10}/$PM_{2.5}$. Construction activities will generate fugitive dust from travel on unpaved roads, grading, foundation excavation, and setting structures. Some of these activities such as clearing vegetation may create exposed areas susceptible to wind erosion. Most of the fugitive dust emissions associated with the project are expected to be along gravel roads during worker and material transport.

During operation, air emissions do not meet thresholds that would require an air quality permit. Emissions would be generated from vehicle fuel usage during routine inspection and maintenance activities such as vegetation clearing. Cleared ROWs, storage areas, and access roads would be restored and revegetated once construction is complete, limiting the potential for further dust production associated with the project. Emissions at the regeneration station will be limited to propane and vehicle use associated with operation and routine maintenance.

During operation, transmission lines produce small amounts of ozone and nitrous oxide through the corona effect—the ionization of air molecules surrounding the conductor. Ozone production from a conductor increases with temperature and sunlight and decreases with humidity. Nitrogen oxides can react to form ground-level ozone and contribute to smog (reference (115)). Rain causes an increase in O_3 production. In addition to weather conditions, design of the transmission line also influences O_3 production rate. The O_3 production rate decreases significantly as the conductor diameter increases and is greatly reduced for bundled conductors over single conductors. The applicants state that each phase of transmission line will have two conductor bundles (Section 3.2.3). Conversely, the production rate of

O_3 increases with applied voltage (reference (120)). Ozone and nitrous oxide emissions from the project are anticipated to be well below state and federal limits such as the Clean Air Act.

4.7.1.3 Mitigation

4.7.1.3.1 Commission Draft Route Permit

The draft route permit does not contain mitigation measures specific to air quality. The draft route permit states, “The Permittee shall comply with all applicable state rules and statutes.”

Several sections of the draft route permit indirectly mitigate impacts to air quality, including sections related to soils, vegetation removal, restoration, and pollution and hazardous wastes. Direct impacts to soils can cause indirect impacts to air quality through erosion. Condition 5.3.8 requires permittees to “implement reasonable measures to minimize erosion.” This includes protecting exposed soils by promptly planting and seeding, using erosion control blankets, protecting soil stockpiles, and controlling vehicle tracking. The applicants could commit to utilizing wildlife friendly erosion control measures with no plastic mesh netting during construction as requested by the DNR (reference (121)).

4.7.1.3.2 Other Proposed Mitigation

As noted in the route permit application, if construction activities generate problematic dust levels, the applicants would employ construction-related practices to control fugitive dust as needed. This could include water application or other commercially available non-chloride dust control agents on unpaved areas subject to frequent vehicle traffic, reducing the speed of vehicular traffic on unpaved roads, and covering open-bodied haul trucks. The DNR recommended not using dust control products that contain chlorides to avoid the potential for chloride products accumulating to levels that are toxic to plants and wildlife (reference (121)).

As noted in the route permit application, corona effects would be minimized during operation by using good engineering practices such as the proposed bundling of conductors. Corona signifies a loss of electricity, so the applicants have engineered the transmission lines to limit these emissions.

Exhaust emissions can be minimized by keeping vehicles and equipment in good working order, not running equipment unless necessary, and minimizing the number of driving trips. Additionally, utilizing existing power sources wherever practical, for example, grid supplied-power or cleaner fuel generators and vehicles rather than diesel, could reduce emissions.

Watering exposed surfaces, utilizing chemical stabilization, covering disturbed areas, covering open-bodied haul trucks, and reducing speed limits on-site are all standard construction practices to reduce fugitive dust. The applicants could commit to using dust mitigation and control measures that do not contain chloride. The draft VMP (Appendix J) identifies construction best management practices related to soil erosion and vegetation establishment that will help mitigate fugitive dust emissions.

4.7.2 Climate Change

The ROI for climate change is the five-county area. The impact analysis for climate change considers existing patterns in the ROI and how the project could be impacted by climate change, as well as how the project could affect climate change.

The climate change risks the project is most susceptible to include increases in annual temperatures, increases in storm frequencies and intensities, and more frequent wildfires. The project would minimally contribute to climate change impacts as a result of GHG emissions. The project would generally be routed and engineered to be resilient against changing climatic factors such as increased average temperatures. The project as a whole will reduce CO_2 emissions by reducing congestion on the electrical grid, enabling greater use of existing renewable generation, and supporting the development of new renewable generation.

4.7.2.1 Existing Conditions

Climate change is observed as changes in temperature and precipitation patterns, increases in ocean temperatures and sea level, changes in extreme weather events, and ecosystem changes. These changes are largely attributed to the greenhouse effect. As the amount of GHGs in the Earth's atmosphere increases, the greenhouse effect causes the Earth to become warmer (reference (122)).

There are also naturally occurring climate variations. These are cyclical patterns caused by variations in ocean circulation and atmospheric pressure patterns that occur on timescales of weeks to decades. Increased global surface temperatures could change these natural climate patterns and the resulting impact on regional precipitation and temperature anomalies (reference (123)).

Warmer and wetter conditions have been observed in Minnesota since observations first began in 1895, especially in the past several decades. An increase in precipitation volume and intensity has also been observed, including large-area extreme rainstorms. A rise in temperatures, particularly during the winter season in Minnesota, has been occurring as well. These trends are expected to continue (reference (124)).

To understand how climate change is anticipated to affect the project area, historical and projected climate data is considered, as well as climate hazard projections. The DNR's Minnesota Climate Explorer tool provides a summary of historical climate data for various regions across Minnesota (reference (125)). Data for the West Central Climate Division (WCCD) were analyzed as a conglomerate as its most representative of the project's geographical area. The WCCD includes the following counties: Big Stone, Chippewa, Douglas, Grant, Lac qui Parle, Otter Tail, Pope, Stevens, Swift, Traverse, Wilkin, and Yellow Medicine.

Figure 4-8 and Table 4-9 summarizes the mean, maximum, and minimum average daily temperature from 1895 to 2024 for the WCCD. It also shows the temperature trends per decade from 1895 to 2024 and from 1995 to 2024 to represent the full record of data and the most recent 30-year climate period, respectively (reference (125)). In each temperature statistic, the WCCD exhibits an increase in daily temperature from 1895 to 2024. The annual average minimum daily temperature has increased at the largest rate of the three temperature statistics for the full record of data, and the annual average maximum temperature has increased at the largest rate for the most recent 30-year climate period. Table 4-9 summarizes the trends for mean, maximum, and minimum average daily temperatures.

Figure 4-8 Historical Annual Mean, Maximum, and Minimum Daily Air Temperature (°F) for the West Central Climate Division from 1895 to 2024

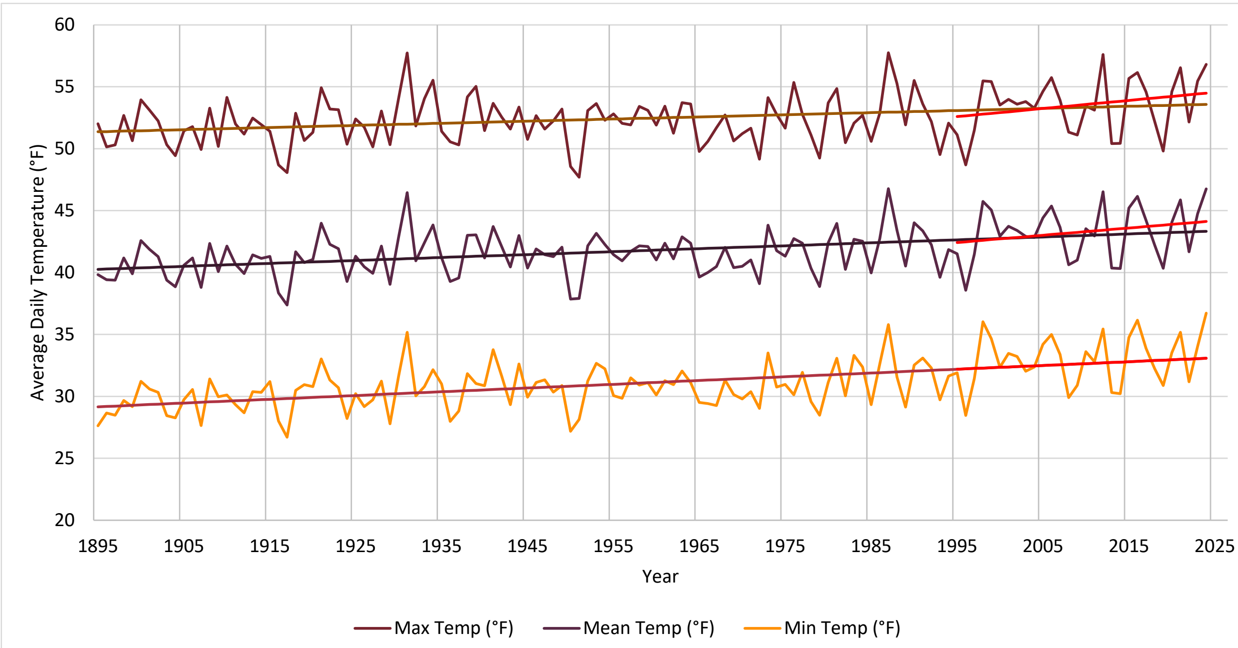


Table 4-9 Historical Annual Mean, Maximum, and Minimum Daily Air Temperature Trends (°F/decade) for the West Central Climate Division from 1895 to 2024

Temperature Statistic	Years	Trend (°F/decade)
Minimum Average Daily	1895-2024	0.30
Minimum Average Daily	1995-2024	0.30
Mean Average Daily	1895-2024	0.24
Mean Average Daily	1995-2024	0.59
Maximum Average Daily	1895-2024	0.17
Maximum Average Daily	1995-2024	0.65

Figure 4-9 shows the total annual precipitation for the WCCD from 1895 to 2024. Total annual precipitation has increased from 1895 to 2024 by a rate of 0.26 inches/decade and increased from 1995 to 2024 by a rate of 0.06 inches/decade.

Figure 4-9 **Historical Total Annual Precipitation (inches) for the West Central Climate Division from 1895 to 2024**

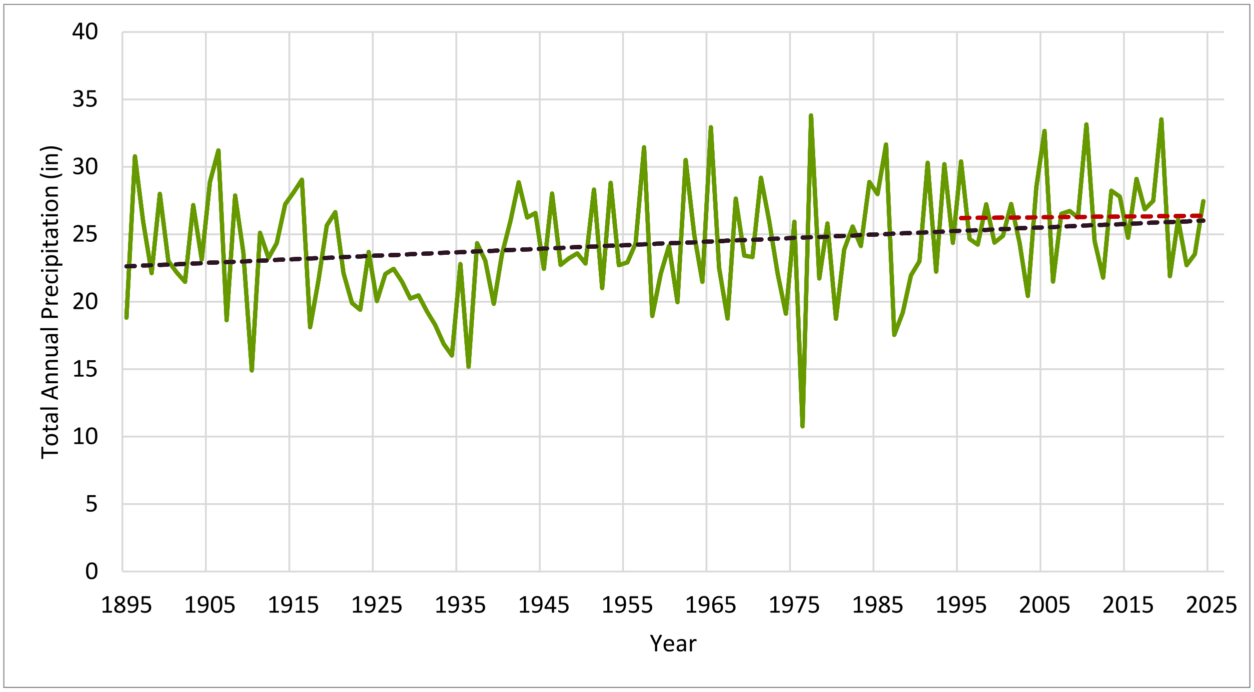
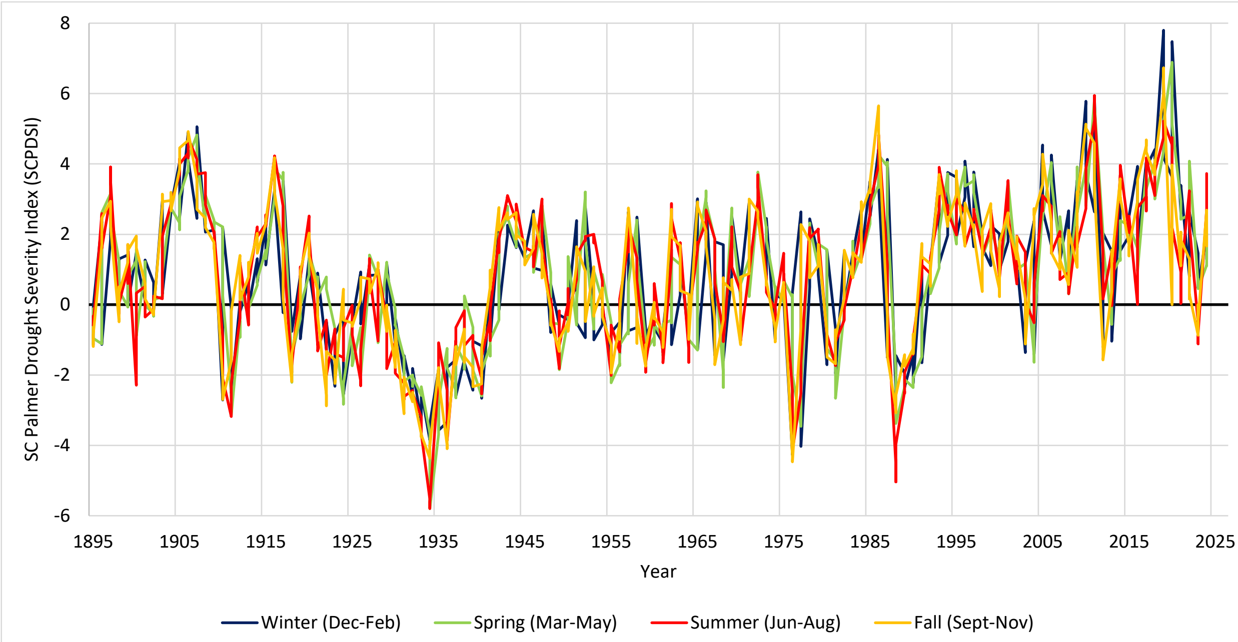


Figure 4-10 shows the seasonal drought severity for the WCCD from 1895 to 2024 using the Self-Calibrated Palmer Drought Severity Index (scPDSI). The scPDSI is a meteorological drought index that measures the departure of moisture. Negative scPDSI values indicate drought conditions, positive values indicate wet conditions, and values near zero indicate normal conditions (reference (126)). The WCCD experienced frequent drought episodes from 1910 to 1940 and 1950 to 1970. From 1990 to 2024, seasonal wet conditions have generally been more frequent than drought conditions.

Figure 4-10 Historical Drought Severity for the West Central Climate Division from 1895 to 2024



Future projections are based on the Minnesota dynamically downscaled climate model data that was developed by the University of Minnesota and are summarized in three scenarios, Shared Socioeconomic Pathway (SSP) 245, SSP370, and SSP585. SSP is a measure adopted by the Intergovernmental Panel on Climate Change (IPCC) to represent various greenhouse gas concentration pathways as well as social and economic decisions (reference (127)).

SSP245 represents a "Middle of the Road" scenario where economic, social, and technological trends follow historical patterns, population growth is moderate, and inequality persists. Additionally, SSP245 includes an intermediate emissions scenario, where a net radiative forcing of 4.5 watts per meter squared (W/m^2) is received by the earth due to the greenhouse gas (GHG) effect and emissions begin to decrease around 2040 (reference (127)).

SSP370 represents a "Regional Rivalry" scenario where nations focus on regional issues instead of cross-collaboration and development. SSP370 also includes a high emissions scenario, where a net radiative forcing of 7.0 W/m^2 is received by the earth (reference (127)).

SSP585 represents a "Fossil-fueled Development" scenario where there is increased development in competitive markets driven by an increased global consumption of fossil fuels. SSP585 also includes a very high emissions scenario, where a net radiative forcing of 8.5 W/m^2 is received by the earth and no emissions are reduced through 2100 (reference (127)).

Table 4-10 shows the model historical and projected temperature values for the project. Under all scenarios for each statistic, temperature values are projected to increase through the end of the 21st century. The largest increases for Minnesota occur in the minimum daily temperature under each scenario.

Table 4-10 Modeled Historical and Projected Temperature Trends for the Project

Scenario	Time Period	Average Daily Temperature (°F) – Ensemble Mean	Minimum Daily Temperature (°F) – Ensemble Mean	Maximum Daily Temperature (°F) – Ensemble Mean
Historical	1995-2014	43.2	33.4	56.0
SSP245	2040-2059	47.0 (3.8)	37.4 (4.0)	59.6 (3.6)
SSP245	2060-2079	48.3 (5.2)	38.8 (5.4)	60.8 (4.8)
SSP245	2080-2099	49.9 (6.7)	40.3 (6.9)	62.4 (6.5)
SSP370	2040-2059	48.2 (5.0)	38.3 (4.9)	61.2 (5.3)
SSP370	2060-2079	50.5 (7.3)	40.6 (7.2)	63.4 (7.4)
SSP370	2080-2099	52.3 (9.1)	42.6 (9.2)	64.9 (8.9)
SSP585	2040-2059	47.6 (4.5)	38.0 (4.6)	60.2 (4.3)
SSP585	2060-2079	50.4 (7.2)	40.9 (7.5)	62.7 (6.8)
SSP585	2080-2099	54.7 (11.5)	45.5 (12.1)	66.8 (10.9)

Note: Values in parentheses represent the difference from the modeled historical value.

Table 4-11 shows the model historical and projected precipitation values for the project. Under the SSP245 scenario, a slight increase in precipitation is projected. Under SSP370, a decrease in precipitation from modeled historical values is projected to occur under all time periods (largest occurring before 2080). For SSP585, an increase in precipitation from modeled historical values is projected.

Table 4-11 Modeled Historical and Projected Precipitation Trends for the Project

Scenario	Time Period	Total Annual Precipitation (in) - Ensemble Mean
Historical	1995-2014	26.8
SSP245	2040-2059	27.7 (0.9)
SSP245	2060-2079	28.0 (1.2)
SSP245	2080-2099	27.1 (0.3)
SSP370	2040-2059	24.3 (-2.5)
SSP370	2060-2079	23.8 (-3.0)
SSP370	2080-2099	26.5 (-0.3)
SSP585	2040-2059	27.0 (0.2)
SSP585	2060-2079	29.6 (2.8)
SSP585	2080-2099	30.1 (3.3)

Note: Values in parentheses represent the difference from the modeled historical value.

The EPA Climate Resilience Evaluation and Awareness Tool (CREAT) provides 100-year storm intensity projections to help with planning for water, wastewater, and stormwater utilities (references (128);

(129)). A 100-year storm is an event that has a one percent chance of occurring in a given year. The CREAT tool considers two time periods, 2035 and 2060. For each time period, two scenarios are considered, a 'Not as Stormy' future to a 'Stormy' future. The project would cross five counties, including: Big Stone, Swift, Stevens, Pope, and Douglas. Within the counties traversed by the project, the 2035 time period shows a 2.5 to 3.2 percent increase in the 100-year storm intensity for the ‘Not as Stormy’ scenario, and a 13.8 to 15.4 percent increase for the ‘Stormy’ scenario. The 2060 time period shows a 4.8 to 6.2 percent increase in the 100-year storm intensity for the ‘Not as Stormy’ scenario, and a 26.9 to 30.1 percent increase for the ‘Stormy’ scenario.

The EPA Streamflow Projections Map summarizes general projections related to streamflow under climate change (reference (130)). The EPA Streamflow Projections Map for 2071 to 2100 (RCP 8.5) anticipates a general change in average streamflow of streams within the five-county area by a ratio of 1.18 to 1.27 (90th percentile) under wetter projections and a ratio of 0.82 to 0.94 (10th percentile) under drier projections when compared to baseline historical flows (1976 to 2005).

The First Street Risk Factor risk assessment and map tool was used to determine a risk assessment for each of the counties traversed by the project to help identify current and future climate change risks (reference (131)). Table 4-12 summarizes risks for flood, wildfire, wind, air quality, and heat as defined by Risk Factor (references (132); (133); (134); (135); (136)).

Table 4-12 Climate Change Risks for Counties Traversed by the Project

County	Flood Risk	Wildfire Risk	Wind Risk	Air Quality Risk	Heat Risk
Big Stone	Minor	Moderate	Minor	Moderate	Minor
Swift	Minor	Moderate	Minor	Moderate	Minor
Stevens	Minor	Moderate	Minor	Moderate	Minor
Pope	Minor	Moderate	Minor	Moderate	Minor
Douglas	Minor	Moderate	Minor	Minor	No Data

Current and future climate change risk for all counties was minor for flood risk, moderate for wildfire, and minor for wind. The air quality risk is moderate for most counties, and minor for Douglas County. Heat risk is minor for all counties with data.

4.7.2.2 Potential Impacts

The project would result in GHG emissions that could minimally contribute to climate change impacts such as changes in temperature, precipitation, and extreme weather events. These emissions are discussed in Section 4.7.3. As assessed in Section 4.7.2.1, the climate change risks that the project is most susceptible include increases in annual temperatures, increases in storm frequencies and intensities, and more frequent wildfires.

High temperatures can affect the sagging of a transmission line conductor and its thermal tolerance. Changes in storm timing and intensities may increase landslide potential in areas of steeper terrain and increase the risk of local flooding. Due to increases in annual temperatures, there may be periods of dry weather and concerns of wildfires caused by increases in drought severity.

Where the project requires tree clearing along shorelines, increased sun exposure could affect environmental resources such as cold-water ecosystems. Tree and vegetation loss in the ROW would lead to more intense runoff during storms or flooding that would in turn increase erosion and reduce water retention in nearby water resources. Overall, there is a minimal amount of tree clearing near shorelines along the alignments for all routing alternatives.

Heat wave events could change demands on the electrical transmission and generation systems, especially as more indoor space is equipped with cooling systems. Because this is a reliability project, it will improve the electrical transmission system, making it more resilient and reducing potential for peak overloads during heat wave events.

Transmission infrastructure has few mechanical elements and is built to withstand weather extremes that are normally encountered. Transmission lines rarely fail apart from outages due to severe weather such as high winds that indirectly take down lines and heavy ice storms that can accumulate ice on lines that strains structural integrity. When this happens, a fault is sensed on the transmission line, which are automatically taken out of service by protective relaying equipment. Such interruptions are usually only momentary. As a result, the average annual availability of transmission infrastructure is more than 99 percent, however, these impacts could be exacerbated by increased storm frequency and intensity driven by climate change.

4.7.2.3 Mitigation

4.7.2.3.1 Commission Draft Route Permit

The draft route permit does not contain mitigation measures specific to climate; it does include reference to construction stormwater in condition 5.3.8.

4.7.2.3.2 Other Proposed Mitigation

The applicants state that the project would be routed and engineered to be resilient under changing climatic factors including increased average temperatures. The transmission lines would be built to meet or exceed local, state, and NESC standards consistent with the applicants' criteria for ambient weather conditions. Transmission line structures will not be constructed with material prone to wildfire damage such as wood.

The applicants would design the top of concrete for the structure foundations to be one foot above the 100-year floodplain elevation anywhere structures are installed in areas prone to flooding. If flooding were to exceed the 100-year flood level, the structures and foundations are expected to resist the flood loads. Final structure placement would consider the project ROW slope to avoid areas with steeper terrain and associated risks of erosion and landslides. Geotechnical studies would also be performed, which would indicate water table levels during drilling. In areas with fluctuating water tables and near floodplains, the applicants would design the foundation assuming that the water table is at the ground surface.

The transmission line facilities would be maintained to meet or exceed NERC reliability standards and NESC requirements that address vegetation management, including the increase of noxious weeds that could occur from changed climate conditions that allow them to spread. Tree clearing along shorelines will be minimal and associated changes to water temperatures are not anticipated.

During construction, a SWPPP would be implemented to manage stormwater and reduce the potential for runoff and erosion. Where areas are subject to higher rates of erosion, vegetation establishment would be achieved within the timelines required in the SWPPP thereby minimizing potential impacts for erosion. During operation of the project, vegetative cover would minimize potential for erosion impacts to waterways.

Increased chance of severe weather and heat wave events from a warming climate require adequate planning and preparation. Maintenance and repair plans should anticipate future changes to climate. During operation, wildfire prone debris could be removed as a maintenance activity. Efforts will assist in managing impacts from increased storm intensity and frequency but may not fully mitigate the anticipated effects from climate change.

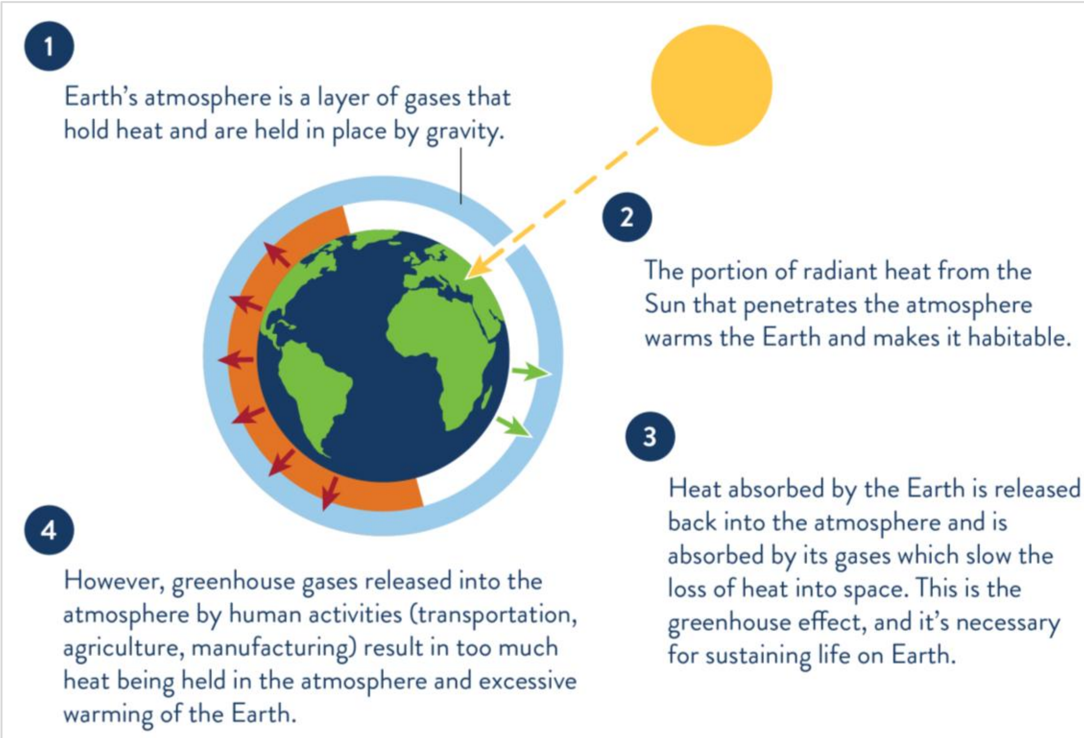
4.7.3 Greenhouse Gases

An ROI has not been assigned for GHG emissions as the influence from GHG emissions cannot be confined by geographic boundaries. Construction activities within the route would result in short-term increases in GHG emissions because of the combustion of fossil fuels in construction equipment and vehicles. These emissions would be short-term and minimal. Maintenance activities within the ROW would also cause GHG emissions, but to a much lesser extent. Operational impacts from formation of nitrous oxide and release of sulfur hexafluoride would be minimal. Impacts are unavoidable but can be minimized.

4.7.3.1 Existing Conditions

GHGs are gases that trap heat in the atmosphere. Some of the solar radiation that reaches Earth’s surface radiates back toward space as infrared radiation. GHGs trap heat in the atmosphere from the absorption of this infrared radiation, which causes a rise in the temperature of Earth’s atmosphere as illustrated in Figure 4-11. This warming process is known as the greenhouse effect (reference (137)).

Figure 4-11 Greenhouse Gases and Earth's Atmosphere



The most common GHGs include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorinated gases. GHG emissions are calculated as carbon dioxide equivalent (CO_2e), which is equal to the global warming potential (GWP) for each pollutant multiplied by the potential pollutant emissions. CO_2e normalizes all GHGs emissions to CO_2 for comparability across different pollutants. Human GHG emissions are responsible for about two-thirds of the energy imbalance that is causing Earth's temperature to rise, which has direct and cascading effects on weather and climate patterns, vegetation, agriculture, disease, availability of water, and ecosystems (reference (138)).

Climate change and decarbonization have been discussed for decades at all levels of government, as well as in global, national, and local institutions. There is general agreement that immediate and large-scale progress toward carbon neutrality is needed. Many countries have announced decarbonization initiatives. The first binding global agreement, the Paris Agreement, was established in 2016. The Paris Agreement goal is to keep the rise in mean global temperature to below 3.6°F, and preferably limit the increase to 2.7°F. To meet this goal, global emissions needed to be reduced as soon as possible and to reach net-zero emissions by the middle of the 21st century (reference (139)).

More recently in 2021, the United States announced the Net Zero World Initiative to reach net zero emissions by 2050 and the 2030 Greenhouse Gas Pollution Reduction target to achieve a 50-52 percent reduction in greenhouse gas emissions from 2005 levels. These reductions would be accomplished by accelerating transitions to net zero, resilient, and inclusive energy systems (references (140); (141)).

The state of Minnesota has also established a goal for the reduction of GHG emissions, set forth in Minnesota Statute § 216H.02:

> *It is the goal of the state to reduce statewide greenhouse gas emissions across all sectors producing those emissions by at least the following amounts, compared with the level of emissions in 2005: (1) 15 percent by 2015; (2) 30 percent by 2025; (3) 50 percent by 2030; and (4) to net zero by 2050.*

Minnesota Statute § 216B.1691 Renewable Energy Objectives, which became effective in 2023, requires all electric utilities to generate or procure 100 percent of electricity sold to Minnesota customers from carbon-free sources by 2040, with an interim goal of 80 percent (for public utilities) and 60 percent (for other electric utilities) carbon-free electricity by 2030. Carbon-free sources are those that generate electricity without emitting CO_2. Electric utilities are also required to generate or procure 55 percent of electricity sold to Minnesota customers from an eligible energy technology by 2035. Eligible energy technology includes technology that generates electricity from solar, wind, and certain hydroelectric, hydrogen, and biomass sources (Minnesota Statute §216B.1691).

4.7.3.2 Potential Impacts

GHG emissions associated with the construction and operation of the project consist of direct emissions generated from combustion sources (for example, mobile on- and off-road sources) and land use change.

Construction emissions from mobile combustion were calculated for on-road vehicles and off-road construction equipment. Construction emissions from combustion sources are anticipated to be similar for each of the routing alternatives. Therefore, the total construction combustion emissions and average length of the applicants' proposed routes were used to calculate an average emission rate in metric tons CO_2e/mile, to quantify combustion emissions for each of the routing alternatives. Construction emissions from temporary land use changes were calculated with an assumed construction duration of 60 days for each land use change area. The calculated average emission rate for all routing alternatives is 205.72 metric tons CO_2e/mile. GHG emissions calculations are summarized in Appendix L.

Identified GHG emissions associated with operations of the project include direct emissions generated from combustion sources (for example, mobile on- and off-road sources) and land use change. Operational emissions from mobile combustion were calculated for equipment used for operation and maintenance, and are anticipated to be similar for all routing alternatives and thus have only been calculated for one operational scenario. Operational emissions from temporary land use changes were calculated with the assumption that forest land, cropland, and settlement land would be converted to grassland following completion of the project and for the duration of operations as outlined in the VMP.

The Prevention of Significant Deterioration (PSD) is a Clean Air Act permitting program for new or modified major sources of air pollution in attainment areas. It is designed to prevent NAAQS violations, preserve and protect air quality in sensitive areas, and protect public health and welfare (reference (142)). The current threshold for new facilities with GHG emissions is 100,000 tons CO_2e per year. Estimated project GHG emissions are below this threshold.

Potential emissions from the use of sulfur hexafluoride (SF_6) are also associated with this project. SF_6 is a powerful GHG and used in high-voltage circuit breakers in transmission systems. The use of such a substance is common due to its stability and effectiveness at insulating electrical equipment. However, potential SF_6 emissions from high-voltage circuit breakers are minimal and not expected routinely because they are largely attributed to faulty equipment and leakage. Equipment containing SF_6 is designed to avoid SF_6 emissions (reference (143)).

4.7.3.3 Mitigation

4.7.3.3.1 Commission Draft Route Permit

The draft route permit does not contain mitigation measures specific to GHG emissions and states, "The Permittee shall comply with all applicable state rules and statutes."

4.7.3.3.2 Other Proposed Mitigation

Minimization efforts to reduce project construction GHG emissions would include limiting vehicle idling to only times when necessary. Minimization efforts to reduce the project's operational GHG emissions from SF_6 would include following safe handling practices during refilling, avoiding exposure to high temperatures, and monitoring for leaks. Performing routine inspections and preventative maintenance as well as following manufacturer specifications for replacing SF6 containing equipment can mitigate the risk of unexpected emissions from aging equipment.

4.7.4 Geology and Topography

The ROI for geology and topography is the ROW. Structure foundations have the potential to impact bedrock. Negligible impacts are anticipated to topography along the transmission line ROW given that original surface contours are re-graded and revegetated to the extent feasible.

4.7.4.1 Existing Conditions

The project area surface geology is dominated by quaternary aged glacial deposits from the most recent Wisconsinian glaciation. Clayey to loamy sediments deposited by ice of the Des Moines and Red River lobes are most prevalent within the project area and are part of the New Ulm and Goose River formations. Deposits of glaciolacustrine sediments and post glacial alluvium are also present within the project area. Various surface glacial features are present including end and ground moraine, drumlins, eskers, and hummocks (reference (144)). The thickness of the glacial deposits vary depending on the location and type of deposit; thicknesses generally range from 50-600 feet, with some areas where bedrock outcrops are present at or just below the surface (reference (145)). The project area bedrock consists of Cretaceous shale and sandstone and Precambrian igneous and metamorphic rocks (reference (144)).

There are no known karst features within the project area. The nearest karst feature is a stream sink approximately 5 miles north of Redwood Falls, Minnesota; approximately 60 miles southeast of the project area (reference (146)). Karst features can also form from springs that emerge through dissolved limestone or other soluble rock, and are connected to underground caves or conduits. There no known springs that have resulted in karst features within the project area. Section 4.7.5 identifies springs within the project area.

Elevations range from about 1,500 feet above sea level to 850 feet within the project area. Topography along the routing alternatives is generally flat with localized areas of steeper slopes occurring adjacent to waterbodies.

The project area's seismic risk is very low, as it's within an area rated as less than a two-percent chance of damage from natural or human-induced earthquake in 10,000 years (reference (147)).

The type of landslide most common in Minnesota is shallow slope failure triggered by a heavy rain event. This type of slope failure is generally less than 3 feet deep but can erode the entire length of a slope. Deeper landslides, mudflows, and debris flows are much less common in Minnesota than in more mountainous areas. Less destructive landslides, such as slow-moving earthflows and soil creep, can also occur when soil moisture and shallow groundwater saturate sediments during heavy rain events or snowmelt. Human factors including inadequate storm water management, undercutting of slopes, placement of artificial fill, and land-use changes, such as urbanization and agricultural practices, can lead to erosion and landslides (reference (148)).

4.7.4.2 Potential Impacts

Thick glacial deposits cover most of the project area. Bedrock is generally deeper than 50 feet, however in some areas, bedrock is present as outcrops at or just below the surface (reference (149)). Construction and operation of transmission line projects can impact geology through temporary construction-related impacts and/or long-term impacts.

Impacts to topography, such as the creation of abrupt elevation changes, are not expected. Transmission line structures would be installed at existing grade with minor alterations made to topography for construction as needed.

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

4.7.4.3 Mitigation

4.7.4.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.3.8, contains the following mitigation related to geology and topography, "Areas disturbed by construction activities shall be restored to pre-construction conditions." The draft route permit also states in condition 5.5.2 that, "the Permittee shall comply with all applicable state rules and statutes. The Permittee shall obtain all required permits for the project and comply with the conditions of those permits unless those permits conflict with or are preempted by federal or state permits and regulations."

4.7.4.3.2 Other Proposed Mitigation

Should grading occur for installation of the transmission line structures, it would be restricted to establishing a flat, safe workspace. Major topographical changes to the landscape would not occur. Once construction is complete, disturbed areas would be regraded to restore original surface contours and revegetated to the maximum extent feasible.

4.7.5 Groundwater

The ROI for groundwater is the route width. Documented active wells and DWSMA/WHPAs are present within the ROI. Associated wellhead protection plans should be reviewed by the applicants. To minimize impacts, the applicants would store materials including fuel and gasoline in sealed containers to prevent spills, leaks, or other discharges to soil and groundwater in accordance with the SWPPP during construction. Potential impacts to groundwater could also occur during construction (specifically installation of foundations) if artesian groundwater conditions are present and the confining layer is breached by structure foundations. Artesian groundwater conditions can be found throughout the state of Minnesota and are not limited to certain areas of geography. Provided the pressurized conditions and extents are identified, understood, and a plan is implemented to manage pressurized groundwater conditions should they be encountered, impacts would be minimized and/or mitigated.

4.7.5.1 Existing Conditions

The DNR divides Minnesota into six groundwater provinces based on bedrock and glacial geology. The aquifers within these provinces occur in two general geologic settings: bedrock and unconsolidated sediments deposited by glaciers, watercourses, and waterbodies. The project area crosses three main groundwater provinces: the Central Province, Western Province, and the Arrowhead/Shallow Bedrock Province (reference (150)). The Central Province, present in Douglas, Pope, Stevens, Swift, and Big Stone counties, has thick glacial sediment, sand and gravel aquifers are common, and the deeper fractured crystalline bedrock has poor aquifer properties and limited use as an aquifer. The Western Province, present in Big Stone, Stevens, Pope, and Swift counties, contains fractured bedrock commonly buried deep beneath glacial sediment and is of limited use as an aquifer. The Arrowhead/Shallow Bedrock Province, present in Big Stone County, has thin or absent glacial sediment with limited use as an aquifer except in major river valleys where sediment thickness is greater. The Arrowhead/Shallow Bedrock Province is mostly underlain by crystalline bedrock that typically has limited groundwater available for use (reference (150)).

Groundwater flow direction in these shallow, unconsolidated sediments is expected to follow surface topography and surface water flow. However, groundwater flow direction could vary throughout the project area depending on factors such as the presence of shallow bedrock, underground utilities, and/or other surficial features. The depth to the water table is generally less than 50 feet below ground surface in the project area (reference (151)).

One spring was identified within the route width based on a search of the Minnesota Spring Inventory database. The spring is in the Big Stone Subregion along the Stony Run Stream, northwest of Odessa

(Map 14-1). There are two additional springs directly north along the Stony Run Stream, but these do not fall within the route width (Map 14-1; reference (152)).

The EPA defines a sole source aquifer (SSA) or principal source aquifer area as:

- One that supplies at least 50 percent of the drinking water consumed in the area overlying the aquifer
- Where contamination of the aquifer could create a significant hazard to public health
- Where there are no alternative water sources that could reasonably be expected to replace the water supplied by the aquifer.

There are currently no EPA-designated SSAs in the project area (reference (153)).

Wells are abundant throughout the route width of all routing alternatives. The Minnesota Well Index (MWI), which is managed by the MDH, provides information about wells and borings such as location, depth, geology, construction, and static water level at the time of construction. According to the MWI, there are approximately 108 active wells within the route width of the routing alternatives; several other wells within the route width are reported as sealed. Appendix M summarizes the active wells or those with unknown status within the route width of all routing alternatives(reference (154)).

The Wellhead Protection Area (WHPA) program administers the public and non-public community water supply source-water protection in Minnesota. WHPAs are areas surrounding public water supply wells that contribute groundwater to the well. In these areas, contamination on the land surface or in water can affect the drinking water supply. WHPAs for public and community water-supply wells are delineated based on a zone of capture for 10-year groundwater time-of-travel to the well and are available through a database and mapping layer maintained by MDH (reference (155). The viewer also includes the Drinking Water Supply Management Areas (DWSMA) and DWSMA Vulnerability. DWSMAs are delineated areas within the WHPA and are managed in a wellhead protection plan, usually by a city.

According to the MDH there is only one WHPA/DWSMA within the route width of the routing alternatives. As shown in Map 14-1, the Odessa WHPA/DWSMA is directly northeast of the city of Odessa in the Big Stone Subregion. DWSMAs are rated for vulnerability, or how likely it is that contamination in the DWSMA can reach the public water supply intake. The Odessa WHPA/DWSMA has a vulnerability to contamination ranking of Moderate-High (reference (156)).

A Special Well and Boring Construction Area, or well advisory, is a mechanism which provides for controls on the drilling or alteration of public and private water-supply wells, and environmental wells in an area where groundwater contamination has, or might, result in risks to the public health. There are no MDH-designated Special Well and Boring Construction Areas in the project area (reference (156)).

Flowing wells and borings are drilled holes that encounter an aquifer with sufficient natural pressure to force water above the ground surface so that water will flow without pumping. Flowing artesian conditions exist when a low permeability confining layer, such as clay or shale, overlies the aquifer. This puts the groundwater under pressure because the material doesn’t permit water to flow through it.

When ground disturbing activities (for example, a well, boring, or installation of a foundation for a transmission line structure) breach the confining layer, it creates a pressure relief valve which allows the water to rise above the top of the aquifer. If the pressure in the aquifer is great enough to force water to rise above the land surface, artesian groundwater conditions occur. Flowing conditions can also occur in an unconfined aquifer, most often at lower elevations in groundwater discharge areas near rivers, lakes, or other waterbodies. These unique features can be found throughout the state of Minnesota and are not limited to certain areas or geography (reference (157)).

The project would use concrete foundations. Approximately ten billion tons of concrete is produced in the world each year, with a significant quantity used in construction of structures that are built in water, such as bridge supports, piers, and culverts (reference (158)). It is manufactured by mixing together cement, aggregates, water, air, and various admixtures. Conventional hardened concrete is comprised of approximately 30 percent cement pastes by volume and 18 percent pore voids. When concrete structures contact groundwater, the pore voids are filled with water. Groundwater chemistry is affected when brought into contact with or when in close proximity to such structures since the hydration products of cement can be dissolved and leached into the groundwater (reference (159)). The most common constituents of the cement paste that can be leached are the alkali salts followed by calcium hydroxide (reference (160)). Additionally, soluble components of concrete might leach into the surrounding soil or groundwater prior to concrete setting and hardening.

Generally, the interaction between concrete and the soil-rock surrounding it controls the chemistry of the groundwater near concrete foundations. Both are porous, and a common transitional zone is established. Cement chemistry dominates within the bulk of concrete structure, and local groundwater chemistry dominates within the bulk of the soil-rock. The width of this transitional zone is controlled mainly by the rate of flow of the groundwater around the surface of the concrete, with higher flows resulting in a narrower zone. The width of the transitional zone can be significant for concrete sitting in stagnant water. The pH of liquid leaching from concrete can be as high as 13.5, which is significantly higher than groundwater. Therefore, increased pH of groundwater can be expected around the surface of concrete but is not expected to penetrate far into the groundwater matrix because the transport rate from the concrete is low (reference (159)).

4.7.5.2 Potential Impacts

Potential impacts on groundwater can occur directly or indirectly. Direct impacts are generally associated with construction, such as the penetration of shallow water tables while drilling foundations (reference (161)). Indirect impacts could occur through spills or leaks of petroleum fluids or other contaminants that could ultimately contaminate groundwater. The risk of contamination is heightened in areas with sandy soils, which often exhibit water repellent properties that intensify runoff and erosion and result in fast-moving flow of water into and across soils, increasing nutrient leaching and groundwater contamination (reference (162)); two commenters raised concerns over drinking water contamination in areas with sandy soil (scoping comments #60 and #61; reference (2)). If a contaminant from the project were to reach the Odessa WHPA/DWSMA, which has a vulnerability ranking of Moderate-High, it is likely that contamination would reach the public water supply intake. Impacts could be significant.

Installation of structure foundations would require dewatering to enable construction activities. Dewatering would cause temporary draw down of existing groundwater levels and could cause erosion or sedimentation when the water is discharged. Significant dewatering that would require a water appropriation permit from the DNR is not expected during construction of the project.

When an unexpected artesian condition is found, it can have a substantial impact that could compromise the condition and use of the area in which the flow is encountered and could cause challenges with construction of transmission line tower foundations along the routes. Artesian groundwater conditions, when unintentionally encountered or created through the breach of the confining layer, can cause excavation stability issues and uncontrolled release of groundwater at the ground surface and to surface waters. If uncontrolled, artesian groundwater conditions can be extremely difficult to repair and in some instances are un-repairable. However, subsurface investigations and construction in artesian groundwater conditions can be completed successfully provided the pressurized conditions and extents are identified, understood, and a plan implemented to manage pressurized groundwater conditions should they be encountered.

One commenter noted that three artesian flowing wells and multiple springs are located within a route near their property (comment #18, reference (2)).

Several commenters voiced concerns that concrete foundation leachate could contaminate groundwater and impact water quality in domestic wells (scoping comments #47, #89, and #91; reference (2)). When concrete foundations are used, some portions of the soluble components of the cement paste can leach into groundwater prior to the setting and hardening of the concrete. This will change the pH of groundwater around the surface of the concrete but is not expected to extend far from the concrete foundation. Leaching from concrete foundations near shallow wells in areas with low depth to groundwater may increase well pH levels above the maximum water quality standard of 8.5 (reference (163)). Drinking water with high pH levels can have a slippery feel, a soda-like taste, and leaves deposits on surfaces (reference (164)).

4.7.5.3 Mitigation

4.7.5.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.3.8, contains the following mitigation related to groundwater resources, "Areas disturbed by construction activities shall be restored to pre-construction conditions."

In the draft route permit, condition 5.5.2, also states that, "the Permittee shall comply with all applicable state rules and statutes. The Permittee shall obtain all required permits for the project and comply with the conditions of those permits unless those permits conflict with or are preempted by federal or state permits and regulations."

4.7.5.3.2 Other Proposed Mitigation

The applicants would coordinate with the DNR, as necessary, to confirm that ground disturbing activities such as geotechnical investigation and structure installation do not disrupt groundwater hydrology.

The applicants would conduct geotechnical evaluations prior to project construction to identify where potential groundwater impacts could occur. The applicants noted that if shallow depths to groundwater resources are identified during geotechnical design of the project, specialty structures with wider, shallower foundations could be used. EIP staff recommends these locations be shown on the plan and profile submitted for the project, and that appropriate mitigation measures be identified as part of the filing.

Depending on the results of the geotechnical evaluations, the applicants would obtain a Water Appropriation Permit from DNR if groundwater dewatering activities would be greater than 10,000 gallons of water per day or 1 million gallons per year. The project SWPPP would outline BMPs for sediment controls (for example, a filter bag) so sediment-laden waters are not discharged directly onto the surface and erosion controls (for example, use of well-vegetated upland areas) to promote infiltration and avoid erosion during discharge. Depending on site conditions, the water may be de-silted and discharged to an upland area for re-infiltration or removed from the site via a tank truck. Dewatering will be conducted in accordance with applicable regulations and permit requirements.

The applicants would assess any previously unknown wells identified within the ROW during project construction to determine if they are open, and seal them, if necessary, in accordance with MDH requirements. They would also place project components to adhere to the MDH isolation distance from a water supply well rule (reference (165)).

Indirect impacts to groundwater can be mitigated by avoiding or minimizing impacts to surface waters. Measures to control soil erosion and sedimentation would be implemented during construction activities. Direct impacts to groundwater, that is, leaching from concrete foundations where groundwater is present, is difficult to mitigate. Dewatering might minimize potential impacts. Should dewatering be required, the applicants would work with MPCA via the SWPPP to minimize runoff to surface and groundwater.

At the time of decommissioning, concrete foundations would be managed in accordance with MPCA and county solid waste regulations. The Odessa DWSMA/WHPA is crossed by routing alternatives in the Big Stone Subregion. As part of the geotechnical analyses, the applicants will conduct soil borings and evaluate water levels at structure locations with the Odessa WHPA prior to construction. Associated wellhead protection plans should be reviewed by the applicants to ensure compliance. During construction, the applicants would store materials including fuel and gasoline in sealed containers to prevent spills, leaks, or other discharges to soil and groundwater in accordance with the SWPPP.

4.7.6 Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands often involve unique resources intended for protection and/or preservation. Public lands (local, state, or federal) and conservation easements within the ROI are identified and qualitatively assessed for potential impact. Public lands within the ROI include Wildlife Management Areas, Waterfowl Production Areas, and national wildlife refuges. No other public lands such as local parks, state forests, or national forests were identified.

Designated lands with easements within the ROI include: CREP and RIM easements, Native Prairie Banking easements, WRP easements, and SFIA land. Designated lands are generally easements on privately-owned lands that are not accessible to the public.

4.7.6.1 Existing Conditions

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

Public lands within the ROI of routing alternatives include Wildlife Management Areas (WMAs) and Waterfowl Production Areas (WPAs). Two national wildlife refuges are within the ROI of the Big Stone Subregion, but neither are crossed by the anticipated alignments. WPAs are small natural wetlands and grasslands designated by USFWS that provide breeding, resting, and nesting habitat for waterfowl, shorebirds, grassland birds and other wildlife (Section 4.7.8). The DNR manages WMA land to protect wildlife habitat as well as provide hunting and recreational activities related to wildlife (Section 4.7.8). National Wildlife Refuges are lands and waters designated by USWFS for the conservation, management, and restoration of wildlife and their habitat (Section 4.7.8). The following public lands were not identified within the ROI:

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

Privately-held land could also be subject to special designations. The routing alternatives cross lands that are part of various conservation easement programs, including the RIM Reserve program, CREP, Native Prairie Bank program, and Wetlands Reserve Program (WRP). The Minnesota BWSR acquires, on behalf of the state, conservation easements to permanently protect, restore and manage critical natural resources without owning the land outright. The RIM Reserve program compensates landowners for granting conservation easements and establishing native vegetation habitat on economically marginal, flood-prone, environmentally sensitive or highly erodible lands (reference (166)).

CREP is a federal program that leverages federal and non-federal funds to target specific state, regional, or nationally significant conservation concerns. In exchange for removing environmentally sensitive land from production and establishing permanent resource conserving plant species, farmers and ranchers are paid an annual rental rate along with other federal and non-federal incentives as specified in each CREP agreement (reference (167)). The Native Prairie Bank is a DNR program that targets remnant native prairie habitats that have never been plowed. In exchange for an upfront, one-time payment, landowners agree to manage the land in a way that protects the native prairie, adhering to common protection features such as no plowing or building on the land (reference (168)).

WRP is a federal program that addresses wetland, wildlife habitat, soil, water, and related natural resource concerns on private agricultural land. Landowners receive technical and financial assistance to restore, protect, and enhance wetlands in exchange for retiring marginal lands from agriculture (reference (169)).

RIM Reserve lands are present in the South, Central, and North Regions (Appendix F). CREP lands are present in the South and Central Regions (Appendix F). Native Prairie Bank and WRP lands are only present in the South Region (Map 15-1 through Map 15-5).

Additional designated lands crossed by the routing alternatives include SFIA lands. The SFIA program is jointly administered by the DNR and the Minnesota Department of Revenue. The SFIA program provides annual incentive payments to encourage private landowners to keep their wooded areas undeveloped and to follow an active woodland management plan for a minimum of either 8, 20, or 50 years (reference (105)). SFIA lands are only present in the South Region and discussed in Section 5.2.6.6.

4.7.6.2 Potential Impacts

Project construction and operation could temporarily or permanently impact public and designated lands. Public and designated lands can be spanned to avoid placing structures within these lands, but in cases where public and designated lands cannot be spanned, construction would occur within them. Activities associated with transmission line structure construction include vegetation clearing, movement of soils, and vehicle and equipment traffic. Public and designated lands containing permanent transmission line infrastructure would experience operational impacts from infrastructure presence and maintenance vehicle activity.

Public recreational opportunities in WMAs, WPAs, and National Wildlife Refuges within the ROI could be impacted by construction and operation. Short-term disturbances from construction activities, such as noise, dust, and the visibility of vehicles and equipment, could lessen public enjoyment of the recreational opportunities provided by these public lands (Section 4.3.9). Construction activities could displace wildlife or increase sedimentation into water systems, reducing the quality of recreational opportunities such as hunting, fishing, trapping, wildlife viewing, and hiking. Wildlife are expected to return once construction is complete, but members of the public could experience long-term impacts to their enjoyment of recreational opportunities on WMA, WPAs, and National Wildlife Refuges due to the visual presence of transmission line infrastructure and maintenance vehicles.

Construction and operation of the project could impact the state's ability to manage WMAs within the ROI. The state manages WMAs with specific management strategies according to the intended purpose of the land, such as using prescribed burns to maintain prairies and grasslands and planting woody shelter belts to provide cover and nesting sites. Some management strategies can only be conducted under specific weather conditions or in certain seasons. Construction activities occurring in WMAs during times typically reserved for specific management strategies could temporarily reduce or remove the ability of the state to appropriately manage the WMA. Once construction is complete, certain management strategies could be constrained or prohibited if they pose a risk to operation and maintenance of the transmission line, such as prescribed burns or the establishment of trees or taller vegetation, permanently impacting the ability of the state to manage the WMA according to its intended purpose.

WPAs, conservation easement programs, and SFIA lands aim to establish native and permanent plant species and/or conserve and protect natural habitat. Permanent clearing of vegetation within these areas would impact the function and intent of these areas and potentially have long-term effects to the unique resources. These lands must be used and managed pursuant to the applicable state or federal regulations and/or terms of the individual easement contract. If non-permitted land use or management activities occur on lands enrolled in conservation easement programs, the easement agreement can be terminated, resulting in the forfeiture of all further financial payments and significant impacts to the landowner.

WPAs are managed through the National Wildlife Refuge Administration Act (reference (170)), and proposed uses of these lands must be compatible with purposes for which the unit was established (reference (171)). Burn, drain, dredge, and fill impacts to wetland easements in WPAs are prohibited. Soil erosion and sediment deposition into WPA wetland easements due to construction or vehicle movement through the ROW could violate this restriction.

Lands enrolled in CREP are subject to the permitted uses and obligations established in federal regulation (reference (172)) and the terms of the individual easement contract. Landowners must establish and maintain the required vegetative or water cover and maintain the soil productivity throughout the duration of the contract. The use of CREP land must be consistent with the conservation of soil, water quality, and wildlife habitat, including seasonal nesting habitat. Activities within CREP lands that impact soil productivity, such as compaction or erosion from vehicles and equipment moving through the ROW, or vegetative cover, such as permanent vegetation clearing during the primary nesting season for construction or maintenance purposes, could violate CREP regulations and terminate the contract, resulting in significant impacts.

Lands enrolled in the RIM Reserve Program are subject to the prohibited actions and landowner agreements established in state statute (reference (173)) and the terms of the individual easement contract. Landowners must establish and maintain agreed-upon vegetation using seeding rates approved by BWSR, plant trees, or carry out long-term capital improvements approved by BWSR for soil and water conservation or wildlife management. Structures cannot be placed, erected, or constructed on the easement area, wildlife habitat and other natural features cannot be altered unless specifically approved by BWSR, and topsoil extraction is prohibited. Spraying with chemicals or mowing is prohibited except as necessary to comply with noxious weed control laws, emergency pest control, or as approved by BWSR. The installation of structure foundations within RIM Reserve lands and activities that extract topsoil, such as grading, or impact vegetative cover or habitat, such as permanent vegetation clearing or herbicide use for construction or maintenance purposes, could violate RIM Reserve program requirements and terminate the contract, resulting in significant impacts.

Lands enrolled in WRP are subject to the requirements established in federal regulation (reference (174)) and the terms of the individual easement contract. Landowners must agree to a plan of operations to restore, protect, enhance, maintain, manage, and monitor the hydrologic conditions of inundation or saturation of the soil, native vegetation, and natural topography. Lands with permitted or existing ROW for infrastructure development are typically deemed ineligible for WRP as the development would undermine the implementation of restoration practices. Placing structures on the WRP easement is prohibited. The installation of structure foundations within WRP lands and activities that impact wetland conditions, such as sedimentation and erosion from vehicle movement or vegetation clearing for construction or maintenance purposes, could violate WRP requirements and terminate the contract, resulting in significant impacts.

Native Prairie Bank lands are subject to the requirements established in state statute (reference (175)) and the terms of the individual easement agreement. Landowners agree not to alter the native prairie by seeding with nonnative grasses or legumes, spraying with large amounts of herbicides, or otherwise destroying the native prairie character. Activities that impact the native prairie vegetation community, such as permanent vegetation clearing for construction or maintenance purposes, or impact the native prairie character, such as installation of structure foundations, could violate Native Prairie Bank requirements and terminate the easement. The use of improper seed mixes when restoring disturbed areas of Native Prairie Bank land could also result in easement termination, resulting in significant impacts.

SFIA lands have covenants in place limiting the property's use to forest management activities (Section 4.5.2). Landowners must comply with a woodland stewardship plan prepared by a DNR-approved plan writer and meet the requirements established in state statute (reference (176)). To be eligible for the program, land must consist of at least 20 contiguous acres and at least 50 percent of the land must be forest land as defined by state statute (reference (177)). Permanent tree clearing for construction that brings the SFIA land below the 20 contiguous acres and/or 50 percent forest land minimum could lead to the land being found in violation of the conditions for enrollment, resulting in significant impacts and its removal from the SFIA program. Tree clearing for maintenance purposes that does not comply with the woodland stewardship plan or forest management guidelines could also lead to a violation of the conditions for enrollment and removal from the SFIA program.

4.7.6.3 Mitigation

4.7.6.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.3.18, contains the following mitigation related to public and designated lands, "The Permittee shall restore the right-of-way, temporary workspaces, access roads, abandoned right-of-way, and other public or private lands affected by construction of the Transmission Facility."

4.7.6.3.2 Other Proposed Mitigation

Coordination would be required to occupy public lands within the ROW and/or temporary workspace areas for construction activities within the route width. As described in Section 3.3.2.1, where new ROW would be required, rights would consist primarily of permanent electric transmission easements, providing a 150-foot-wide easement area.

The applicants have consulted with USFWS regarding potential impacts on USFWS public lands. The applicants have avoided, where feasible, USFWS public lands, and will continue to work with the USFWS to reduced impacts to USFWS public lands and acquire applicable permits (e.g., USFWS ROW permit and/or Special Use permits) depending on the route selected. USFWS also participated in the scoping comment period and provided routing alternatives C101, S202, S205, S207, and S208 to reduce impacts to various types of federal land, all of which are included in the scope of this EIS (scoping comment # 48, reference (2)).

The applicants intend to avoid conservation easements to the greatest extent practicable. The applicants will limit construction workspaces near BWSR easements to avoid direct impacts and continue to coordinate with BWSR to reduce impacts, through spanning or structure placement, or avoid impacts to easement lands. The applicants have avoided, where feasible, WPA easement lands, and will continue to work with the USFWS to reduce impacts to easement lands. The applicants are requesting narrower route widths in several locations along the proposed routing alternatives near WPAs with wetland and grassland easements (Map 6).

If easements are crossed, the applicants would work with landowners to determine measures to avoid and minimize impacts on these resources and to avoid interfering with landowner participation in the CREP, RIM, WRP, Native Prairie Bank, or SFIA programs.

In its scoping comment letter (scoping comment # 48, reference (2)), the USFWS noted that if WPAs with wetland and grassland easements cannot be avoided, the applicants will be required to submit an application for a right-of-way permit. Upon receipt of the application, the applicants will be required to complete a federal environmental review of the project. The applicants will also be required to conduct a USFWS compatibility determination, a National Environmental Policy Act (NEPA) analysis, Endangered Species Act (Section 7) review, and National Historic Preservation Act review (Section 106). Depending on the findings from the environmental review, the USFWS may approve the application with conditions or deny the right-of-way permit application. Completion of the environmental review, appraisal, and issuance can take two to three years after the application is received by the USFWS. If a right-of-way permit is issued, the permit is time limited to 50 years.

In its additional comments based on new decision options (reference (178)), the USFWS noted that projects that are not granted a right-of-way permit due to being incompatible with the purposes for which a WPA was established, it may be possible for a land exchange to occur so the project can occupy an affected WPA. This option is only available if not other practical alternatives are available, and is a lengthy process that is anticipated to take at least three years to complete.

4.7.7 Vegetation

The ROI for vegetation is the ROW. Impacts to vegetation are primarily evaluated by examining vegetative landcover types within the ROW. Most existing vegetation is dominated by cultivated agricultural crops rather than significant concentrations of forested areas in the ROWs; the most

forested land in the ROW is in the North Region. Potential impacts will be both short- and long-term. Impacts are localized, but unavoidable. Potential impacts can be minimized.

4.7.7.1 Existing Conditions

The DNR and the U.S. Forest Service (USFS) have developed an Ecological Classification System (ECS) for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features (reference (179)). ECS mapping allows consideration of ecological patterns for projects to identify areas with similar management opportunities or constraints. The ECS splits the state of Minnesota into Provinces, Sections, and Subsections.

The project spans two ECS provinces, the Eastern Broadleaf Forest Province in the northwestern corner of the north region and the Prairie Parkland Province across the rest of the project (Map 16). The Eastern Broadleaf Forest Province is characterized as a transition zone between semi-arid portions of Minnesota that were historically prairie and semi-humid mixed coniferous-deciduous forests to the northeast (reference (179)). The Prairie Parkland Province is situated in the part of Minnesota that was historically dominated by tallgrass prairie. The landscape in this province was heavily influenced by the most recent glaciation.

The South Region and Central Region are entirely within the Minnesota River Prairie Subsection of the Prairie Parkland Province (Map 16). The majority of the North Region is also in the Minnesota River Prairie Subsection of the Prairie Parkland Province; the remaining one-third in the northwestern part of the North Region is in the Hardwood Hills Subsection of the Eastern Broadleaf Forest Province (Map 16).

Prior to European settlement, vegetation in the Minnesota River Prairie Subsection was dominated by tallgrass prairie, with islands of wet forest also present and floodplain forests along the Minnesota River and other streams in the subsection (reference (180)). At present, remnant tallgrass prairie is rare and the subsection is dominated by agricultural vegetation. Most of the project is representative of the existing conditions of the Minnesota River Prairie Subsection.

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

In general, the vegetation resources across the project are dominated by agriculture and crops including corn, soybeans, hay/haylage, dry beans, and oats/rye (Section 4.5.1). According to the National Landcover Database (NLCD), areas of natural vegetation such as forests are sparse in the project area (Map 11). The NLCD is derived from Landsat imagery along with various other data sources. As such, it provides only an approximation of existing landcover types.

Other natural areas such as wetlands and native plant communities are more scattered across the project area. Wetlands are predominant throughout the project area, although less so near the ROI in the in the Central Region (Map 14). Native plant communities, consisting predominantly of native prairie communities are scattered across the project area but are most abundant in the Big Stone Subregion of the South Region (Map 11). Wetlands are discussed in Section 4.7.12 and native plant communities and other sensitive ecological resources are discussed in Section 4.7.9.

Native North American wild rice is classified as a grass in the family *Poaceae* and the genus *Zizania*. The most common species throughout Minnesota is northern wild rice, or *Zizania palustris* (reference (182). Wild rice is a valued resource in Minnesota managed by the state that can be negatively impacted by water flow, turbidity, water quality and water level fluctuations. There are no DNR designated or modeled wild rice waters or features in the ROI.

4.7.7.2 Potential Impacts

Construction of the project would result in short-term impacts on existing vegetation such as localized physical disturbance and soil compaction. Construction activities involving establishment and use of access roads, staging, and stringing areas would also have short-term impacts on vegetation by concentrating surface disturbance and equipment use. Vegetation would be permanently removed where structures would be installed and where grading occurs for the regeneration station. Vegetation that is not removed could be disturbed or compacted.

Construction would also result in long-term impacts to vegetation by permanently removing high growing and forested vegetation within the ROW to avoid the potential for vegetation interfering with the safe operation of the transmission line. The applicants would permanently convert forested areas to low-stature vegetation such as herbs and grasses by clearing woody vegetation throughout the entire ROW where it occurs. The routine clearing of woody vegetation within the ROW would result in the widening of existing corridors or bisecting (fragmenting) forests to establish new ROW. Given the predominance of agricultural vegetation in the region, forest fragmentation is anticipated to be minimal for the project.

Although the presence of forest vegetation is minimal across the project, conversion from forest to open habitats in the ROW could have indirect impacts on native vegetation by altering environmental conditions, such as light penetration; this could alter the vegetation community adjacent to the ROW and increase the potential spread of noxious weeds and other non-native species. In addition, tree removal, such as windrows, may contribute to pesticide drift if removal occurs in areas of pesticide use, such as adjacent farm fields or the ROW (reference (183)).

Construction and maintenance activities have the potential to result in the introduction or spread of noxious weeds and other non-native species. Noxious weeds, which are regulated under Minnesota Statute 18, can be introduced to new areas through propagating material like roots or seeds transported by contaminated construction equipment. Activities that could potentially lead to the introduction of noxious weeds and other non-native species include ground disturbance that leaves soils exposed for extended periods, introduction of topsoil contaminated with weed seeds, vehicles importing weed seed, and conversion of landscape type, particularly from forested to open settings.

4.7.7.3 Mitigation

The primary means of mitigating impacts to vegetation is to avoid specific vegetation, such as trees, through prudent routing. Mitigation can be achieved, in part, by using or sharing existing infrastructure rights-of way (for example, roadway, transmission line) if tree removal would be minimized. However, minimal opportunities for ROW sharing that would minimize tree removal were identified for the project. Mitigation can also be accomplished by spanning areas of sensitive vegetation, native plant communities, and other sensitive ecological resources; these resources are discussed in Section 4.7.9.3.

Mitigation measures to reduce the spread of invasive and non-native plant species during construction include the regular and frequent cleaning and inspection of construction equipment and vehicles; minimizing ground disturbance to the greatest degree practicable; rapid revegetation of disturbed areas with native or appropriately certified weed-free seed mixes and using weed-free straw and hay for erosion control; conducting field surveys of the ROW prior to construction to identify areas containing noxious weed (weed surveys during construction would identify infestations of the ROW staging areas); and eradicating new infestations as soon as practicable in conjunction with landowner input.

4.7.7.3.1 Commission Draft Route Permit

Mitigation and minimization measures for potential impacts to vegetation resources are standard Commission route permit conditions and include the following:

- Condition 5.3.10: Minimize number of trees to be removed in selecting the right-of-way specifically preserving to the maximum extent practicable windbreaks, shelterbelts, living snow fences, and vegetation in areas such as trail and stream crossings where vegetative screening could minimize aesthetic impacts.

- Condition 5.3.10: Remove tall growing species located within the transmission line right-of-way that endanger the safe and reliable operation of the transmission line. Leave undisturbed, to the extent possible, existing low growing species in the right-of-way or replant such species in ROW to blend the difference between the right-of-way and adjacent areas, to the extent that the low growing vegetation that will not pose a threat to the transmission line or impede construction.

- Condition 5.3.12: Employ best management practices to avoid the potential introduction and spread of invasive species on lands disturbed by construction activities. Develop an Invasive Species Prevention Plan and file with the Commission prior to construction. Take all precautions against the spread of noxious weeds during construction. Site appropriate seed certified to be free of noxious weeds should be used and the extent possible, native seed mixes should be used.

- Condition 5.3.11: Restrict pesticide use to those pesticides and methods of application approved by the Minnesota Department of Agriculture, DNR, and the EPA. Selective foliage or basal application shall be used when practicable.

4.7.7.3.2 Other Proposed Mitigation

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

- Disturbed areas would be revegetated using weed-free seed mixes and weed-free straw and hay for erosion control.
- Completing tree and brush clearing during the winter to limit interaction with noxious or invasive species that could be spread by equipment through the ROW.
- Spreading mulch across access roads and strategically routing access roads away from infested areas.
- Invasive species/noxious weeds would be removed via herbicide or mechanical means in accordance with easement conditions and landowner restrictions.
- Where possible, the ROW could be mowed before noxious weeds and invasive species go to seed, if present.
- Construction vehicles would be inspected and cleaned to remove dirt, mud, plants, and debris from vehicles prior to arriving at and leaving construction sites.

These BMPs are included in the project's draft Vegetation Management Plan, which the applicants would finalize in coordination with applicable agencies prior to construction. All revegetation would be subject to SWPPP requirements and monitored by a third party via the route permit until the requirements are met.

4.7.8 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. Impacts to wildlife and wildlife habitat are assessed both by considering wildlife inhabiting the ROI as well as assessing the presence of potential habitat for wildlife within the ROI. Wildlife and avian species in the local vicinity are expected to be displaced during construction due to increased human activity. Most wildlife would return to the area after construction. Distinct impacts to terrestrial species, avian species, and habitat will occur. While direct significant impacts might occur to individuals, population level impacts are not anticipated. These minimal, short-term impacts can be minimized. Operational impacts are expected from intermittent but long-term maintenance of the right-of-way.

4.7.8.1 Existing Conditions

Wildlife inhabiting the ROI are typical of those found in disturbed habitats associated with agriculture and rural, exurban, and suburban residential development. Watercourses and waterbodies and areas of natural vegetation, such as deciduous forest, wetlands, and grassland areas also provide habitat for wildlife in the area. Typical wildlife species inhabiting the ROI include mammals such as deer, fox, skunks, muskrats, opossums, squirrels, racoons, and bats; songbirds, such as robins, bluebirds, and red-winged blackbirds; waterfowl, such as mallards and geese; raptors, such as owls and hawks; reptiles, such as garter snakes, skinks, and painted turtles; amphibians, such as American toads, leopard frogs, and Tiger salamanders; and aquatic biota such as fish and mussels.

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

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

Minnesota is home to over 2,000 known native wildlife species and over 300 of these species have been identified as Species in Greatest Conservation Need (SGCN) because they are rare, their populations are declining, or they face serious threats that can cause them to decline and thus have populations below levels desirable to promote their long-term health and stability. Minnesota's Wildlife Action Plan 2015-2025 includes a habitat approach, which focuses on sustaining and enhancing terrestrial and aquatic habitats for SGCN in the context of the larger landscapes (reference (184)). The Wildlife Action Plan lays out the basis for the long-term vision of a Wildlife Action Network composed of terrestrial and aquatic habitat cores and corridors to support biological diversity and ecosystem resilience with a focus on SGCN. Wildlife Action Network corridors are scored using five scalable metrics: SGCN population viability scores, SGCN richness, spatially prioritized Sites of Biodiversity significance, ranks of Lakes of Biological Significance, and Strem Indices of Biological Integrity. Scores range from low to high; low scores indicate that the five scalable metrics had relatively low scores, while high scores indicate that the five scalable metrics had overlapping high scores. As shown on Map 17, several Wildlife Action Network corridors are scattered through the project area. The Wildlife Action Network is a metric that can be used to assess buffers and connectors of habitats representing the diversity of habitat quality, supporting SGCN. As detailed by the DNR, "Consideration should be given to projects or activities that could result in the loss, degradation or fragmentation of habitat within the Wildlife Action Network, as habitat loss was identified as a substantial contributor to SGCN population declines" (reference (184)).

Several lands that are preserved or managed for wildlife and associated habitat are scattered throughout the project's local vicinity, including DNR WMAs, lakes that are part of DNR Shallow Lakes Program, USFWS Grassland Bird Conservation Areas (GBCAs), USFWS WPAs, USFWS National Wildlife Refuges, and National Audubon Society Important Bird Areas; these areas are shown on Map 18.

The DNR manages over one million acres of land as WMAs to protect lands and waters that have a high potential for wildlife production, public hunting, trapping, fishing, and other compatible recreational uses (reference (185)). As shown on Map 18, several WMAs intersect the ROI, including the Lowry State WMA and the Forada State WMA in the Alexandria Subregion, the Old Gravel Pit State WMA in the Swift Subregion, the White Bear State WMA and the New Prairie State WMA in the White Bear Lake Subregion, and the Noordmans State WMA in the Cyrus Subregion.

There are over 5,000 shallow lakes that are greater than 50 acres in size in the state of Minnesota; these shallow lakes serve as important habitat for wildlife species. Several shallow lakes are scattered across the project. The DNR Shallow Lakes Program designates certain shallow lakes as shallow wildlife lakes; this designation allows them to protect and enhance wildlife habitat on these larger lakes (reference (187)). No designated wildlife lakes are within the ROI.

The USFWS designates GBCAs priority areas for grassland protection and enhancement that are thought to provide suitable habitat for many or all priority grassland bird species in tall grass prairie. As shown on Map 18, GBCAs intersect the ROI in all subregions.

The USFWS established WPAs to conserve some of the most threatened and productive migratory bird habitat in the country (reference (188)). As shown on Map 18, several WPAs intersect the ROI, including the Big Stone County WPA in the Big Stone Subregion and the Swift Subregion, the Swift County WPA in the Swift Subregion and the Hancock Subregion, the Pope County WPA in the Hancock Subregion, the Cyrus Subregion, the White Bear Lake Subregion, and the Alexandria Subregion, and the Douglas County WPA in the Alexandria Subregion.

The USFWS designates public lands, such as National Wildlife Refuges, for the conservation and management of wildlife (reference (189)). As shown on Map 18, two USFWS National Wildlife Refuges intersect the ROI in the Big Stone Subregion, the Big Stone National Wildlife Refuge and the Northern Tallgrass Prairie National Wildlife Refuge.

The National Audubon Society works to identify, monitor, and protect habitat for bird species throughout the U.S., in part by designating sites as Important Bird Areas; these areas are designated when they meet certain criteria related to providing habitat for vulnerable species (reference (190)). As shown on Map 18-1 through Map 18-3, an Important Bird Area intersects the Big Stone Subregion and the Swift Subregion.

In addition to the lands that are preserved or managed for wildlife, there are several sensitive ecological resources, such as native plant communities and sites of biodiversity significance, that would also provide habitat for wildlife; these resources are discussed in Section 4.7.9.1.3.

4.7.8.2 Potential Impacts

Construction activities that generate noise, dust, or disturbance of habitat could result in short-term, direct or indirect impacts on wildlife, such as mortality, injury, or decreased breeding success. During construction of the project, wildlife would generally be displaced within and adjacent to the ROW and footprints of associated facilities including the substations. Clearing and grading activities could also destroy birds' eggs or nestlings and less mobile wildlife species such as small mammals, amphibians, and reptiles that might be unable to avoid equipment. Many wildlife species would likely avoid the immediate area during construction; the distance that animals would be displaced depends on the species and the tolerance level of each animal. However, comparable habitat is available adjacent to the project.

Construction of the project could result in long-term adverse impacts on wildlife due to loss, conversion, or fragmentation of habitat. The applicants would permanently clear trees within the ROW and substation footprints. Wildlife species previously occupying forested communities in these areas would be displaced in favor of species that prefer more open vegetation communities. Impacts would be minimal in situations where an existing ROW is expanded because habitat fragmentation would already have occurred; however, minimal opportunity for ROW sharing has been identified. Where ROW paralleling would occur, the fragmented landscape would be extended. Habitat fragmentation could lead to declines in wildlife populations, particularly in specialized species with specific habitat requirements. Less mobile wildlife species could experience resource limitation, as they are unable to move between fragments to access additional food, mates, or shelter. The quality of fragmented habitats could decline due to edge effect changes to resource availability that reduce the amount of suitable habitat within a fragment, or edge effect changes to habitat boundary conditions that promote the spread of invasive species.

Potential impacts to avian species (for example, songbirds, raptors, and waterfowl) could occur due to electrocution and collision with transmission line conductors. Electrocution occurs when an arc is created by contact between a bird and energized lines or an energized line and grounded structure equipment. Electrocution occurs more frequently with larger bird species, such as hawks, because they have wider wingspans that are more likely to create contact with the conductors.

Independent of the risk of electrocution, birds could be injured by colliding with transmission line structures and conductors. The risk of collision is influenced by several factors including habitat, flyways, foraging areas, and bird size. Waterfowl, especially larger waterfowl such as swans and geese, are more likely to collide with transmission lines. The frequency of collisions increases when a transmission line is placed between agricultural fields that serve as feeding areas and wetlands or open water, which serve as resting areas. In these areas, it is likely that waterfowl and other birds would be traveling between different habitats, increasing the likelihood of a collision. Impacts would be similarly increased for bird collisions and electrocution near important habitat areas such as those identified by the Wildlife Action Network, GBCAs, WMAs, Important Bird Areas, and the like.

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

4.7.8.3 Mitigation

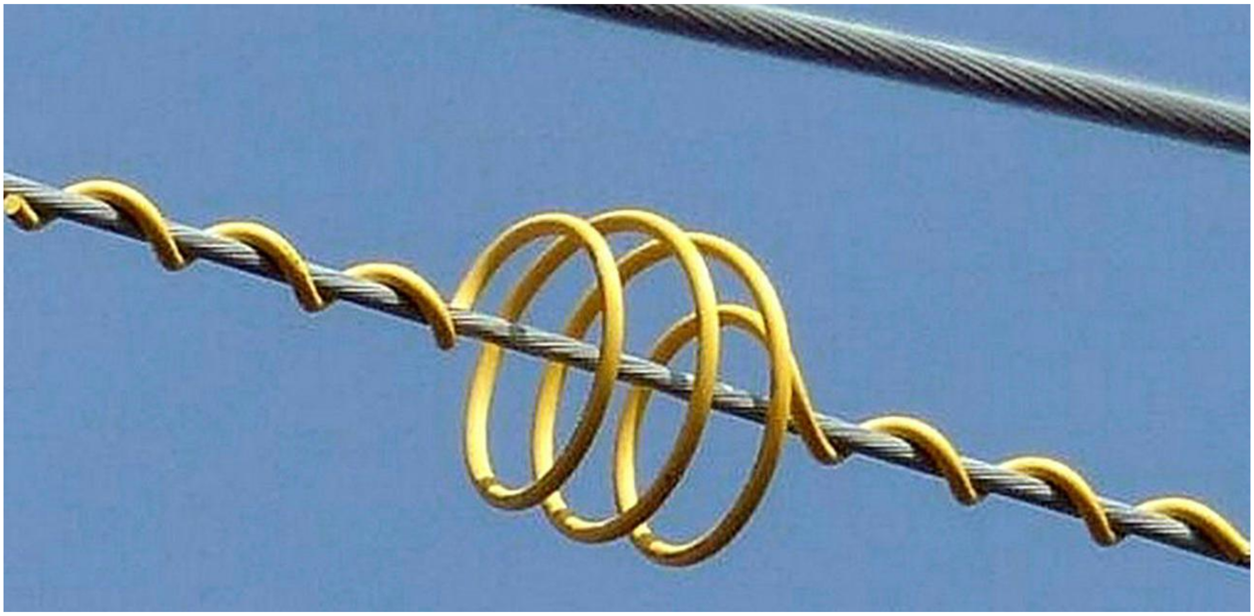
Potential to wildlife and wildlife habitat can often be minimized or mitigated through several strategies. The primary strategy for mitigating impacts is to select routing alternatives away from areas known to contain high-quality habitat or which serve as migratory corridors. Use of existing rights-of-way can minimize habitat loss and fragmentation. Impacts to wildlife can also be minimized by spanning habitats and minimizing the number of structures in high-quality habitat through the use of specialty structures.

4.7.8.3.1 Commission Draft Route Permit

Mitigation and minimization measures for potential impacts to avian species, including federally and/or state protected avian species are standard Commission route permit conditions. As part of the Commission's draft route permit, condition 5.3.16, the applicants, in cooperation with the DNR, would need to identify areas of the transmission line where bird flight diverters would be incorporated into the transmission line design to prevent large avian collisions attributed to visibility issues. A typical bird flight diverter installation is shown in Figure 4-12. In addition, standard transmission design would need to incorporate adequate spacing of conductors and grounding devices in accordance with Avian Power Line Interaction Committee standards to eliminate the risk of electrocution to raptors with larger wingspans that could simultaneously contact a conductor and grounding devices.

As discussed in Section 4.7.7.3, there are several standard Commission route permit conditions to mitigate or minimize potential impacts to vegetation resources; these standard route permit conditions would also be applicable to mitigating and minimizing potential impacts to wildlife habitat.

Figure 4-12 Typical Bird Flight Diverter



4.7.8.3.2 Other Proposed Mitigation

As summarized in its route permit application, the applicants have committed to the following measures to minimize the potential for impacts to wildlife and wildlife habitat:

- Planning the route and structure design to span waterways, basins, and wetlands wherever feasible at natural resource sites.
- Incorporation of DNR recommendations to avoid excess accumulation of mulch and wood chips greater than one inch in thickness throughout native vegetation areas and wetlands during route clearing where feasible and working with the DNR to refine the route and reduce impacts to natural resource sites
- Development of species-specific mitigation measures for protected species and protection plans for rare features, which will also be beneficial to wildlife in general; these are discussed in Section 4.7.7.3.
- Working with the DNR to identify areas avian collision concern areas and where feasible, to incorporate adequate spacing of conductors and grounding devices in accordance with APLIC standards to reduce the risk of electrocution to raptors.

In its Natural Heritage Review responses (MCE 2024-00481 and MCE 2024-00815; Appendix N) and scoping comment letter (scoping comment #96; reference (2)), the DNR recommended use of downward facing, shielded lights that minimizes blue hue on associated facilities to minimize potential impacts to wildlife.

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

Proposed routes that intersect WPAs, public waters, and wetlands, or run parallel to the Big Stone National Wildlife Refuge are all areas with a high risk of avian collision.

To minimize the number of avian collisions with transmission lines, the DNR recommended the applicants coordinate with the DNR to identify appropriate locations for avian flight diverters along the finalized route. Generally, locations that will need avian flight diverters include river crossings, fragmented forested patches, and near lakes and wetlands.

The DNR recommended that dust control products containing calcium chloride or magnesium chloride be avoided. Chloride products do not degrade once released into the environment and instead accumulate to levels that are toxic to both plants and wildlife.

Winter tree clearing protects nesting birds and roosting bats from being directly impacted by construction. The DNR recommended committing to winter tree clearing as a best management practice. The applicants stated that to the extent practicable, they will plan the construction timeline for winter.

Currently the state of Minnesota does not track locations of bald eagles or their nests. The DNR is in the process of developing a database of eagle nest locations; however, it is not currently available. The DNR suggests reporting any eagle sightings on eBird (https://ebird.org/home); these reports will ultimately become part of the DNR’s eagle database.

The USFWS also does not have any public data available on eagle nest locations. USFWS bald eagle management guidelines indicate that activities within 660 feet of an active nest and occur within line of sight of the nesting location might have the potential to disturb nesting bald eagles (reference (191)). Impacts to bald eagles could be minimized by conducting a visual inspection for bald eagle nests not more than two weeks before construction activities begin, if work will occur during the active nesting period for bald eagles (January 15 – July 31). If an active nest is observed and if construction would need to take place during the time that the nest remains active, consultation with the USFWS would need to occur to determine the appropriate next steps. Under these circumstances, a variety of options are available, including having a biological monitor to observe and determine if project activities are resulting in disturbance, shifting the project schedule to avoid the active nesting season, or submitting an incidental take permit that would allow work to proceed even if it is likely to result in disturbance.

4.7.9 Rare and Unique Natural Resources

Rare and unique natural resources encompass protected species and sensitive ecological resources. The ROI for protected species is the project area, and the ROI for sensitive ecological resources is the route width. Impacts on protected species are evaluated by reviewing documented occurrences of these species within the ROI. Potential impacts to sensitive ecological resources, which could provide

suitable habitat for protected species, are evaluated by assessing the presence of these resources within the ROI.

Federally endangered or threatened species are protected under Section 7 of the ESA of 1973 and are typically evaluated and protected by the USFWS. Data on federal protected species were reviewed using the USFWS Information for Planning and Consultation (IPaC) online tool.

At the state level, the evaluation and protection of Minnesota's rare and unique natural resources are overseen by the DNR Division of Ecological and Water Resources through the identification and evaluation of threatened and endangered species and sensitive ecological resources, such as native plant communities. State endangered or threatened species are protected under the Minnesota Endangered Species Statute (Minnesota Statute § 84.0895).

The DNR Natural Heritage Inventory System (NHIS) database (License Agreement #2025-012) was used to assess the presence of state-protected species within one mile of the project. Although these reviews do not represent a comprehensive survey, they provide information on the potential presence of protected species. The NHIS is continually updated as new information becomes available and is the most complete source of data on Minnesota's protected species. Although reports or queries might not show records for state-protected species within the vicinity of a project, it does not necessarily mean that they are not present. It could simply mean that the area has not been surveyed or that records have not been reported to the DNR.

Publicly available GIS datasets and the DNR Conservation Explorer online tool were used to assess the presence of sensitive ecological resources in the area. Sensitive ecological resources could provide habitat suitable for federal- and/or state-protected species.

4.7.9.1 Existing Conditions

4.7.9.1.1 Federally Protected Species

The USFWS IPaC online tool was queried on August 8, 2025, for a list of federally threatened and endangered species, proposed species, candidate species, and designated critical habitat that could be present within the vicinity of the project (Appendix N). The IPaC query identified seven federal species that could potentially be in the project area, including one endangered species, two threatened species, and four proposed endangered or threatened species. These species and their typical habitats are summarized in Table 4-13. The project does not traverse federally designated critical habitat.

Table 4-13 Federal Species Potentially Present in the Vicinity of the Project

Scientific Name	Common Name	Federal Status	State Status	Habitat
Myotis septentrionalis	Northern long-eared bat	Endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Perimyotis subflavus	Tricolored bat	Proposed Endangered	Special concern	Forested habitat in active season; caves and mines during inactive season.[1]
Calidris canutus rufa	Rufa red knot	Threatened	Not listed	In the Northern Great Plains, rufa red knots use inland saline lakes and some freshwater manmade, lake, or wetland habitat for stopover habitat during migration. Rufa red knots do not nest in Minnesota.[2]
Hesperia dacotae	Dakota skipper	Threatened	Endangered	Native dry-mesic to dry prairie, typically with mid-height grasses such as little bluestem (*Schizachyrium scoparium* var. *scoparium*), prairie dropseed (*Sporobolus heterolepis*), and side-oats grama (*Bouteloua curtipendula* var. *curtipendula*)
Danaus plexippus	Monarch butterfly	Proposed Threatened	Not listed	Areas with a high number of flowering plants. Presence of milkweed (Asclepias spp.) to complete the caterpillar life stage.[3]
Bombus suckleyi	Suckley's cuckoo bumble bee	Proposed Endangered	Not listed	Prairies, grasslands, meadows, woodlands, and agricultural and urban areas.[4]
Argynnis idalia occidentalis	Western regal fritillary	Proposed Threatened	Not listed	Tall grass prairie, wet fields, meadows, marshes.[5]

[1] Habitat information from reference (192).
[2] Habitat information from reference (193).
[3] Habitat information from reference (194).
[4] Habitat information from reference (195).
[5] Habitat information from reference (196).

4.7.9.1.2 State-Protected Species

The DNR's NHIS database was queried in June 2025 to determine if state endangered, threatened, or special concern species have been documented within one mile of the project; the DNR uses a one mile buffer as a standard distance to capture the range of species that have already been documented and could be present in the project area, given presence of suitable habitat. The NHIS database identified records for eight endangered, nine threatened, and 31 special concern species within one mile of the project. State threatened and endangered species documented in the NHIS database, along with their typical habitats are summarized in Table 4-14. A state-listed endangered species is defined as a species threatened with extinction throughout all or a significant portion of its range within Minnesota. A state-listed threatened species is defined as being likely to become endangered in the foreseeable future throughout all or a significant portion of its range in Minnesota. State special concern species documented in the NHIS database within one mile of the project are summarized in Appendix N. These species are tracked by the DNR because they are extremely uncommon in Minnesota or have unique or highly specific habitat requirements, however, they are not legally protected under the Minnesota Endangered Species Statute.

Table 4-14 Natural Heritage Information System Database Records of State or Federally Threatened or Endangered Species within One Mile of the Project

Scientific Name	Common Name	Type	State Status	Federal Status	Habitat[1]
Athene cunicularia	Burrowing owl	Bird	Endangered	Not listed	Upland prairies
Coryphantha vivipara	Ball cactus	Vascular plant	Endangered	Not listed	Rock outcrops
Eleocharis wolfii	Wolf's spikerush	Vascular plant	Endangered	Not listed	Savannas, rock outcrops, upland prairies, wet meadow/carr
Hesperia dacotae	Dakota skipper	Butterfly	Endangered	Threatened	Upland prairies
Isoetes melanopoda	Prairie quillwort	Vascular plant	Endangered	Not listed	Rock outcrops
Lanius ludovicianus	Loggerhead shrike	Bird	Endangered	Not listed	Upland prairies
Marsilea vestita	Hairy waterclover	Vascular plant	Endangered	Not listed	Rock outcrops
Oarisma poweshiek	Poweshiek skipperling	Butterfly	Endangered	Endangered	Lowland and upland prairies
Actinonaias ligamentina	Mucket	Mussel	Threatened	Not listed	Medium and large rivers
Alasmidonta marginata	Elktoe	Mussel	Threatened	Not listed	Small to large rivers
Bacopa rotundifolia	Waterhyssop	Vascular plant	Threatened	Not listed	Rock outcrops, marshes
Berula erecta	Stream parsnip	Vascular plant	Threatened	Not listed	Wet meadow/carr, non-forested rich peatlands, small rivers
Callitriche heterophylla	Larger water starwort	Vascular plant	Threatened	Not listed	Rock outcrops, littoral zone of lakes, marshes
Cicindela lepida	Ghost tiger beetle	Beetle	Threatened	Not listed	Steep, open, blowing sand dunes
Cyperus acuminatus	Short-pointed umbrella sedge	Vascular plant	Threatened	Not listed	Rock outcrops
Notropis anogenus	Pugnose shiner	Fish	Threatened	Not listed	Littoral zone of lakes, small rivers

Scientific Name	Common Name	Type	State Status	Federal Status	Habitat[1]
Rhynchospora capillacea	Hair-like beak rush	Vascular plant	Threatened	Not listed	Non-forested rich peatlands

[1] Habitat information from reference (192).

4.7.9.1.3 Sensitive Ecological Resources

The DNR has established several classifications for sensitive ecological resources across the state, many of which are scattered throughout the geographic area (Map 15). Some of these sensitive ecological resources are crossed by the project's route width including Sites of Biodiversity Significance, native plant communities, railroad rights-of-way prairies, prairie bank easements, Prairie Conservation Plan sites, and Lakes of Biological Significance.

The DNR maps Sites of Biodiversity Significance and assigns a biodiversity significance rank to sites surveyed across the state. These ranks are used to communicate statewide native biological diversity of each site and help to guide conservation and management activities (reference (197)). The DNR assigns biodiversity significance ranks, as follows:

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

As shown on Map 15, several Sites of Biodiversity Significance are crossed by the project's ROI for sensitive ecological resources.

The DNR identifies and maps areas containing native plant communities across the state. A native plant community is a group of native plants that interact with each other and their environment in ways that have not been greatly altered by modern human activity or introduced organisms (reference (198)). The DNR provides a state conservation status to each native plant community, as follows:

- **S1** – community is critically imperiled
- **S2** – community is imperiled
- **S3** – community is vulnerable to extirpation or extinction
- **S4** – community is apparently secure
- **S5** – community is demonstrably widespread, abundant, and secure

As shown on Map 15, several native plant communities have been mapped across the project area, many of which are crossed by the project's ROI for sensitive ecological resources, including the following types and associated state conservation status:

- Arrowhead Marsh (Prairie); S1
- Crystalline Bedrock Outcrop (Prairie), Minnesota River Subtype; S2
- Dry Hill Prairie (Southern); S2
- Mesic Prairie (Southern); S2
- Seepage Meadow/Carr, Aquatic Sedge Subtype (S3)
- Cattail Marsh (Prairie); S1
- Crystalline Bedrock Outcrop (Prairie), Sioux Quartzite Subtype; S2
- Dry Sand – Gravel Prairie (Southern); S2
- Wet Prairie (Southern); S2
- Red Oak – Basswood Forest (Calcareous Till); S4

The 1997 Minnesota State Legislature directed the DNR to survey active railroad rights-of-way for native prairie (reference (199)). These areas undergo active management to maintain the existence of prairie communities. As shown on Map 15, railroad rights-of-way prairie are crossed by the project's ROI for sensitive ecological resources in the Hancock Subregion of the Central Region (Section 6.2.6.9).

Native prairie bank easements were authorized by the 1997 Minnesota State Legislature to protect and manage native prairie while allowing the land to remain in private ownership (reference (200)). At present, more than 15,000 acres of land are protected under native prairie bank easements in Minnesota. As shown on Map 15, a few prairie bank easements are in the South Region and North Region. The project's ROI for sensitive ecological resources intersects a prairie bank easement in the Big Stone Subregion (Section 5.2.6.9).

The Prairie Conservation Plan is a 25-year strategy for accelerating prairie conservation in the state, focusing efforts on grassland and wetland (reference (201)). The plan identifies core conservation areas and creates a vision of a connected landscape from Canada to Iowa. The Minnesota Prairie Conservation Plan identifies three site designations as areas to focus conservation efforts; these include Core Areas, Corridors, and Strategic Habitat Complexes. As shown on Map 15, all three Prairie Conservation site designations intersect the project's ROI for sensitive ecological resources and most of these occur in the Big Stone Subregion (Section 5.2.6.9) and White Bear Lake Subregion (Section 6.4.6.9).

The DNR maps certain waterbodies as Lakes of Biological Significance based on the unique presence of aquatic plants or animals (reference (202)). The DNR assigns biological significance classes (outstanding, high, or moderate) to these waterbodies based on a variety of factors, such as the quality of the lake/habitat and presence of certain plants and animals. As shown on Map 15, a few Lakes of Biological Significance are in the South Region and North Region. The project's ROI for sensitive ecological resources intersects a Lake of Biological Significance (Artichoke Lake) in the Swift Subregion (Map 15-3; Section 5.3.6.9).

State and federal lands that are preserved or managed for wildlife would also be considered sensitive ecological resources; these lands are discussed in Section 4.7.8.

4.7.9.2 Potential Impacts

Project construction and operation have the potential to impact protected species and sensitive ecological resources. Construction-related potential short-term impacts on federally or state protected wildlife species would be similar to those described for non-listed species in Section 4.7.8.2 and could include displacement during construction activities that generate noise, dust, or disturbance of habitat. Permanent clearing of vegetation in areas identified as sensitive ecological resources could impact protected species associated with these habitats.

4.7.9.2.1 Federally Protected Species

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

The NHIS database does not document the presence of northern long-eared bats, maternity roost trees, or hibernacula within one mile of the project. The project area is predominantly agricultural, with only small areas of forested habitat. However, impacts to northern long-eared bats could occur if tree clearing or construction take place during the bat's active season, when the species are breeding, foraging, or raising pups in forested habitat. Bats could be injured or killed if occupied trees are cleared during the active season, and the species could be disturbed during clearing or construction activities due to noise or human presence.

Rufa red knots are rare in Minnesota and do not nest in the state. The NHIS database does not track documented records of rufa red knots, nor is the species protected at the state level. It is unlikely but possible that that rufa red knots could use lakes and wetlands in the project area as stopover habitat during migration.

As noted in Table 4-14, Dakota skippers have been documented within one mile of the project. Dakota skippers inhabit prairie habitat and could be present in areas where the route width or ROW intersect native prairie remnants. Vegetation clearing or ground disturbance in prairie habitat could adversely affect Dakota skippers should they be present.

The tricolored bat, monarch butterfly, Suckley's cuckoo bumble bee, and western regal fritillary are federally proposed endangered or threatened species, which means that the USFWS has determined they are in danger of extinction throughout all or a significant portion of their range and has proposed a draft rule to list them as endangered. Until the rule to list these species is finalized, they are not protected by the take prohibitions of the federal ESA.

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

The NHIS database does not track documented records of monarch butterflies. Potential impacts to monarch butterflies could occur as a result ground disturbing activities and/or removal of suitable reproductive (milkweed plants) or feeding (flowering plants) habitat; however, impacts are anticipated to be minimal given the predominance of agricultural land in the project area.

Suckley's cuckoo bumble bees are parasitic bees that invade the nests of other bumble bees and rely on them to rear their young. Suckley's cuckoo bumble bees are rare in Minnesota and the NHIS database does not track documented records of them. However, it is possible that Suckley's cuckoo bumble bees could use the suitable habitats in the project's route width or ROW. Potential impacts to this species could occur as a result ground disturbing activities and/or removal of vegetation should they be present.

The NHIS database does not track documented records of western regal fritillary. Suitable habitat for western regal fritillary is present in the wet meadows and marshes that intersect the project's route width and ROW. Potential impacts to western regal fritillary could occur as a result of ground disturbing activities and/or removal of vegetation that serves as habitat.

4.7.9.2.2 State Protected Species

The state threatened and endangered species identified in Table 4-14 and special concern species identified in Appendix N are known to occur in the project's geographic area where suitable habitat is present. The discussion below is focused on potential impacts to state threatened and endangered species; however, impacts to and mitigation measures for special concern species would generally be similar for many species occupying similar habitats.

The state threatened and endangered vascular plants identified in Table 4-14 might occupy habitats that are traversed by the project. If present, these species and/or their habitats could be impacted as a result of grading and/or clearing activities associated with project construction.

Potential impacts to state protected bird species identified in Table 4-14 would be similar to those described for other avian species in Section 4.7.9.2.2.

The Poweshiek skipperling butterfly is a federally and state protected species and is known to be rare in the state of Minnesota based on surveys conducted by the DNR (reference (203)). Given the rarity of the species and that the IPaC query did not identify it as potentially occurring in the vicinity of the project area suggests that the species is unlikely to be found in the project area. However, potential impacts to the Poweshiek skipperling butterfly could occur as a result of removal of suitable prairie habitat.

The ghost tiger beetle is a habitat specialist, residing primarily in sand dunes. This habitat type is not known to occur in the route width or ROW; as such, impacts to tiger beetles are not anticipated from the project.

Watercourses and waterbodies would be spanned to the extent practicable; as such, direct impacts to the state protected mussel or fish species identified in Table 4-14 are not anticipated from the project.

4.7.9.2.3 Sensitive Ecological Resources

Impacts to sensitive ecological resources could occur as a result of project construction; however, impacts can be minimized by avoiding and/or spanning these resources. The use of construction equipment during site preparation (grading, excavation, and soil stockpiling) could result in localized physical disturbance and soil compaction. The applicants would permanently convert forested and/or shrubland within the ROW to low-growing vegetation, which could result in reduced community sizes and habitat loss. Removal of vegetation and/or conversion to open habitats could increase the potential for the spread of invasive plant species/ noxious weeds and could alter the structure and function of sensitive ecological resources, potentially making them less suitable for the rare species that would typically inhabit them.

4.7.9.3 Mitigation

Through implementation of BMPs and mitigation measures, impacts to federally or state protected species and sensitive ecological resources are anticipated to be minimal. The primary means to mitigate potential impacts to federally and state protected species is to avoid routing through habitat used by these species. Additionally, impacts can be mitigated by incorporating species (or species type) specific BMPs in coordination with the USFWS and/or the DNR. The primary means to mitigate impacts to sensitive ecological resources is prudent routing— that is, by avoiding and/or spanning these communities if possible. In addition, following existing rights-of way and division lines such as roads, existing transmission lines, and field lines, would reduce the potential for fragmentation of these resources.

4.7.9.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.3.16, contains the following mitigation measures related to avian protection, "The Permittee in cooperation with the DNR shall identify areas of the transmission line where bird flight diverters will be incorporated into the transmission line design to prevent large avian collisions attributed to visibility issues. Standard transmission design shall incorporate adequate spacing of conductors and grounding devices in accordance with Avian Power Line Interaction Committee standards to eliminate the risk of electrocution to raptors with larger wingspans that may simultaneously come in contact with a conductor and grounding devices. The Permittee shall submit documentation of its avian protection coordination with the plan and profile pursuant to Section 9.1." Additionally, standard route permit conditions to minimize potential impacts to wildlife and vegetation, which would be applicable to minimizing impacts to federal and state protected species and sensitive ecological resources are summarized in Sections 4.7.7.3 and Section 4.7.8.3.

4.7.9.3.2 Other Proposed Mitigation

As summarized in the route permit application, the applicants have committed to the following measures to minimize the potential for impacts to federal and state protected species and sensitive ecological resources:

- The applicants would access or obtain available USFWS and DNR rare species databases prior to construction activities to determine locations where the routes and structures are near or adjacent to known locations of listed species.

- The applicants would avoid impacts to federal- and state-listed species to the maximum extent practicable. If this is not feasible, a qualified surveyor would conduct an assessment to identify potential locations where federal- and/or state-listed species may occur.
- The applicants would work with USFWS and DNR to develop avoidance plans and species-specific mitigation measures, if applicable.
- Where feasible, the applicants would avoid excess accumulation of mulch and wood chips greater than one inch in thickness throughout native vegetation areas and wetlands during route clearing, as recommended by the DNR.
- The applicants would avoid native prairie remnants to the extent practicable as recommended by DNR and supported by the Minnesota Prairie Conservation Plan. If any native prairie remnants are crossed by the project in the final design, the applicants would coordinate with the DNR to develop a native prairie protection plan.
- For sensitive areas that would be crossed, the applicants would conduct rare species surveys and commit to spanning wetlands, water features, and natural resources to the maximum extent practicable.

In their Natural Heritage Review responses (MCE 2024-00481 and 2024-00815; Appendix N) and scoping comment letter (scoping comment #96; reference (2)), the DNR recommended the following to minimize potential impacts to sensitive ecological resources:

- As much as possible, operate within already-disturbed areas.
- Avoid Minnesota Biological Survey Site of Biodiversity Significance ranked high or outstanding.
- To avoid incidental take of endangered or threatened prairie species, avoid all native prairie remnants. If any native prairie remnants are crossed, a prairie protection plan may be needed.
- Avoid Minnesota Biological Survey sites and native plant communities ranked S1, S2, or S3.
- Retain a buffer between proposed activities and the Minnesota Biological Survey site.
- Confine construction activities to the opposite side of the road from Minnesota Biological Survey sites. If this is not feasible, confine construction activities to the existing road rights-of-way.
- Minimize vehicular disturbance in the Minnesota Biological Survey site (allow only vehicles necessary for the proposed work).
- Do not park equipment or stockpile supplies in the Minnesota Biological Survey site.
- Do not place spoil within Minnesota Biological Survey site or other sensitive areas.
- If possible, conduct the work under frozen ground conditions.
- Use effective erosion prevention and sediment control measures.
- Inspect and clean all equipment prior to bringing it to the site to prevent the introduction and spread of invasive species.
- Revegetate disturbed soil with native species suitable to the local habitat as soon after construction as possible.

- Use only weed-free mulches, topsoils, and seed mixes. Of particular concern is birdsfoot trefoil (*Lotus corniculatus*) and crown vetch (*Coronilla varia*), two invasive species that are sold commercially and are problematic in prairies and disturbed open areas, such as roadsides.

- To minimize potential impacts to Artichoke Lake, a Lake of Biological Significance, the DNR recommends the following:

    - Avoid lakebed disturbance / span waterbodies.

    - Avoid the removal of shoreline vegetation.

    - Implement stringent/redundant erosion prevention and sediment control practices.

    - Prevent the spread of invasive species.

    - Use only herbicides approved for application within shoreline/riparian areas.

    - Minimize use of fertilizer.

In their Natural Heritage Review responses (MCE 2024-00481 and 2024-00815; Appendix N) and scoping comment letter (scoping comment #96; reference (2)), the DNR recommended the following to minimize potential impacts to state-protected species:

- To minimize impacts to loggerhead shrike, tree and shrub removal is required to be avoided during the breeding season, April through July.

- To protect the Dakota skipper and other prairie obligate butterfly species, it is imperative that the destruction and disturbance of native prairie be avoided.

- To minimize potential impacts to protected mussel species, effective erosion prevention and sediment control practices must be implemented and maintained near the Chippewa River throughout the duration of the project and incorporated into any stormwater management plan.

- To minimize potential impacts to big brown bats, the DNR recommends that tree removal be avoided from June 1 through August 15.

- To minimize potential impacts to trumpeter swans, the DNR recommends avoiding construction activities late April through early June near suitable nesting habitat.

- To minimize potential impacts to the American white pelican and other birds, the DNR recommends installing avian flight diverters on power cables near waterbodies to reduce bird collisions with power cables.

- To avoid potential impacts to short-eared owls, minimize disturbance as much as feasible to nesting habitat during nesting season, May through June.
- To minimize potential impacts to great plains toads, the DNR recommends that the use of erosion control mesh, if any, be limited to wildlife-friendly materials.
- To minimize potential impacts to Henslow's sparrows, initial disturbance in suitable nesting habitat should not occur during their breeding season, between May 15th and July 15th. If avoidance during breeding season is not feasible, areas that will be disturbed that contain suitable nesting habitat will need to be surveyed for active nests prior to any project disturbance.

4.7.10 Soils

The ROI for soils is the ROW. Existing soil types and associated qualities are reviewed to better understand the most likely impacts to occur as a result of construction activities. Common soil impacts include rutting, compaction, and erosion. Potential impacts would be short-term during construction, localized, and can be minimized. If long-term revegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts.

4.7.10.1 Existing Conditions

Overall, soils are essential natural resources that support various aspects of human life, the environment, and the economy. Understanding their properties, functions, and management is important to determine potential project environmental impacts. Soil is a mix of living and non-living material. Soil health is defined as, "the continued capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans," by the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) (reference (204)).

Soil information for the ROW was obtained from the USDA-NRCS SSURGO database (reference (205)). Soil mapped in the ROW generally includes the following soil texture classes: clay loam, sandy loam, silt loam, and silty clay loam (reference (205)). The drainage classes of these soils range from very poorly drained to well drained.

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

Soil compaction susceptibility within the ROW ranges from low to high. Soil compaction occurs when moist or wet soil particles are pressed together, reducing pore space between them and is primarily caused by heavy vehicular traffic or permanent structure placement such as with the new substations. Soils are rated based on their susceptibility to compaction from the operation of ground-based equipment for planting, harvesting, and site preparation activities when soils are moist. A “low” rating means the soil can support standard equipment with minimal compaction. A “medium” rating means that after the initial compaction (that is, the first equipment pass), the soil can support standard equipment with only minimal increases in soil density. A “high” rating means that the soil will continue to compact after each equipment pass.

Soil rutting potential within the ROW ranges from low to severe. Ratings in this hazard category indicate the potential of surface rut formation through the operation of heavy, wheeled equipment. Ratings are based on depth to the water table, rock fragments on or below the surface, the classification of the soil material based on the Unified Soil Classification System, depth to a restrictive layer, and slope. A rating of "slight" indicates that the soil is subject to little or no rutting, "moderate" indicates that rutting is likely, and "severe" indicates that ruts form readily.

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

Hydric soils are present throughout the ROW. A hydric soil is a soil that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil profile. Hydric soils are typically associated with lowlands and wetlands and are rated by their proportion of hydric soil in the map unit. Within the ROW, soils consist of not hydric (0 percent), marginally hydric (1-32 percent), partially hydric (33-66 percent), predominantly hydric (67-99 percent), and hydric (100 percent) soils.

4.7.10.2 Potential Impacts

Transmission line and substation projects have the potential to impact soils during construction and operation of the project. Construction might require some amount of grading to provide a level surface for safe operation of construction equipment. In addition, potential topsoil and subsoil mixing might result from the excavation, stockpiling, and redistribution of soils during installation of transmission line structures and substation components. Installing structures requires removing and handling soils, which, along with vegetation clearing and grading, will expose soils to wind and water erosion. Fine textured soils are especially susceptible. Localized soil erosion, compaction, and topsoil and subsoil mixing could affect revegetation within temporary work areas. During operations, soils could be temporarily disturbed for equipment access to the transmission line for maintenance. Apart from where transmission line structures are located, most impacts will be temporary.

Impacts on soils are dependent, to some extent, on the conditions of the soil surface at the time of construction. Construction activities that occur on wet soils tend to have longer lasting impacts, regardless of the soil type. Should high rainfall events occur during construction or prior to establishment of permanent vegetation, significant sedimentation may occur.

4.7.10.3 Mitigation

4.7.10.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.3.8, includes the following measures to mitigate impacts on soils:

"The Permittee shall implement those erosion prevention and sediment control practices recommended by the Minnesota Pollution Control Agency (MPCA) Construction Stormwater Program. If construction of the Transmission Facility disturbs more than one acre of land or is sited in an area designated by the MPCA as having potential for impacts to water resources, the Permittee shall obtain a National Pollutant Discharge Elimination System/State Disposal System Construction Stormwater Permit from the MPCA that provides for the development of a Stormwater Pollution Prevention Plan (SWPPP) that describes methods to control erosion and runoff.

The Permittee shall implement reasonable measures to minimize erosion and sedimentation during construction and shall employ perimeter sediment controls, protect exposed soil by promptly planting, seeding, using erosion control blankets and turf reinforcement mats, stabilizing slopes, protecting storm drain inlets, protecting soil stockpiles, and controlling vehicle tracking. Contours shall be graded as required so that all surfaces provide for proper drainage, blend with the natural terrain, and are left in a condition that will facilitate re-vegetation and prevent erosion. All areas disturbed during construction of the Transmission Facility shall be returned to pre-construction conditions."

4.7.10.3.2 Other Proposed Mitigation

During construction of the transmission line, the applicants would implement measures to reduce soil compaction and have committed to soil decompaction during restoration of temporary workspaces, including travel lanes. Impacts to soils along the transmission line would be mitigated through the proper use and installation of BMPs, such as minimizing the number of vehicles trips and segregation of topsoil and subsoil. Construction will be completed according to NPDES permit requirements and the applicants' prepared AIMP (Appendix K) and a VMP (Appendix J). The applicants will also develop a SWPPP that complies with MPCA rules and guidelines. That will identify BMPs that would be implemented during construction to minimize erosion.

Some site features, such as highly erodible soils, steep slopes, and sensitive receiving waters, will require special attention to avoid adverse environmental effects. The MPCA has identified increased BMPs that are required to be used in areas discharging to and within one mile of designated Special or Impaired Waters. The BMPs will be included in the Construction Stormwater General Permit as applicable.

4.7.11 Surface Water

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

Several federal and state laws regulate watercourses and waterbodies. The Clean Water Act (CWA) establishes the structure for regulating the discharge of materials into waters of the United States and for developing water quality standards for surface waters (U.S. Code [USC]: Chapter 33 § 1311 and 1344). The CWA could potentially regulate several types of activities and their impacts associated with the project.

Watercourses and waterbodies may be regulated under Section 10 of the Rivers and Harbors Act (USC Chapter 33 § 401) and Section 404 of the CWA (USC Chapter 33 § 328.3 and 1344). The Rivers and Harbors Act regulates activities such as excavating and dredging and altering the course of Section 10 designated waters (USC Chapter 33 § 403). Section 404 of the CWA prohibits discharge of dredged or fill materials without a permit. It provides legal protection to more waterbodies than the Rivers and Harbors Act, namely all jurisdictional waters of the United States, including navigable waters, interstate waters, and wetlands with a significant nexus to navigable waters (USC Chapter 33 § 320). The USACE holds both Section 10 and Section 404 permitting authority.

Activities regulated under either Section 10 or Section 404 must obtain a Section 401 water quality certification to confirm that the project would comply with state water quality standards. Section 401 of the CWA is administered by the EPA. The CWA, however, gives the EPA the authority to delegate 401 certification to the states. In Minnesota, the EPA has delegated Section 401 certification to the MPCA.

Section 303(d) of the CWA requires states to monitor and assess their waters to determine if they meet water quality standards and, thereby, support the beneficial uses they are intended to provide. Waters that do not meet their designated uses because of water quality standard violations are listed as impaired. In Minnesota, the MPCA has jurisdiction over determining 303(d) waters, which are described and listed as impaired.

Some watercourses and waterbodies within the ROI are designated as public waters and are listed in the Public Waters Inventory (PWI) by the state of Minnesota. The statutory definition of a public water is found in Minnesota Statutes § 103G.005, Subdivision 15a (Minnesota Statute §103G.005). These water resources are under the jurisdiction of the DNR, and a DNR license to cross public waters would be required when an activity would cross or change or diminish the course, current, or cross-section of public waters by any means, including filling, excavating, or placing materials in or on the beds of public waters. PWI watercourse crossings are unavoidable, and the applicants would be required to coordinate with the DNR to obtain licenses to cross.

Minnesota designates some water resources as outstanding resource value waters because of their exceptional qualities. Minnesota Statute § 7050.0180 prohibits, or stringently controls, new or expanded discharges from either point or nonpoint sources to outstanding resource value waters. There are no outstanding resource value waters in the ROI.

4.7.11.1 Existing Conditions

Minnesota has eight major watershed basins classified by the U.S. Geological Survey (USGS) (reference (206)). The project intersects the Upper Mississippi and Minnesota River Basins. Within the major watershed basins of Minnesota, there are 81 major surface water watersheds. A watershed is composed of areas of land and water features that drain surface water to a common location or network (reference (207)). Four major watersheds are in the project area as assigned by USGS with an 8-digit Hydrologic Unit Codes (HUC):

- Minnesota River - Headwaters (HUC 7020001)
- Chippewa River (HUC 7020005)
- Long Prairie River (HUC 7010108)
- Pomme de Terre River (HUC 7020002)

The DNR uses the Watershed Health Assessment Framework (WHAF) to rate the health of watersheds; WHAF uses a scale of 1 to 100 using the mean of five biological, geological, and water quality components to generate a score from low health (0) to high health (100) (reference (208)). The watersheds within the project area have average ecological health condition rankings between 49 and 60, with the Minnesota River – Headwaters having the lowest ranking and the Long Prairie River having the highest ranking.

At the state scale, watersheds further downstream tend to decrease in health score in the southern and western parts of the state. The DNR indicates that lower health scores trend closely with removal of permanent vegetation, landscape changes, increased impervious surface, or altered waterbodies. In contrast, the highest rankings are in north central Minnesota where there are lower levels of development and agriculture, and more prominent wetland and forested land cover (reference (208)).

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

Major PWI watercourses in the ROI include the Minnesota River, Pomme de Terre River, Stony Run, Little Chippewa River, and Chippewa River. Several jurisdictional watercourses, county ditches, and unnamed streams also cross the ROI. No designated trout streams are within the ROI. Major PWI water basins in the ROI include Artichoke Lake, Mud Lake, and Union Lake. There are also several unnamed PWI water basins within the ROI.

There are no Section 10 navigable waters regulated under the Rivers and Harbors Act in the ROI (reference (209)). There are also no Outstanding Resource Value Waters in the ROI. There are two state water trails in the ROI, including the Minnesota River in the Big Stone Subregion and a portion of the Pomme de Terre River in the Swift Subregion. The Minnesota River crosses several routes in the Big

Stone Subregion and is considered a designated wild and scenic river further downstream, but is not a designated river in the project's ROI.

In their natural state, floodplains provide temporary water storage during flooding events, which prevents damage by detaining debris, sediment, water, and ice. Floodplains are low-lying areas that are susceptible to periodic inundation due to heavy rains or snowmelt, and are usually adjacent to rivers, streams, and lakes. The Federal Emergency Management Administration (FEMA) delineates floodplains and determines flood risks in areas susceptible to flooding.

There are several FEMA designated 100-year (Zone A and AE) and 500-year (Zone X) floodplains that cross the ROI (Map 14). FEMA-designated 100-year floodplains are associated with specific watercourses and waterbodies along the routing alternatives. FEMA-designated 500-year floodplains are less prevalent and primarily located along wide, bottom-land terraces associated with large rivers along the routing alternatives. Most of the floodplains that cross the ROI are 100-year floodplains. The South Region, and the Big Stone Subregion in particular, has the most floodplains crossed by the anticipated alignments of routing alternatives. 500-year floodplains are not present in the ROI.

Watercourses that have 100-year floodplains that intersect the ROI include the Minnesota River, Stony Run Stream, Artichoke Creek, Pomme de Terre River, County Ditch 2, Chippewa River, and Little Chippewa River. Artichoke Lake, in the Swift Subregion, is the only major waterbody that has 100-year floodplain that intersects the ROI.

The ROI contains several larger waterbodies including, but not limited to: Artichoke Lake, South Drywood Lake, Solvie Slough, and Mud Lake (Map 14). The DNR Shallow Lakes Program designates certain shallow lakes as shallow wildlife lakes; this designation allows them to protect and enhance wildlife habitat on these larger lakes (reference (187)). Several shallow lakes are scattered across the project, none of which are designated shallow wildlife lakes. Shallow wildlife lakes are discussed under Wildlife and Wildlife Habitat in Section 4.7.8. One Lake of Biological Significance, Artichoke Lake, is in the ROI, however, no routing alternative crosses it. The DNR designates these lakes based on the unique presence of aquatic plants or animals (reference (202)). Lakes of Biological Significance are discussed under Rare and Unique Natural Resources in Section 4.7.9. No state designated trout lakes are located in the ROI.

Minnesota water quality standards protect lakes, rivers, streams, and wetlands by defining how much of a pollutant (bacteria, nutrients, turbidity, mercury, etc.) can be in the water before it is no longer drinkable, swimmable, fishable, or useable in other, designated ways. An impaired water fails to meet one or more water quality standards. Numerous impaired watercourses are located in the ROI, some of which are crossed by the anticipated alignments of routing alternatives. Two impaired lakes, Artichoke and South Drywood, are in the ROI, neither of which is crossed by a routing alternative. The major impaired streams that would be crossed by anticipated alignments include the Little Chippewa River, the Chippewa River, Judicial Ditch 9, Pomme de Terre River, Stony Run, and the Minnesota River. Most of the impairments (that is, stressors) are related to aquatic life, mercury in fish tissue, e. coli, sediment, and dissolved oxygen. Total Maximum Daily Load plans, or TMDLs, have been approved by the EPA for some of the watercourses for some of the impairments whereas the others will need TMDL plans to return the watercourse to acceptable quality standards. Some waters are impaired for stressors that could be exacerbated by construction activities.

4.7.11.2 Potential Impacts

The routing alternatives avoid and minimize impacts to watercourses and waterbodies, to the extent practicable. The project is designed to span waterbodies and watercourses such that no direct impacts to the bed and bank would occur. The crossing distance for all watercourses and waterbodies in the project area is less than 1,400 feet (the maximum transmission line span for the project), meaning that the project is expected to be able to span all watercourses and waterbodies. Thus, no structures would be placed within these features, and no direct impacts on watercourses and waterbodies are anticipated.

Although watercourses and waterbodies are anticipated to be spanned, indirect impacts associated with crossing these resources could occur. Removal of vegetation and soil cover could result in short-term water quality impacts due to increased turbidity. Construction impacts could also remove riparian or shoreline forest areas within the ROW that currently assist with water attenuation and decreasing erosion impacts. In addition to habitat changes, vegetation clearing could increase light penetration to watercourses and waterbodies, potentially resulting in localized increases in water temperatures and changes to aquatic communities, especially those that rely on cold water.

Indirect impacts such as erosion or sedimentation could occur to streams from construction with potentially increased impact intensity where the anticipated alignments parallel streams. In addition, tree clearing within the ROW would occur during construction and operation of the transmission line which would potentially impact shading and temperature of the watercourse. The fiber optic regeneration station would be sited to avoid impacts on waterbodies, rivers, and streams. No sanitation systems or septic tanks are associated with the new regeneration station.

Impacts to floodplains during construction would include soil disturbance and removal of vegetation. Vegetation clearing within a floodplain, especially tree removal, can greatly destabilize the area, make it more prone to ongoing erosion and sediment issues, and further contribute to water quality issues. The project might require that transmission line structures be placed within FEMA-designated floodplain. There are some situations where an anticipated alignment crosses floodplains that may be too wide to span; these situations may require that transmission line structures be placed within FEMA-designated floodplain. However, if a transmission line structure were to be placed in floodplains, they are not anticipated to alter the flood storage capacity due to their minimal footprint in comparison to the floodplain.

Regardless of the route that could be chosen for the route permit, the project would be designed to span waterbodies and floodplains where practicable and to minimize the number of structures in surface water resources where these resources cannot be spanned. Final structure placement will consider the ROW slope to avoid areas with steeper terrain and associated risks of erosion and landslides. The applicants state that geotechnical studies will also be conducted to indicate water table levels during drilling. The applicants will design foundations assuming that the water table is at the ground surface to prevent issues in areas with fluctuating water tables and near floodplains. The fiber optic regeneration station is expected to be able to avoid floodplains when it is sited; therefore, no impacts on floodplains are anticipated from construction and no mitigation measures are proposed.

Drift from herbicides used to control regrowth of woody vegetation within the ROW could result in contamination of surface waters. The potential for pesticide drift can be intensified through land clearing activities, such as tree clearing. Construction equipment use, repair, and maintenance involves fluids that may leak or spill with the potential to reach surface water. If equipment crosses a watercourse or inadvertently enters a waterbody, direct impacts such as bottom disturbance or petroleum-based products washing into the water would occur. If dewatering is necessary, water removed could contain sediments or pollutants that might be introduced into surface waters. The applicants do not anticipate the need for a dewatering permit for construction.

4.7.11.3 Mitigation

4.7.11.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.3.9, includes the following measures to mitigate impacts to surface water:

- Space and place structures at variable distances to span and avoid watercourse and floodplains.
- Contain soil excavated from riparian areas and not place it back into the riparian area.
- Access riparian areas using the shortest route possible to minimize travel and prevent unnecessary impacts.
- Not place staging or stringing set up areas within or adjacent to water resources, as practicable.
- Assemble structures on upland areas before they are brought to the site for installation.
- Restore water resource areas disturbed by construction activities to pre-construction conditions in accordance with the requirements of applicable state and federal permits or laws and landowner agreements.
- Meet the USACE, DNR, Minnesota BWSR, and local units of government water resource requirements.

4.7.11.3.2 Other Proposed Mitigation

Impacts to surface waters could be avoided by prudent routing, i.e., selecting the routes that cross the fewest watercourses or waterbodies. Mitigation measures outlined in this section are anticipated to prevent and minimize impacts to watercourses and waterbodies.

The applicants would work with the DNR to confirm that all proper licenses and approvals are obtained for public water crossings. Further, through the licensing process, the applicants would work with the DNR to determine appropriate mitigation measures for these crossings. The applicants would coordinate with applicable agencies regarding transmission line crossings of waterbodies, including public waters or Section 10 waters if applicable.

Projects must be designed so that stormwater discharged after construction does not violate state water quality standards. The applicants would obtain a NPDES Construction Stormwater permit from the MPCA for construction of the project which requires development of a SWPPP that identifies BMPs to be used during construction that minimize erosion and sedimentation. Per the stormwater permit, additional BMPs would be required for work within one mile of any impaired and specially protected waters which include calcareous fens and wild and scenic rivers (Minnesota Rules 7050.0335, Subpart 1). These BMPs would include immediately initiating stabilization of exposed soil areas and complete stabilization within seven calendar days after the construction activity in that portion of the site temporarily or permanently ceases.

Utilizing sediment barriers such as silt fence, straw bales, and bio-logs along waterways and slopes during construction would minimize soil erosion and sedimentation. A temporary seed mix would be installed where appropriate to support bank stabilization during restoration. If new access roads for vehicles and equipment are required, access roads would be selected to avoid disturbance to watercourse banks. Vegetation would be maintained along the transmission line through the operational life of the project according to the VMP (Appendix J).

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

In their Natural Heritage Review responses (MCE 2024-00481 and MCE 2024-00815; Appendix N) and scoping comment letter (scoping comment #96; reference (2)), the DNR recommended the following to minimize potential impacts to water resources:

- Vegetation clearing within a floodplain, especially tree removal, should be reduced or avoided to the extent practicable as it can greatly destabilize sediment by exacerbating erosion issues as well as the riverbank, further contributing to water quality issues.
- Utilize side-by-side pole structures for new river crossings rather than stacked line pole structures so there are fewer vertical planes that could cause potential bird impacts. Installing avian flight diverters in coordination with the DNR should also be included as a special permit condition to prevent avian collisions with transmission lines.
- Minimize the number of crossings over the same public water and analyze setbacks from river and stream banks as well as floodplains.
- Appropriate wildlife friendly erosion control measures, such as fabric, straw bales, mulch, and silt fences should be used to prevent sedimentation of adjacent wetlands, lakes, or watercourses.

- Impacts to existing vegetation and fragmentation of riparian habitat should be kept to a minimum. Disturbed soil areas should be reseeded with native species suitable to the local habitat.

In its Natural Heritage Review responses (MCE 2024-00481 and MCE 2024-00815; Appendix N) and scoping comment letter (scoping comment #96; reference (2)), the DNR also identified concerns for specific water resources, including the following:

- The applicants' original route segment S10, as noted in their route permit application, would create a new crossing over the Minnesota River, a State Water Trail; this route segment is incorporated into EIS routes BSSR02, BSSR04, BSSR06, BSSR08, and BSSR10. The DNR encourages avoidance of this route due to its potential to impact multiple rare resources and state recreation trails. DNR suggests using an existing crossing over the Minnesota River instead of creating a new crossing.

- Route segment S10 would cross the border of Odessa 19-1 Native Prairie Bank (NPB) at the Stony Run Creek crossing. DNR encourages avoidance of this route due to its potential to impact multiple rare resources and conservation land.

- Disturbance should be minimized during construction, operation, and maintenance activities to Artichoke Lake, a Lake of Moderate Biological Significance. These actions include spanning waterbodies, avoiding removal of shoreline vegetation, redundant erosion prevention and sediment control practices, preventing the spread of invasive species, and minimizing the use of fertilizer.

Potential impacts to surface waters where herbicides are used would be mitigated through implementation of the applicants' VMP (Appendix J). The applicants committed to the following in the VMP:

- All herbicide use will be in accordance with manufacturer's specifications and all applicable federal and state regulations.

- Herbicides designated for upland use will not be used within 75 feet of the vegetative buffer of waterbodies.

- Herbicides used in or near wetlands and waterbodies must be designed for use in wet areas as designated by manufacture's specifications and federal and state regulations.

- The contractor applying herbicide will be required to obtain any necessary permits and/or certifications prior to herbicide placement and will be required to keep proper documentation of location and timing of herbicide use. Treatment shall conform to manufacturers' specifications.

4.7.12 Wetlands and Calcareous Fens

The ROI for wetlands is the route width, except for forested wetlands where it is the ROW due to permanent conversion within that area. Impacts to wetlands are evaluated by examining wetland types, sizes, and potential for spanning. Wetlands will be spanned to the greatest extent possible for all routing options. Permanent impacts to wetlands would occur if a transmission line structure were placed in a wetland, or if a woody wetland would be permanently converted in type and function due to ROW clearing. Impacts can be mitigated or minimized.

Wetlands are areas with hydric (wetland) soils, hydrophytic (water-loving) vegetation, and wetland hydrology (inundated or saturated much of the year). Wetlands detain floodwaters, recharge groundwater supplies, remove pollution, and provide fish and wildlife habitat. Wetland types vary widely due to differences in soils, topography, climate, hydrology, water chemistry, vegetation, and other factors (reference (210)).

4.7.12.1 Regulation of Wetlands

Similar to watercourses and waterbodies, some wetlands are protected as USACE-regulated (or jurisdictional) waters of the United States under Section 404 of in the CWA. Under Section 404 of the CWA, a permit from the USACE is required for the discharge of dredged or fill materials into jurisdictional wetlands. As part of the USACE permitting process, wetlands within the project ROW would be identified and delineated by the applicants. For unavoidable impacts, compensatory mitigation is required to replace the loss of wetland, stream, or other aquatic resource functions.

Minnesota also has state-level regulations focused on protecting wetlands. The WCA (Minnesota Rules 8420) is administered by the BWSR under Minnesota Rules 8420.0100, subpart 3 and was established to maintain and protect Minnesota's wetlands and the benefits they provide. The WCA's goal of no-net loss of wetlands requires that proposals to drain, fill, or excavate a wetland must (1) avoid disturbing the wetland if feasible, (2) minimize wetland impacts, and (3) replace lost wetland acres, functions, and values. Certain activities are exempt from the WCA, allowing projects with minimal impact or projects located on land where certain pre-established land uses are present to proceed without regulation.

A second state-level program that offers protection to the state's waters and wetlands is the PWI program administered by the DNR (Minnesota Statute § 103G.005). The DNR regulates work below the ordinary high-water level of PWI wetlands and waters through the public waters work permit program. Examples of work activities addressed by this program include filling, excavation, bridges and culverts, dredging, structures, and other construction activities. In addition, the DNR regulates calcareous fens under Minnesota Rules 8420.0935.

4.7.12.1.1 Existing Conditions

The USFWS NWI, as updated by the DNR, identifies numerous wetland complexes and small isolated wetlands throughout the ROI (Map 14). Wetlands are most prevalent in the Big Stone, Swift, and Alexandria Subregions. Many of the wetlands are associated with riverine and floodplain ecosystems in the southwestern portion of the project area, and localized depressions and lake ecosystems in the northeastern portion of the project area.

One calcareous fen occurs in the ROI (Stony Run) in the Big Stone Subregion. Two candidate calcareous fens (Ortonville 25 sites) are near the ROI but not within it, both of which are roughly 1.0 mile south of the South 2 alignment (reference (211)). Calcareous fens are rare and distinctive peat-accumulating wetlands that receive hydrology from groundwater that is rich in calcium and other minerals. Calcareous fens are legally protected via Minnesota Statutes, Section 103G.223, which states that calcareous fens may not be filled, drained, or otherwise degraded, wholly or partially, by any activity, except as provided for in a management plan approved by the commissioner of the DNR.

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

4.7.12.2 Potential Impacts

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

Wetlands can also be impacted by soil erosion and sediment deposition during construction. Sedimentation and ground disturbance in wetlands can make them more susceptible to establishment of invasive plant species, such as reed canary grass, which would adversely impact wetland function by reducing vegetative biodiversity and altering wildlife habitat. Impacts to wetlands can also occur if disturbed soils are eroded by rain or snowmelt and transported into a wetland. The indirect filling of wetlands by up slope construction erosion and run-off could result in temporary or permanent impacts to the receiving wetland, depending on the timing of clean-up and restoration of the affected area.

Wetland conversion is distinct from permanent wetland fill. Whereas permanent wetland fill eliminates the wetland, conversion is a process where the wetland changes from one wetland type to another. The wetland itself is not eliminated, however, it is still considered a permanent impact because it changes functionality of the wetland. Forested wetland types within the transmission line ROW would undergo a permanent change of vegetation type as a result of the project. Transmission lines cannot be safely or reliably operated with trees growing within their ROW. Therefore, existing trees must be removed throughout the ROW, which would generally include forested wetlands and exclude other wetland types. The applicants may be required to provide wetland mitigation for the conversion of forested wetlands to non-forested wetlands that occurs as a result of the project.

In its Natural Heritage Review responses (MCE 2024-00481 and MCE 2024-00815; Appendix N) and scoping comment letter (scoping comment #96; reference (2)), the DNR noted that many of the unique characteristics of calcareous fens result from the upwelling of groundwater through calcareous substrates. Because of this dependence on groundwater hydrology, calcareous fens can be affected by nearby activities or even those several miles away. Activities that affect surface water flows (e.g., stormwater flow, erosion) or activities that affect groundwater hydrology (e.g., groundwater pumping or dewatering, contamination, discharge, or excavation) can impact calcareous fens.

Project activities that can impact calcareous fens include the installation of structure foundations and construction or maintenance vehicles crossing through the ROW along stream beds or bank areas. Structure foundation installation would require dewatering, which would temporarily draw down existing groundwater levels, and water discharge, which could cause erosion or sedimentation. Vehicles crossing through the ROW may release sediment in a wetland. Dewatering that draws down the calcium-rich groundwater upwelling in a calcareous fen can result in a breakdown of peat, releasing nutrients and altering the plant community. Erosion or sedimentation caused by water discharge or vehicles can also release nutrients which alter the plant community. Disturbances such as these can result in invasions of shrubs, upland plants, and other invasive species, which can outcompete the unique fen species and lead to the loss of the calcareous fen community. Once they are disturbed, calcareous fens can be difficult to restore.

4.7.12.3 Mitigation

4.7.12.3.1 Commission Draft Route Permit

In the draft route permit, condition 5.3.9, includes the following measures to mitigate impacts to wetlands:

- Develop wetland impact avoidance measures and implement them during construction of the project.
- Space and place the structures at variable distances to span and avoid wetlands.
- Limit unavoidable wetland impacts as a result of the placement of structures to the immediate area around the structures.
- Construct in wetland areas during frozen ground conditions where practicable and according to permit requirements by the applicable permitting authority.
- Use wooden or composite mats to protect wetland vegetation when construction during winter is not possible.
- Contain soil excavated from the wetlands and not place it back into the wetland.
- Access wetlands using the shortest route possible to minimize travel through wetland areas and prevent unnecessary impacts.

- Prohibit staging or stringing set up areas within or adjacent to wetlands, as practicable.
- Assemble structures on upland areas before they are brought to the site for installation.
- Restore wetland areas disturbed by construction activities to pre-construction conditions in accordance with the requirements of applicable state and federal permits or laws and landowner agreements.
- Meet the USACE, DNR, Minnesota BWSR, and local units of government wetland requirements. The applicants would obtain all appropriate permits and approvals from the watershed districts (if necessary) for any actions determined to occur in wetlands.

4.7.12.3.2 Other Proposed Mitigation

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

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

In its Natural Heritage Review responses (MCE 2024-00481 and MCE 2024-00815; Appendix N) and scoping comment letter (scoping comment #96; reference (2)), the DNR noted that for compliance with WCA, the applicants would be required to contact the Calcareous Fen Program Coordinator for further coordination. If, through further coordination, the DNR determines if any impacts to the Stony Run calcareous fen would occur during any phase of the project, the applicants could be required to develop a Calcareous Fen Management Plan in coordination with the DNR, as specified in Minnesota Statute § 103G.223.

4.8 Costs that are Dependent on Design and Route

As outlined in the route permit application and discussed in Section 3.5, the estimated project construction cost at the time of the application was approximately $465 million to $535 million, with cost varying by route alternative selected for the project. Construction cost estimates rely on the best available information at the filing time of the route permit application. Estimates include permitting, engineering, materials (for example: steel, conductor, and insulators), land rights, ROW acquisition, and construction costs. The cost estimate assumes the applicants would pay prevailing wages for applicable positions during project construction.

The construction cost estimate of $465 million to $535 million was developed specifically for the applicants' proposed routes. Construction costs for each alternative are discussed in Chapters 5 through 7 for each subregion. The estimated costs differ between each alternative due to the following variables which are considered when estimating costs.

Terrain – topographic changes along a route can impact transmission structure spacing and height which can impact transmission costs. Structure spacing might be closer in locations where there is varied relief in terrain and could result in taller structures. Increasing the number of structures and structure heights increase costs due to the number and size of foundations, the amount of steel in a structure (bigger structures require more steel), and the tooling needed to construct the transmission line (for example, heavier towers could require larger equipment such as cranes used to set towers) that could potentially require larger work areas (matting and restoration).

Alignment – the alignment of a transmission line can have an impact on construction costs. Linear alignments are more economical to construct. Introduction of angles and corner structures have additional costs. Typically angle structures require more steel and larger foundations than tangent structures.

Soil Conditions – the type of soil can impact the size of a foundation or potential for specialty foundations needed to support the transmission structures. Poor soils might require larger or deeper foundations which results in additional reinforcing steel (rebar) and concrete volume or might require a pile cap foundation. Rock near the surface also can lead to changes in the foundation type. If the rock is competent, the foundation material could be lessened as the foundation would be attached to the rock. If the rock is fractured, additional labor and equipment might be required for excavation.

Micro-routing to Avoid Specific Features – site specific routing modifications to avoid specific human or environmental features can also have an impact to transmission costs. For example, modifications to alignments where the transmission line crosses roadways or deflects around a sensitive environmental area adds to the costs due to additional structures and foundations. Span lengths could be shortened and require additional structures to meet the requirements.

Existing Transmission Crossings – crossing of existing transmission lines can impact the number of transmission structures and height required for a crossing. Each line crossing needs to be reviewed for safe operations of the existing and new transmission line. Typically, high voltage transmission lines cross over lower voltages, and crossing geometry would need to be coordinated between utility companies. The crossing could require structures to be taller to cross over or shorter to cross under. In addition, a vertical or horizontal configured crossing might also impact the cost of the crossing because it could require additional structures, foundations and increased construction costs.

Pipeline and Railroads – construction of high voltage transmission lines near pipelines or railroads might require AC induction mitigation, increasing costs. The cost of mitigation would be dependent on the amount of AC induction and acceptable mitigation measures by the pipeline company or railroad. Detailed mitigation studies would be completed where transmission lines are within a quarter mile of railroads or pipelines.

Distribution Line Relocation – If a transmission line is routed in the same location as an existing electric distribution line, the distribution line might need to be relocated so it does not interfere with the operation and maintenance of the new transmission line. The transmission line developer would work with the distribution line owner and assume the cost to move or bury the distribution line.

Material Pricing – market fluctuations in material pricing can have a substantial impact to the cost of transmission projects. Increases in metal costs has a direct impact on the cost of steel structures and conductors. Additionally, where the material is procured (domestic or foreign) can also be impacted by the tariffs imposed.

Right-of-Way – Changes in land values between project proposal and easement acquisition and the number of voluntary easements would affect project costs.

Specialized construction practices and mitigation – areas which require specialized construction or avoidance/minimization measures can also increase costs to the extent they require additional equipment, etc. (for example, matting).

Length – The overall length of a transmission line can impact the overall cost. However, a longer, straight transmission line using single, tangent structures can be less expensive than a shorter line that includes double angle structures, poor soils, and other cost escalating features described above.

4.9 Electric System Reliability

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

These contingencies include requirements such as analyzing the consequences of a storm outage on a transmission line or loss of all transmission lines along a common ROW and an entire voltage level at a substation. The effects of these transmission contingencies on the system, and the transmission system's ability to serve load, must be monitored and managed by utilities. Route permits issued by the Commission require permittees to comply with NERC standards.

In addition, transmission lines crossing other transmission lines can increase risk with system reliability and safety concerns. Most significantly, there is a greater risk that an outage of one transmission line can result in an outage of another nearby (i.e. crossed) transmission line at the same time, reducing system resiliency and potentially structural damage to both transmission lines that could complicate and increase restoration times. When a new transmission line crosses over an existing line it may create safety risks during maintenance activities that could require one line to remain energized while work is occurring on the second line. Taking multiple transmission lines out of service can stress the remaining system components and lead to overloads and voltage issues, and potentially stability concerns should there be a loss of another system element at the same time. The intensity of the potential reliability issues would increase where the project would cross other transmission lines, especially similarly sized lines, i.e. those operating at a similar transmission voltage.

In developing possible routes, the applicants designed and routed the project in accordance with Minnesota Statute § 216E.12, subdivision 1, by minimizing adverse human and environmental impacts and ensuring continuing electric power system reliability and integrity. There can be reliability concerns with additional transmission line crossings, therefore, the number of new crossings with existing lines should be limited to the extent practical.

The applicants would design the project to meet or exceed local, state, and NESC standards regarding ground clearance, crossing utilities clearance, building clearance, strength of materials, and right-of-way widths. Construction crews and/or contract crews will comply with local, state, and NESC standards regarding facility installation and standard construction practices.

The total number of crossings between the routing alternatives and existing transmission lines that are 100 kV or larger are summarized in Table 4-15. The total number of crossings between route segments or alignment alternatives and existing transmission lines that are 100 kV or larger are summarized in Table 4-16. The locations of the crossings are shown in Appendix F.

Table 4-15 Route Count of Crossings with Existing Transmission Lines Greater than 100 kV

Route	Transmission Line Crossing Count (over 100kV)
BSSR01	2
BSSR02	2
BSSR03	2
BSSR04	2
BSSR05	2
BSSR06	2
BSSR07	2
BSSR08	2
BSSR09	2
BSSR10	2
BSSR11	2
BSSR12	2
SSR01	1
SSR02	5
SSR03	1
SSR04	1
HSR01	2
HSR02	6
HSR03	4
CSR01	1
CSR02	1
ASR01	2
ASR02	4

Table 4-16 Route Segment or Alternative Alignment Count of Crossings with Existing Transmission Lines Greater than 100 kV

Route Segment or Alignment Alternative	Transmission Line Crossing Count (over 100kV)
S210	2
S205	1
S202	2
S201	1
C208	2
N11	1

The project was studied, reviewed, and approved as part of the LRTP Tranche 1 Portfolio by the MISO Board of Directors as part of the 2021 Transmission Expansion Plan (reference (212)). The purpose of the Tranche 1 Portfolio is partially to facilitate reliability. The project is needed to address a number of reliability concerns due to the existing 230 kV system that transports energy from North Dakota and South Dakota into Minnesota being at its capacity. The project will provide additional capacity and in turn improve electric system reliability throughout the region.

5 South Region – Potential Impacts and Mitigation

This chapter describes potential impacts in the South Region (Map 3). The South Region includes the Big Stone and Swift subregions. There are 29 routing alternatives (16 routes, 9 route segments, and 4 alignment alternatives) in the South Region as shown on Map 3.

5.1 Environmental Setting

The South Region, which includes the Big Stone and Swift Subregions, is bound by the South Dakota and Minnesota state boundary along its western extent (Map 2). The South Region primarily intersects Big Stone and Swift counties, along with the southwestern corner of Stevens County. The city of Ortonville is in the western extent of the South Region and is the largest community that intersects the South Region; the cities of Odessa and Holloway and several townships also intersect the South Region. Existing transmission lines and the Appleton – State Line Burlington Northern Santa Fe railroad traverse the Big Stone Subregion in the western extent of the South Region. Major highways that traverse the South Region include U.S. Highway 75, U.S. Highway 12, and State Highway 7; county and local roads are also present. The South Region is dominated by agricultural land (Map 11-1 through Map 11-3). Major waterways crossed by the routing alternatives within the South Region include the Minnesota River and the Pomme de Terre River (Map 14-1 through Map 14-5).

The DNR and the USFWS have developed an Ecological Classification System (ECS) for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. Under this classification system, the South Region is in the Minnesota River Prairie Subsection of the North Central Glaciated Plains Section in the Prairie Parkland Province (Map 16; reference (180)).

The Minnesota River Prairie Subsection is characterized by large till plains that are bisected by the broad valley of the Minnesota River. Topography is steepest along the Minnesota River and the Big Stone Moraine, which has steep kames and broad slopes, while topography outside of the river valley consists of level to gently rolling ground moraine. Glacial drift generally ranges between 100 and 400 feet throughout this subsection. Soils are mostly well to moderately well-drained loams formed in gray calcareous till with some localized inclusions of clay, sand, and gravel soils. Wetlands were common within this subsection prior to pre-European contact, and most have been drained to establish usable cropland (reference (180)).

5.2 Big Stone Subregion Routes

The Big Stone Subregion includes 12 routes, three route segments, and one alignment alternative. The 12 routes are shown on Figure 5-1 and summarized in Table 5-1. The three route segments and one alignment alternative are discussed in Section 5.2.9.

Figure 5-1 Big Stone Subregion Routes

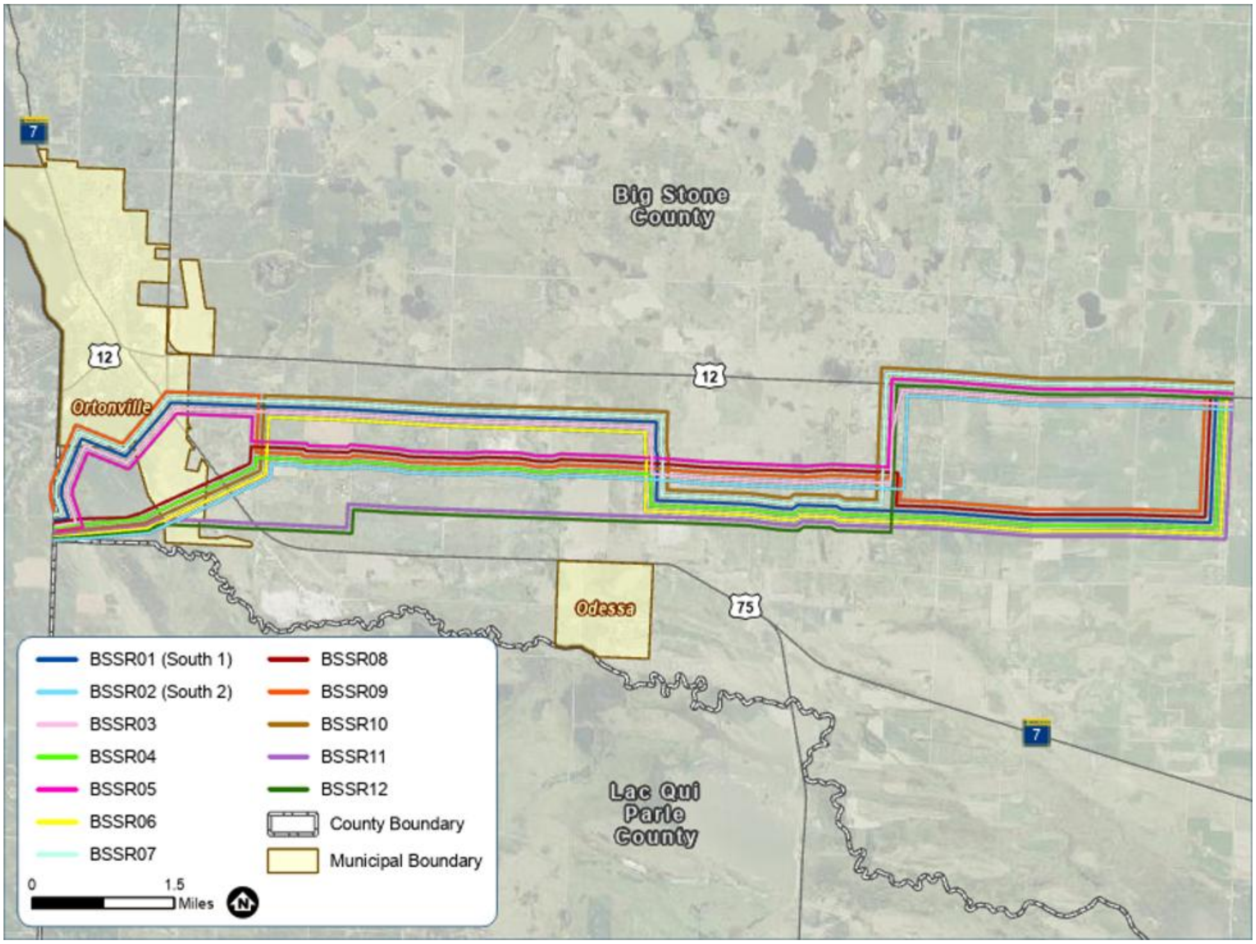


Table 5-1 Routes in the Big Stone Subregion

Routing Alternative	Type	Description
BSSR01	Route	Follows the applicants' proposed South 1.
BSSR02	Route	Follows the applicants' proposed South 2.
BSSR03	Route	Follows the applicants' proposed South 1, then crosses to the applicants' proposed South 2 at their intersection point.
BSSR04	Route	Follows the applicants' proposed South 2, then crosses to the applicants' proposed South 1 at their intersection point.
BSSR05	Route	Follows the applicants' proposed South 1, then crosses to the applicants' proposed South 2 using route connector S16.
BSSR06	Route	Follows the applicants' proposed South 2, then crosses to the applicants' proposed South 1 using route connector S16.
BSSR07	Route	Follows the applicants' proposed South 1, then crosses to the applicants' proposed South 2 using route connector S17.
BSSR08	Route	Follows the applicants' proposed South 2, then crosses to the applicants' proposed South 1 using route connector S17.
BSSR09	Route	Follows the applicants' proposed South 1, then crosses to the applicants' proposed South 2 using route connector S16, then crosses back to the applicants' proposed South 1 using route connector S17.
BSSR10	Route	Follows the applicants' proposed South 2, then crosses to the applicants' proposed South 1 using route connector S16, then crosses back to the applicants' proposed South 2 using route connector S17.
BSSR11	Route	Follows the applicants' proposed South 2, then crosses to the applicants' proposed South 1 using route connector S104.
BSSR12	Route	Follows the applicants' proposed South 2, then crosses to the applicants' proposed South 1 using route connector S104, then crosses back to the applicants' proposed South 2 using route connector S17.

5.2.1 Use or Paralleling of Existing Rights-of-Way

The use and paralleling of existing ROW is considered by the Commission when determining the most appropriate route for the project. Opportunities for ROW sharing for the project include public roads, existing transmission lines and railroads.

Paralleling and/or sharing other types of existing ROW would have an incremental impact relative to existing horizontal elements, such as existing transmission lines, highways and county roads, and/or railroads (collectively referred to as "existing infrastructure"). In some cases, portions of a route could parallel ROW with more than one of these existing features at the same time (e.g., be sharing or paralleling both transmission line and road ROW). Map 7 illustrates where ROW paralleling occurs and shows existing infrastructure. As shown in Figure 5-2 and Table 5-2, BSSR01 through BSSR12 are all between 13.7 miles (BSSR02) and 16 miles long (BSSR07 and BSSR09). BSSR02, BSSR03, BSSR05, and BSSR09 all follow existing ROW for fifty or more percent of their lengths, with BSSR05 following existing ROW for the largest percentage of its length (68.5 percent). BSSR11 follows existing ROW for the smallest percentage of its length (12.3 percent).

Figure 5-2 Big Stone Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

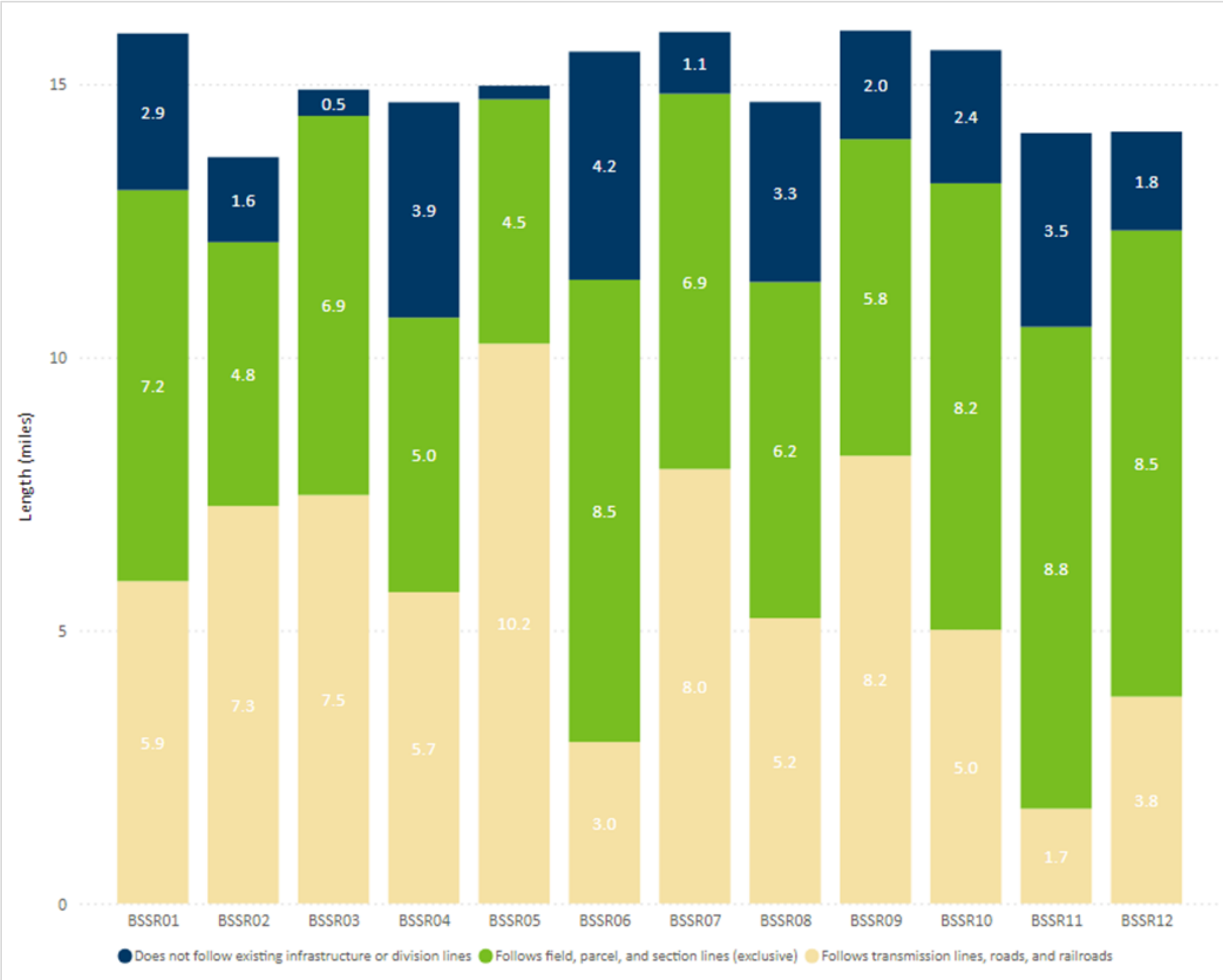


Table 5-2 Big Stone Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

		Follows existing transmission lines		Follows existing roads		Follows existing infrastructure (transmission lines, roads, and railroads)		Follows field, parcel, and section lines	
Document Name	Total Length (mi)	Length (mi)	%	Length (mi)	%	Length (mi)	%	Length (mi)	%
BSSR01	15.9	2.5	16.0	3.4	21.0	5.9	37.1	11.7	73.3
BSSR02	13.7	0.0	0.0	7.3	53.3	7.3	53.3	12.1	88.6
BSSR03	14.9	2.5	17.1	4.9	33.1	7.5	50.2	13.0	87.5
BSSR04	14.7	0.0	0.0	5.7	38.9	5.7	38.9	10.7	73.1
BSSR05	15.0	2.1	13.9	8.2	54.6	10.2	68.5	13.3	89.1
BSSR06	15.6	0.5	3.2	2.5	15.8	3.0	19.0	11.4	73.2
BSSR07	16.0	2.5	16.0	5.4	33.9	8.0	49.9	13.4	84.3
BSSR08	14.7	0.0	0.0	5.2	35.6	5.2	35.6	11.4	77.5
BSSR09	16.0	2.1	13.0	6.1	38.3	8.2	51.3	12.6	78.9
BSSR10	15.6	0.5	3.2	4.5	28.9	5.0	32.1	13.2	84.4
BSSR11	14.1	0.0	0.0	1.7	12.3	1.7	12.3	10.6	74.9
BSSR12	14.1	0.0	0.0	3.8	26.8	3.8	26.8	12.3	87.2

5.2.2 Human Settlement

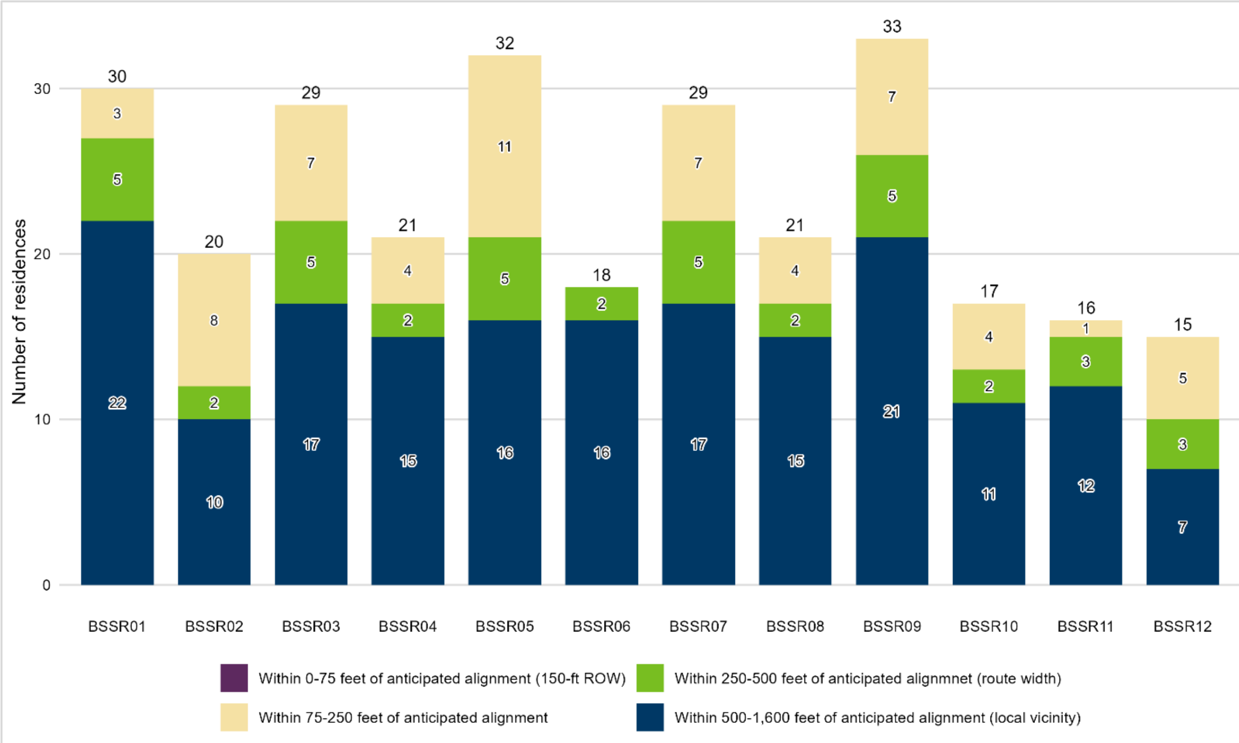
5.2.2.1 Aesthetics

The ROI for aesthetics is the local vicinity. Transmission lines alter a viewshed (Section 4.3.1). Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes. Determining the relative scenic value or visual importance in any given area is subjective and depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question.

Aesthetic impacts can be minimized by selecting routes farther from homes, schools, businesses, and other places where people congregate such as recreational areas. Aesthetic impacts can also be minimized by following existing transmission line ROW where elements of the built environment already define the viewshed and the addition of a transmission line would have an incremental impact. Following other infrastructure, such as roads and railroads, would also be expected to reduce potential impacts but not to the same extent. Additional details regarding potential impacts to aesthetics and potential mitigation measures for the project as a whole are provided in Section 4.3.1.

Appendix F shows human settlement features such as residences and nursing homes in the local vicinity of the routes in the Big Stone Subregion. The proximity of residential structures (homes) and non-residential structures to routes at various distances is shown in Figure 5-3 and Table 5-3 , respectively. BSSR12 and BSSR11 have the fewest residences (15 and 16, respectively) in the ROI, however, a comparable number of residences are present in many routes as shown in Figure 5-3. Routes BSSR12 and BSSR10 have the fewest non-residential structures (56 and 70, respectively) within the local vicinity. BSSR09 has the most residences (33) and non-residential structures (191) within the local vicinity.

Figure 5-3 Big Stone Subregion, Proximity of Residential Structures



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

Table 5-3 Big Stone Subregion, Proximity of Non-Residential Structures

Non-Residential Structures	Route											
Distances from Anticipated Alignment	**BSSR01**	**BSSR02**	**BSSR03**	**BSSR04**	**BSSR05**	**BSSR06**	**BSSR07**	**BSSR08**	**BSSR09**	**BSSR10**	**BSSR11**	**BSSR12**
0-75 feet (150-foot-ROW)	1	0	1	0	0	1	1	0	0	1	0	0
75-250 feet	3	8	3	8	9	2	4	7	8	3	5	6
250-500 feet (generally route width)	27	64	42	49	83	8	43	48	67	24	10	26
500-1,600 feet (local vicinity)	131	26	80	77	65	93	80	77	116	42	75	24
Total	162	98	126	134	157	104	128	132	191	70	90	56

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

Recreational resources where people might congregate identified within the ROI include the Minnesota River State Trail, the Minnesota River State Water Trail, the Historic Highway 75 King of Trails Scenic Byway, the Minnesota River Valley Scenic Byway, and the Big Stone Lake Sno-Rider snowmobile trails (Map 10-1 and Map 10-2; Section 5.2.2.8). Recreational resources are defined and discussed for the project as a whole in Section 4.3.9. The Historic Highway 75 King of Trails Scenic Byway follows Highway U.S. 75 until the highway heads south and becomes the Minnesota River Valley Scenic Byway.

All 12 routes in the Big Stone Subregion, BSSR01 through BSSR12, cross the Minnesota River State Trail, the Minnesota River State Water Trail, the Historic Highway 75 King of Trails Scenic Byway, the Minnesota River Valley Scenic Byway, and the Big Stone Lake Sno-Rider snowmobile trails. Scenic byways are crossed six times by all of the routes in the Big Stone Subregion (Map 10-1 and Map 10-2). BSSR11 and BSSR12 both cross snowmobile trails three times. All other routes cross snowmobile trails, the state water trail, and the state trail once each.

Aesthetic impacts in the ROI of Minnesota River State Trail and the Minnesota River State Water Trail are relatively similar as they are both crossed once by all routes near the city boundaries of Ortonville (Map 10-1). The Big Stone Lake Sno-Rider snowmobile trails is in the ROI of routes BSSR11 and BSSR12 for approximately 1,500 feet; the remaining trails have less overlap. The aesthetic impact to recreational features is further pronounced for routes BSSR11 and BSSR12 as they contain the most length of the Historic Highway 75 King of Trails Scenic Byway and the Minnesota River Valley Scenic Byway in the ROI, approximately 10,000 and 20,000 more feet than the other routes, respectively.

Where all routes cross the Minnesota River near the origin of the route at the South Dakota/Minnesota border, existing forested vegetation would require clearing (Map F-1). Minimal vegetation clearing would be required for all routes where they cross the Minnesota River State Trail, however, routes associated with South 1 (BSSR01, BSSR03, BSSR05, BSSR07 and BSSR09) would parallel an existing transmission line, reducing vegetation clearing and aesthetic impacts (Map F-1). MnDOT also stated during the scoping comment period that they prefer routes associated with South 1 because of the existing utility crossing which would reduce impacts to crossing the Highway 75 King of Trails Scenic Byway (comment #71 reference (2)). Aesthetic impacts to recreational resources associated with Minnesota River would be moderate for routes associated with South 2 (BSSR02, BSSR04, BSSR06, BSSR08, BSSR10, BSSR11 and BSSR12).

Aesthetic impacts will be greater in areas where no existing linear infrastructure, such as other transmission lines or railroads, are present. BBSR01, BBSR04, BBSR06, BBSR08, BBSR09, and BBSR11 parallel an existing transmission line along 620th Avenue, reducing aesthetic impacts in this area (Map F-7 and Map F-9). All routes are crossed twice by existing transmission lines in the Big Stone Subregion: once by Otter Tail Power Company's 115 kV line that runs parallel to U.S. Highway 75, and once by the transmission line parallels 620th Avenue. A railroad also parallels U.S. Highway 75 and is crossed by all routes, with no other railroad crossings in the Big Stone Subregion. Section 5.2.1 has further discussion on the use or paralleling of existing right of way for each route in the Big Stone Subregion.

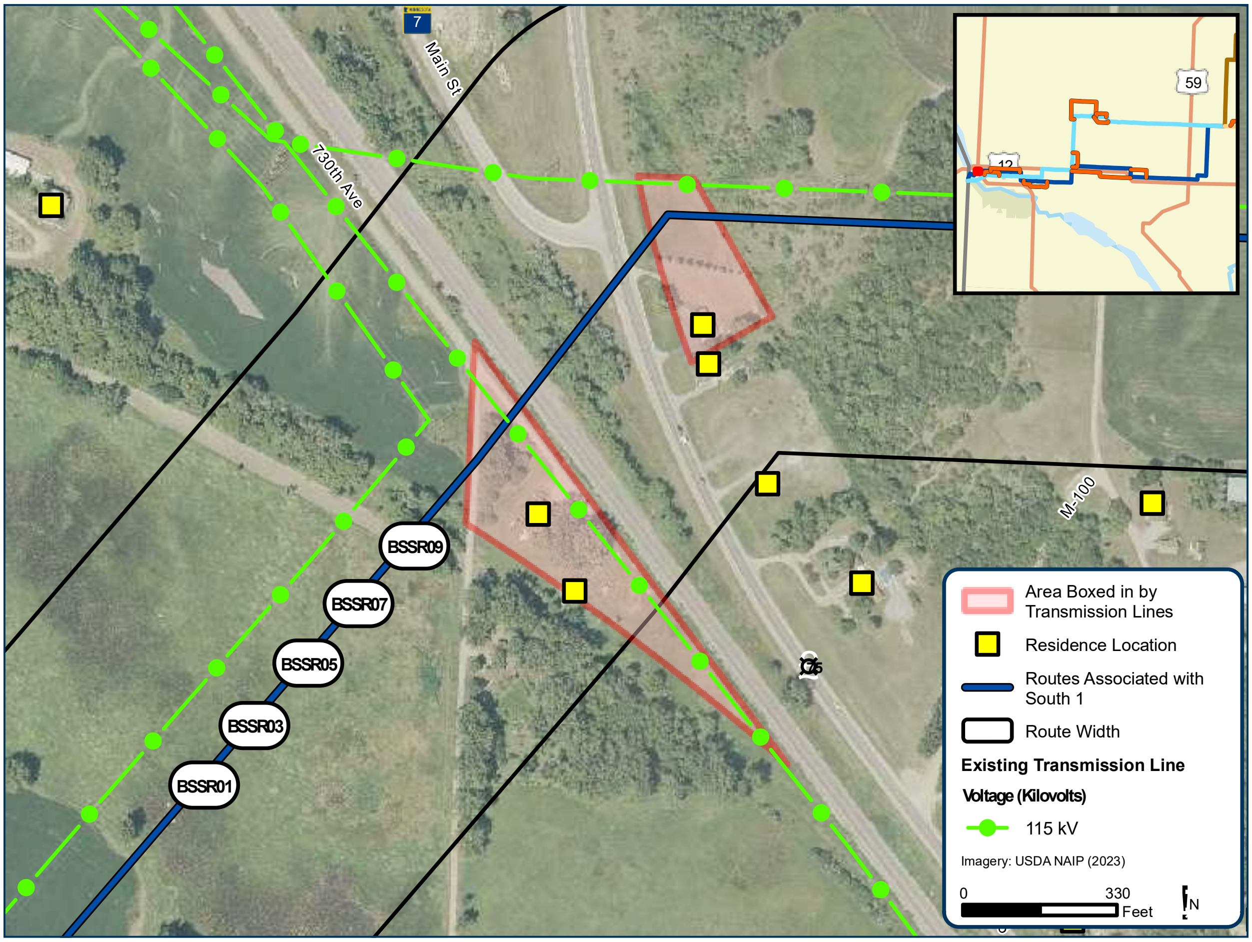
Each route would parallel with existing infrastructure or division lines as shown in Map 11-1 through Map 11-5. These maps illustrate existing infrastructure and division lines in the region, including roads, railroads, transmission lines, and parcel lines. In some cases, portions of a route could parallel ROW with more than one of these existing features at the same time.

Table 5-2 quantifies the length and percentage of each type of paralleling for each route in the Big Stone Subregion. Figure 5-2 demonstrates the same information in a chart based on length.

All routes are relatively similar in the percentage of parallelling with all types of existing infrastructure, and all routes have similar total lengths. BSSR05 and BSSR03 parallel the most with approximately 98 and 97 percent (14 miles) of their lengths, respectively. BSSR04 and BSSR06 parallel the least existing infrastructure with approximately 73 percent (11 miles) of their lengths each. Aesthetics are minimized by paralleling with existing transmission line ROW rather than all types of existing ROW, which includes roads and parcel lines. Where transmission line structures already define the viewshed, more transmission line structures would have an incremental impact. BSSR01 follows the most existing transmission lines at approximately 25 percent of its length (4 miles) whereas BSSR10 follows the least at approximately 3 percent (0.5 miles). Aesthetic impacts are more moderate for residents in the ROI along routes that parallel with less existing transmission lines.

There are two locations in the Big Stone Subregion where any route associated with South 1 (BSSR01, BSSR03, BSSR05, BSSR07 and BSSR09) would box in residential parcels on two sides of their property with existing transmission lines and portions of the proposed transmission line as shown in Figure 5-4. The existing lines are 115 kV. The residences within this area would be subject to significant aesthetic impacts.

Figure 5-4 Areas Bordered by Existing Transmission and BSSR01, BSSR03, BSSR05, BSSR07 and BSSR09



5.2.2.2 Cultural Values

An assessment of potential impacts to cultural values is discussed for the entire project in Section 4.3.2. The impact assessment was completed for the project as a whole because there is limited variability in cultural values across the routing alternatives. Impacts to cultural values are independent of the route selected.

5.2.2.3 Displacement

There are no residences within the ROW for the routes within the Big Stone Subregion. Routes BSSR01, BSSR03, BSSR06, BSSR07, and BSSR10 each include one non-residential structure within their ROW, which is a communications or utility structure. The non-residential structures are shown on Map 9-1 and Map 9-2. An overview regarding displacement, the general impacts from construction and operation of the project, and ways to avoid, minimize, and mitigate these impacts are in Section 4.3.3.

5.2.2.4 Environmental Justice

No EJ areas were identified in the Big Stone Subregion routes. An impact assessment on environmental justice is discussed for the entire project in Section 4.3.5.

5.2.2.5 Land Use and Zoning

An assessment of potential impacts to land use and zoning is discussed in Section 4.3.6. The impact assessment for land use and zoning was completed for the project as a whole because there is limited variability in zoning impacts among the routing alternatives.

5.2.2.6 Noise

An assessment of potential impacts from noise is discussed for the entire project in Section 4.3.7. The impact assessment for noise was completed for the project as a whole because there is limited variability in noise impacts among the routing alternatives.

5.2.2.7 Property Values

An assessment of potential impacts to property values is discussed for the entire project in Section 4.3.8. The impact assessment for property values was completed for the project as a whole because there is limited variability in the potential for property value impacts across the routing alternatives and changes to a specific property's value are difficult to predict. Potential impacts would be minimized by minimizing aesthetic impacts; aesthetic impacts are analyzed by subregion in Chapters 5 through 7.

5.2.2.8 Recreation

The ROI for recreation is the route width. Intermittent and localized indirect impacts could occur during construction (for example – increased noise levels); long-term impacts during operation could occur in the form of aesthetic impacts (Section 4.3.1.2). Given that direct long-term effects are predominantly related to aesthetics, the indirect long-term repercussions on recreation are anticipated to be subjective, meaning that responses vary based on individual perspectives and experiences. Impacts to recreation are assessed through identification of recreational resources within the ROI. The project is not anticipated to directly impede recreational activities within the ROI such as snowmobiling, golfing, canoeing, hunting, or fishing. Additional details regarding potential impacts to recreation and potential mitigation measures for the project are provided in Section 4.3.9.

A land-based public trail, a state water trail, a state wild and scenic river, scenic byways, and snowmobile trails are present in the Big Stone Subregion (Map 10-1 and Map 10-2) Table 5-4).

The Minnesota River is designated as a state trail, state water trail, and a state wild and scenic river as described in Section 4.3.9 and is crossed by each of the routes in the Big Stone Subregion (Map 8-1). Aesthetic impacts related to the watercourse and state trail crossings are discussed in Section 5.2.2.1.

The Minnesota River Valley Scenic Byway (U.S. Highway 212) and Historic Highway 75 King of Trails are located north and south of the Minnesota River and are crossed once by all the routes in the Big Stone Subregion (Map 10-1). Aesthetic impacts related to the scenic byway crossings are discussed in Section 5.2.2.1.

Snowmobile trails referred to as the Big Stone Lake Sno-Rider Trails are present in the Big Stone Subregion. BSSR11 and BSSR12 have the most snowmobile crossings (3) and linear feet (1.3 miles).

Public lands, including Waterfowl Production Areas and Big Stone National Wildlife Refuge, in the Big Stone Subregion are publicly accessible and can be used for recreational purposes. These public lands are also used for wildlife management and are discussed in Section 5.2.6.8.

Table 5-4 Big Stone Subregion, Recreational Resources within Route Width

Recreational Resource	Unit	Routes											
		BSSR01	BSSR02	BSSR03	BSSR04	BSSR05	BSSR06	BSSR07	BSSR08	BSSR09	BSSR10	BSSR11	BSSR12
Minnesota River State Trail	Crossings (linear feet)	1 (1,736)	1 (1,009)	1 (1,736)	1 (1,009)	1 (1,736)	1 (1,009)	1 (1,736)	1 (1,009)	1 (1,736)	1 (1,009)	1 (1,087)	1 (1,087)
Minnesota River State Water Trail and State Wild and Scenic River[1]	Crossings (linear feet)	1 (2,864)	1 (1,070)	1 (2,864)	1 (1,070)	1 (2,864)	1 (1,070)	1 (2,864)	(1,070)	1 (2,864)	1 (1,070)	1 (1,213)	1 (1,213)
Historic Highway 75 King of Trails	Crossings (linear feet)	1 (2,346)	1 (2,048)	1 (2,346)	1 (2,048)	1 (2,346)	1 (2,048)	1 (2,346)	1 (2,048)	1 (2,346)	1 (2,048)	1 (2,893)	1 (2,893)
Minnesota River Valley Scenic Byway	Crossings (linear feet)	1 (3,731)	1 (4,095)	1 (3,731)	1 (4,095)	1 (3,731)	1 (4,095)	1 (3,731)	1 (4,095)	1 (3,731)	1 (4,095)	1 (5,785)	1 (5,785)
Snowmobile Trail [2]	Crossings (miles)	1 (0.2)	1 (0.2)	1 (0.2)	1 (0.2)	1 (0.2)	1 (0.2)	1 (0.2)	1 (0.2)	1 (0.2)	1 (0.2)	3 (1.3)	3 (1.3)

[1] Linear feet totals are taken from the DNR Minnesota State Water Trails Dataset
[2] Snowmobile trails within Big Stone Subregion include: Big Stone Lake Sno-Rider Trails

5.2.2.9 Socioeconomics

An assessment of potential impacts to socioeconomics is discussed for the entire project in Section 4.3.10 because there is limited variability in socioeconomic impacts among the routing alternatives.

5.2.2.10 Transportation and Public Services

An assessment of potential impacts to transportation and public services, including roadways, railroads, emergency services, airports, and utilities, is discussed for the entire project in Section 4.3.11. The impact assessment for transportation and public services was not analyzed at the subregional level because there is limited variability across the routing alternatives.

5.2.3 Human Health and Safety

An assessment of potential impacts to human health and safety is discussed for the entire project in Section 4.4. The impact assessment was completed for the project as a whole because there is limited variability across the routing alternatives and impacts would be minimized by prudent routing and adhering to applicable transmission line standards and codes.

5.2.4 Land-based Economies

Impacts to land-based economies are assessed by considering four elements: agriculture, forestry, mining, and tourism. Impacts and mitigation related to land-based economies are analyzed for the project as a whole in Section 4.5. The primary land-based economic activity in the project area is agriculture. The primary means of mitigating impacts to land-based economies is prudent routing; that is, by choosing routing alternatives that avoid such economies.

5.2.4.1 Agriculture

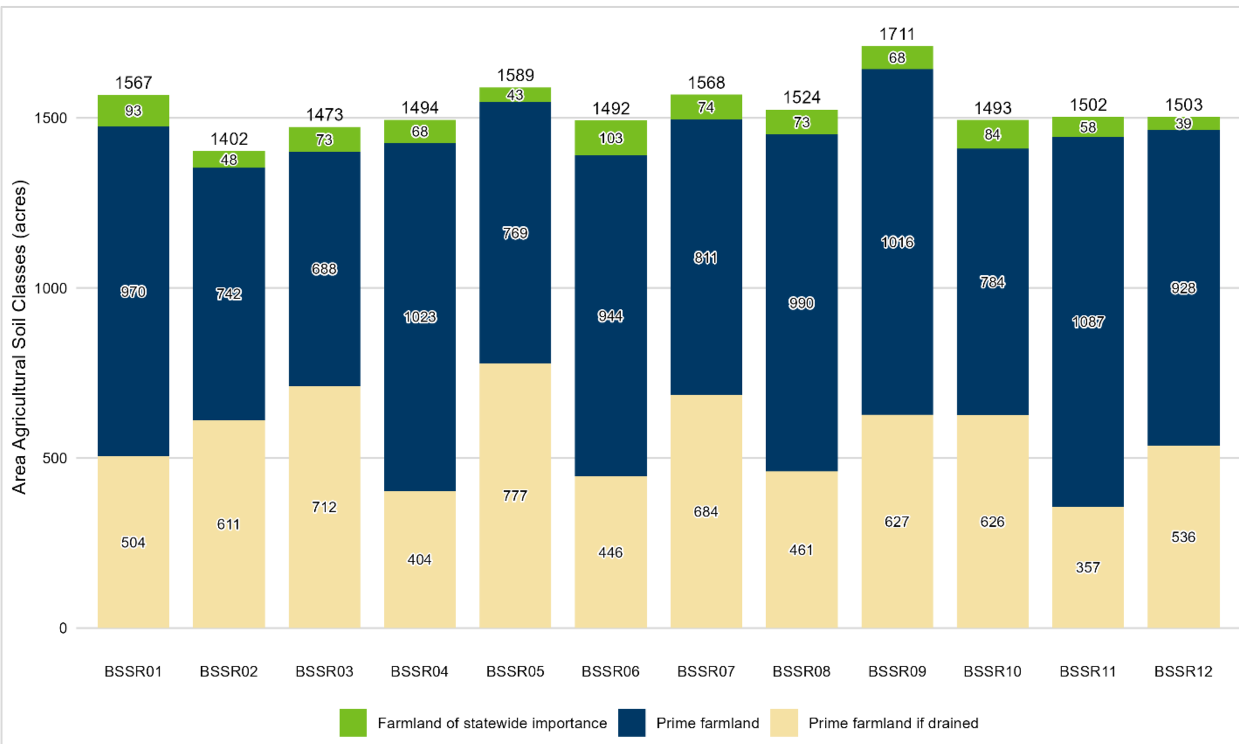
The ROI for agriculture is the route width. Construction and operation of a transmission line impacts agriculture (Section 4.5.1.2). During construction, impacts would include the limited use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Permanent impacts would also occur when the footprint of the transmission line structures directly impedes agricultural production and/or impedes efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields.

Prudent routing (paralleling existing infrastructure and/or paralleling division lines) could minimize potential impacts. Implementation of the AIMP (Appendix K) would minimize and mitigate impacts to agriculture. Additional details regarding potential impacts to agriculture and potential mitigation measures is provided in Section 4.5.1.

Figure 5-5 summarizes the total acres within the route widths of the Big Stone Subregion routes that have designated soil classifications for prime farmland and farmland of statewide importance. Figure 5-6 summarizes the total acres within the route widths of the Big Stone Subregion routes that are designated agricultural land use. Most land use (60 percent or more) within the route widths of each route in the Big Stone Subregion are designated as agricultural (cultivated crops and hay/pasture; see Section 5.2.6.7). BSSR11 has the most prime farmland. BSSR03 has the least prime farmland. BSSR01 has the most agricultural land. BSSR02 has the least agricultural land.

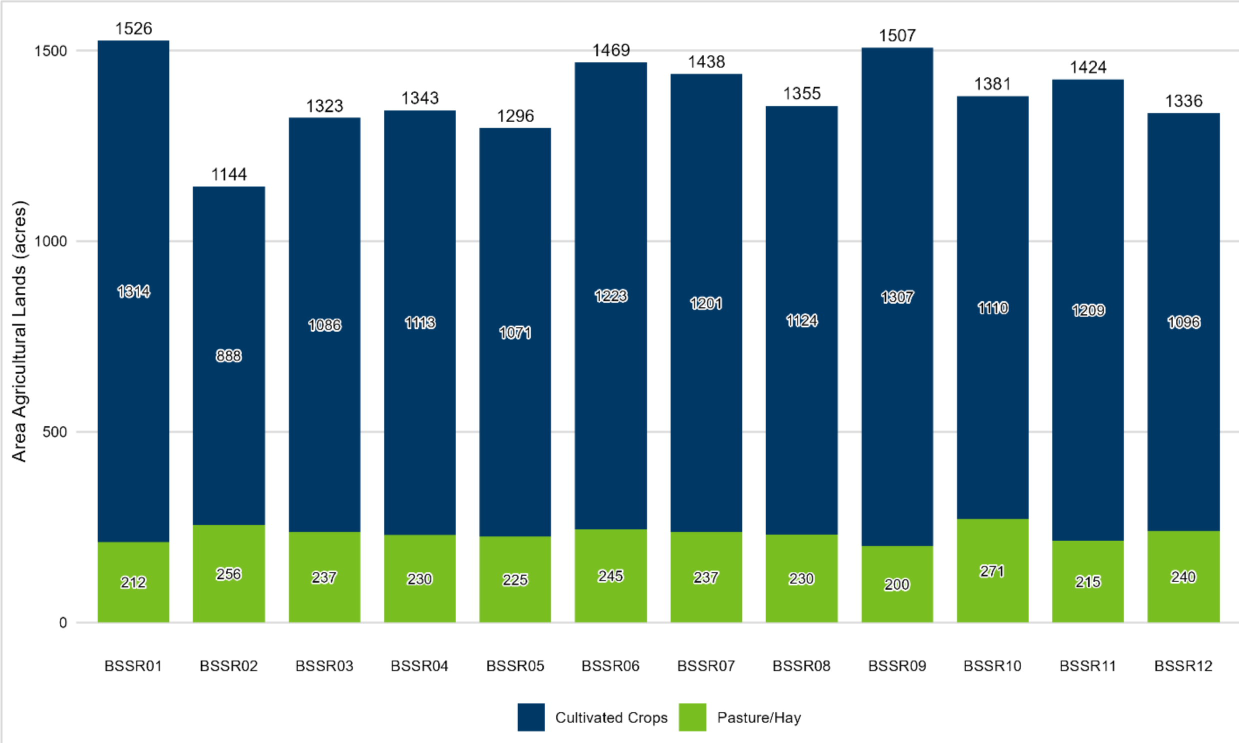
Routing with existing infrastructure or division lines, such as parcel or agricultural fields, would reduce impacts to agriculture. As noted in Table 5-2, BSSR05 parallels the most existing infrastructure (69 percent of its total length) while BSSR11 parallels the least amount (12 percent). BSSR06 has the greatest distance that does not follow existing infrastructure or division lines at 4.2 miles, while BSSR05 has 0.3 miles that does not follow existing infrastructure or division lines (Figure 5-2).

Figure 5-5 Big Stone Subregion, Prime Farmland within Route Width



Source: Prime farmland/farmland of statewide importance, SSURGO (Appendix D)
Not all prime farmland is farmed.

Figure 5-6 Big Stone Subregion, Acres of Agricultural Lands within Route Width



Source: Agricultural land, NLCD (Appendix D)

There are no center pivot irrigation systems within the route width in the Big Stone Subregion.

The RIM/CREP program provides financial incentives to farmers to remove land from production (Section 4.7.6). Farmers within the route widths of the routes in the Big Stone Subregion participate within the CREP and RIM programs (Section 5.2.6.6); however, no anticipated alignment in this subregion crosses an easement area. If RIM/CREP easements are encountered within the route width of the permitted route, it is anticipated the easement could be avoided during final design. Additional discussion regarding the potential to avoid the easement areas is provided in Section 5.2.6.6. If impacts were to occur, they can be mitigated by compensating individual landowners through negotiated easement agreements.

5.2.4.2 Forestry

Potential impacts to forestry are analyzed for the entire project in Section 4.5.2. Within the South Region, SFIA land is present within the route width of BSSR11 and BSSR12. Potential impacts and mitigation for the SFIA land is discussed in Section 4.5.2.

5.2.4.3 Mining

The ROI for mining is the route width. Impacts to aggregate mining could include interference with access to aggregate resources or the ability to successfully mine these reserves (Section 4.5.3.2). If future geophysical surveys are planned, the surveying technology could also be impacted. Potential

impacts are assessed through identification of known, existing and prospective mining operations and assessing potential impacts to those current or potential future operations. If the potential for impacts to mining operations would occur, the applicants would be required to coordinate those impacts with the mining operator (Section 4.5.3.3).

Multiple active mining operations, including Minnesota Aggregate Source Information System (ASIS) Numbers 06001, 06004, 06005, 06009, 06012, 06022, 06023, 06042, and 06044, are present within the route width of routes in the Big Stone Subregion. However, based on aerial imagery, the anticipated alignment of the routes does not cross mining workspaces; therefore, impacts are anticipated to be negligible.

5.2.4.4 Tourism

An assessment of potential impacts to tourism is analyzed for the entire project in Section 4.5.4. Impacts to tourism are anticipated to be negligible to minimal and independent of the route selected.

5.2.5 Archaeological and Historic Resources

The ROI for archaeological sites and historic cemeteries is the route width. The ROI for historic resources is the 1600-foot buffer on either side of the anticipated alignment (local vicinity), which accounts for resources outside of the route width but within visual range of the project.

The analysis of impacts to archaeological and historic resources takes NRHP eligibility into account. Pursuant to state (Minnesota Statutes § 138.661 to 138.669) and federal law (36 CFR 800), only resources that are eligible, listed, or unevaluated for the NRHP have the potential to be adversely affected by the project. For additional information regarding NRHP eligibility, see Section 4.6.1.

Impacts to archaeological and historic resources could result from construction activities such as ROW clearing, placement of structures, the construction of access roads, temporary construction areas, and vehicle and equipment operation (Section 4.6.2). Impacts could also result from the removal of historic buildings or structures, or if the project is near or within view of a resource (typically a historic building, structure, or TCP). Assessment of potential impacts and mitigation regarding archaeological and historic resources for the project as a whole are provided in Section 4.6.3.

Documented archaeological and historic resources within the Big Stone Subregion are summarized in Table 5-5 and Table 5-6. Table 5-5 summarizes the number of archaeological and historic resources within the ROI (which is the route width for archaeological sites and historic cemeteries, and a 1600-foot buffer on either side of the anticipated alignment for historic resources). Table 5-6 provides descriptions of the resources located within the ROIs.

Additional cultural resources may be in the ROIs; reconnaissance survey and evaluation would be necessary to determine whether any other significant archaeological and/or historic resources are present and could be impacted by project activities. If a route permit is issued, the applicants would coordinate with landowners to proceed with these surveys in the permitted route and surrounding areas to include access roads and other areas of potential ground disturbance.

Table 5-5 Big Stone Subregion, Cultural Resource counts within Route's ROI

Route	Archaeological Sites				Historic Architecture				Historic Cemeteries
	Not NRHP-Eligible	Unevaluated	NRHP-Eligible or Listed	Total	Not NRHP-Eligible	Unevaluated	NRHP-Eligible or Listed	Total	Total
BSSR01	0	2	0	**2**	5	2	2	**9**	0
BSSR02	0	0	0	**0**	5	1	1	**7**	1
BSSR03	0	2	0	**2**	6	3	2	**11**	1
BSSR04	0	0	0	**0**	4	0	1	**5**	0
BSSR05	0	2	0	**2**	6	3	2	**11**	1
BSSR06	0	0	0	**0**	4	0	1	**5**	0
BSSR07	0	2	0	**2**	6	3	2	**11**	1
BSSR08	0	0	0	**0**	4	0	1	**5**	0
BSSR09	0	2	0	**2**	5	3	2	**10**	0
BSSR10	0	0	0	**0**	5	1	1	**7**	1
BSSR11	0	0	0	**0**	5	1	1	**7**	0
BSSR12	0	0	0	**0**	6	2	1	**9**	1

Table 5-6 Big Stone Subregion, Descriptions of Cultural Resources within Route's ROI

Route	Site/Resource Number	Resource Type	Resource Name/Description	NRHP Status	Description
BSSR01, BSSR03, BSSR05, BSSR07, BSSR09	21BS0009	Archaeological Site	Mound site	Unevaluated	Burial mound site consisting of three mounds reported in 1911/1943 investigation unable to relocate
BSSR01, BSSR03, BSSR05, BSSR07, BSSR09	21BS0008	Archaeological Site	Mound site	Unevaluated	Burial mound site consisting of one mound reported in 1911 and reidentified in 1943
BSSR11, BSSR12	BS-OTN-00003	Historic Architecture	Homan Farmstead	Unevaluated	Constructed 1900, substantial vegetative screening
BSSR01 (extra), BSSR03 (extra), BSSR05 (extra), BSSR07 (extra), BSSR09 (extra)	BS-ORT-00068	Historic Architecture	Big Stone Canning Company	Unevaluated	Constructed 1902/extant industrial complex
BSSR01 (extra), BSSR03 (extra), BSSR05(extra), BSSR07(extra), BSSR09 (extra)	BS-ORT-00069	Historic Architecture	Ortonville Grain Company	Unevaluated	Constructed 1895-1910/extant industrial complex
BSSR01, BSSR02, BSSR03, BSSR04, BSSR05, BSSR06, BSSR07, BSSR08, BSSR09, BSSR10, BSSR11, BSSR12	XX-RRD-CSP010	Historic Architecture	Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company: Hastings and Dakota Division Main Line	Eligible	Constructed 1872-1880/ extant railroad segment

Route	Site/Resource Number	Resource Type	Resource Name/Description	NRHP Status	Description
BSSR01, BSSR02, BSSR03, BSSR04, BSSR05, BSSR06, BSSR07, BSSR08, BSSR09, BSSR10, BSSR11, BSSR12	XX-RRD-CSP012	Historic Architecture	Hastings and Dakota Railway Company: Main Line Extension	Not Eligible	Constructed 1878/ Active railroad segment
BSSR01, BSSR02, BSSR03, BSSR04, BSSR05, BSSR06, BSSR07, BSSR08, BSSR09, BSSR10, BSSR11, BSSR12	XX-ROD-00020	Historic Architecture	Trunk Highway/U.S. Highway 75 (formerly Trunk Highway 6)	Not Eligible	Constructed 1921, 1956/Active Trunk Highway
BSSR01, BSSR02, BSSR03, BSSS04, BSSR05, BSSR06, BSSR07, BSSR08, BSSR09, BSSR10, BSSR11, BSSR12	XX-ROD-00111	Historic Architecture	Trunk Highway 12	Not Eligible	Constructed 1921/Active Trunk Highway
BSSR01, BSSR02, BSSR03, BSSR04, BSSR05, BSSR06, BSSR07, BSSR08, BSSR09, BSSR10, BSSR11, BSSR12	XX-ROD-00151	Historic Architecture	Trunk Highway 7	Not Eligible	Constructed 1921/Active Trunk Highway
BSSR01, BSSR03, BSSR05, BSSR07, BSSR09	XX-RRD-CSP039	Historic Architecture	Fargo and Southern Railway Company/Chicago Milwaukee and St. Paul Railway Company/Chicago Milwaukee St. Paul and Pacific Railroad Company	Not Eligible	Constructed 1883/non-extant railroad segment
BSSR02, BSSR03, BSSR05, BSSR07, BSSR10, BSSR12	BS-ODS-00002	Historic Architecture	Immanuel Lutheran Church	Unevaluated	Constructed 1900/Gothic Revival architecture. Current viewshed includes existing infrastructure (Hwy 12). Vegetative screening present east/west.

Route	Site/Resource Number	Resource Type	Resource Name/Description	NRHP Status	Description
BSSR11, BSSR12	BS-OTN-00004	Historic Architecture	Granite View Farmstead (Longhenry Farmstead)	Not Eligible	Constructed 1913/Bungalow architecture.
BSSR01(extra), BSSR03(extra), BSSR05 (extra), BSSR07 (extra), BSSR09 (extra)	BS-OTN-00005	Historic Architecture	U.S. Hwy 12 State Line Marker	Eligible	Stone monument state line markers, constructed in 1942 by the WPA.
BSSR02, BSSR03, BSSR05, BSSR07, BSSR10, BSSR12	BS-AKR-00007	Historic Architecture	Bridge 794	Not Eligible	Concrete box culvert crossing US Hwy 12 over ditch.
BSSR02, BSSR03, BSSR05, BSSR07, BSSR10, BSSR12	19409	Historic Cemetery	Immanuel Lutheran Church Cemetery	N/A	PLSS: S11, T121N, R45W

5.2.5.1 Archaeological Resources

Two documented archaeological sites, neither of which have been evaluated for listing on the NRHP, are present within several of the route widths, as shown in Table 5-6. Both of these sites are in Section 15 of Township 121N, Range 46W, and consist of burial mounds first identified in 1911, and reinvestigated in 1943. Site 21BS0008 consists of one mound near the edge of an agricultural field and, during the 1943 investigation, was reported to be partially disturbed (reference (213)). Site 21BS0009 consists of three mounds which were not reidentified in 1943 (reference (214)).

Routes BSSR01, BSSR03, BSSR05, BSSR07, and BSSR09 may contain these sites within their route widths. If these sites are present, the project has the potential to impact these resources. In addition, because sites 21BS0008 and 21BS0009 represent precontact burial mounds, if any of these five routes are selected then consultation with OSA and MIAC would be required pursuant to the Minnesota Private Cemeteries Act (Minnesota Statute § 307.08).

5.2.5.2 Historic Resources

Historic resources within the Big Stone Subregion include two NRHP-eligible resources, five unevaluated resources and eight ineligible resources, as shown in Table 5-6.

Resource XX-RRD-CSP010, the Chicago, Milwaukee, and St. Paul Railway Company/Chicago, Milwaukee, St. Paul and Pacific Railroad Company: Hastings and Dakota Division Main Line, is eligible for listing on the NRHP. This resource consists of a former and current railroad right of way between Minneapolis and the South Dakota state boundary and is considered eligible for the NRHP under Criterion A for its association with significant events. The railroad played a significant role in the growth of the flour milling industry in Minnesota by connecting the milling district in Minneapolis to the wheat growing regions of greater Minnesota. This allowed wheat production and distribution to expand by connecting suppliers, producers, and purchasers. By 1881, Minneapolis had become the largest flour-milling center in the nation (reference (215)).

Resource BS-OTN-00005 is a roadside marker along U.S. Highway 12 constructed in 1942, marking the state boundary between Minnesota and South Dakota. This resource was determined eligible for the NRHP in 1995 under Criterion A for its association with significant events. State line markers constructed between 1940-1942 are the first known examples of this type of roadside structure, constructed by the Works Progress Administration, in coordination with the Department of Highways. The state line marker project represented an expansion in the role of the Department of Highways, which had not previously been responsible for roadside development (reference (216)).

The unevaluated resources in the Big Stone Subregion include two early twentieth century farmsteads (BS-OTN-00003 and BS-ODS-00003), a circa 1900 Gothic Revival Church (BS-ODS-00002), and two industrial facilities (Big Stone Canning Company/BS-ORT-00068 and Ortonville Grain Company/BS-ORT-00069).

All of the routes contain at least one NRHP eligible resource within the ROI (XX-RRD-CSP010/Chicago Milwaukee and St. Paul Railroad). Routes BSSR04, BSSR06, and BSSR08 have only the Chicago Milwaukee and St. Paul Railroad (XX-RRD-CSP010) and no unevaluated resources within their ROIs and therefore have the least potential to impact significant historic resources. BSSR12 contains the Chicago Milwaukee and St. Paul Railroad (XX-RRD-CSP010) and two unevaluated resources within the ROI while BSSR01, BSSR03, BSSR05, and BSSR07 each contain two eligible resources and three unevaluated resources in their ROIs and therefore have the most potential to impact significant historic architectural resources. Additionally, one eligible resource (BS-OTN-00005/roadside marker) and two unevaluated resources are within an expanded route width beyond 500 feet from the alignment for these routes (Map 19-1).

5.2.5.3 Historic Cemeteries

One historic cemetery was identified within the ROI in the Big Stone Subregion. The Immanual Lutheran Church Cemetery (1906-1963) appears to be confined to the grounds of the Immanuel Lutheran Church north of US Highway 12.

The route widths of BSSR02, BSSR03, BSSR05, BSSR07, BSSR10, and BSSR12 may intersect this cemetery; however, strategic placement of support structures would allow for spanning and avoidance of this resource. The visual setting of the cemetery may be impacted if BSSR02, BSSR03, BSSR05, BSSR07, BSSR10, or BSSR12 are selected.

5.2.6 Natural Environment

Electric infrastructure, such as transmission lines, can impact the natural environment. The Commission must consider effects on the natural environment when designating transmission lines routes and making a decision on a route permit. Impacts are dependent upon many factors, such as how the project is designed, constructed, and maintained. Other factors, such as the environmental setting, influence potential impacts.

5.2.6.1 Air Quality

An assessment of potential impacts to air quality is discussed for the entire project in Section 4.7.1. The impact assessment for air quality was not analyzed at the subregional level because impacts are anticipated to largely be independent of the route selected.

5.2.6.2 Climate Change

An assessment of potential impacts from climate change is discussed for the entire project in Section 4.7.2. The impact assessment for climate change was completed for the project as a whole because there is limited variability in the potential for climate change across the routing alternatives.

5.2.6.3 Greenhouse Gases

An assessment of potential impacts from greenhouse gases is discussed for the entire project in Section 4.7.3. The impact assessment for greenhouse gases was completed for the project as a whole because there is limited variability in the potential for greenhouse gases across the routing alternatives.

5.2.6.4 Geology and Topography

An assessment of potential impacts to geology and topography is discussed for the entire project in Section 4.7.3. The impact assessment for geology and topography was not analyzed at the regional level because impacts are anticipated to largely be independent of the route selected.

5.2.6.5 Groundwater

An assessment of potential impacts to groundwater is discussed for the entire project in Section 4.7.5. The impact assessment for groundwater was not analyzed at the subregional level because impacts are anticipated to largely be independent of the route selected.

5.2.6.6 Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands often involve unique resources intended for protection and/or preservation and would be subject to short and long-term impacts depending upon their use (Section 4.7.6.2). Public and designated lands within the ROI are first identified and then further reviewed to better understand potential impacts such as vegetation clearing. Occupying public and designated lands would require coordination with the landowner (Section 4.7.6.3).

Public land and designated lands with existing easements or covenants that are within the route widths and rights-of-way of routes in the Big Stone Subregion are summarized in Table 5-7 and shown in Map 10-1, Map 10-2, Map 15-1, Map 15-2, Map 18-1, and Map 18-2.

There are no state WMAs in the ROI of the Big Stone Subregion. Federal public lands in the Big Stone Subregion ROI include the Big Stone National Wildlife Refuge and several WPAs.

The Big Stone National Wildlife Refuge, which is owned by USFWS, is in the ROI of BSSR02, BSSR04, BSSR06, BSSR08, BSSR10, BSSR11, and BSSR12 near the origin of the route at the South Dakota border. If one of these routes is selected, impacts to the Big Stone National Wildlife Refuge could include vegetation clearing in the ROW along the edge of the refuge, however, the route width does not extend over the refuge's boundary. Construction activities in this area could temporarily impact public enjoyment of the Big Stone National Wildlife Refuge, and if transmission line structures would be visible from the refuge there could be permanent impacts to public enjoyment. In contrast, BSSR01, BSSR03, BSSR05, BSSR07, and BSSR09 would not impact the Big Stone National Wildlife Refuge.

WPAs owned and managed by USFWS are within the ROI of all routes in the Big Stone Subregion, and all routes would cross WPAs. Impacts to crossed WPAs would include vegetation clearing in the ROW and wildlife as analyzed in Section 3.3.1. Construction activities in this area could temporarily impact public enjoyment of WPAs, and the visibility of transmission line structures could create long-term impacts to public enjoyment of WPAs. Routes with less acreage in the ROI indicate fewer impacts to WPAs as shown in Table 5-7. The applicants requested narrower route widths at four locations (Section 3.3.1) adjacent to routes in the Big Stone Subregion (Map 6). The narrower route widths were requested in areas where WPA easements exist to avoid USFWS lands or easements to the greatest extent practicable. If a route were permitted in these areas, the narrower route width would ensure placing transmission structures directly into these lands would be avoided.

In its additional comments based on new routing alternatives (reference (178)), the USFWS identified the Hillman WPA as, “one of the most important WMAs we manage. We have been acquiring, restoring, and managing land for this WPA since the early 1960s and have spent millions of dollars to create this important waterfowl habitat.” BSSR02, BSSR03, BSSR05, BSSR08, and BSSR09 would cross the Hillman WPA (Map 18-1 and Map 18-2).

Three conservation easement programs including CREP, the RIM reserve program, and the Native Prairie Banking program have lands in the Big Stone Subregion ROI (Map 18-1 and Map 18-2). The SFIA program has covenant lands in the Big Stone Subregion ROI (Section 5.2.4.2). The applicants intend to avoid conservation easements to the greatest extent practicable.

There are 13 acres of one riparian CREP easement within the ROI of BSSR02, BSSR04, BSSR05, BSSR08, and BSSR09. The CREP easement is not crossed by the anticipated alignments or their associated rights-of-way. The routes parallel an existing road ROW, across the road from the CREP easement, thus it is anticipated to be avoided during final design. Impacts to the CREP easement are not anticipated. All other routes in the Big Stone Subregion avoid CREP easements entirely.

There are 10 acres of one wetland RIM easement within the ROI of BSSR02, BSSR03, BSSR05, BSSR07, BSSR10, and BSSR12. The RIM easement is not crossed by the anticipated alignments or their associated ROWs. The routes parallel an existing road ROW, across the road from the RIM easement, thus it is anticipated to be avoided during final design. Impacts to the RIM easement are not anticipated. All other routes avoid RIM easements entirely.

A native prairie bank easement (Odessa 19-1) intersects the ROI of BSSR02, BSSR04, BSSR05, BSSR08, and BSSR09. Potential impacts to this prairie bank easement are discussed under Rare and Unique Natural Resources (Section 5.2.6.9).

There are 33 acres of SFIA lands within the ROI of BSSR11 and BSSR12, which both cross SFIA land for a length of approximately 0.02 miles. Impacts to the SFIA land would include tree clearing in the ROW, which would require coordination with the landowner, the DNR, and the Minnesota Department of Revenue. Permanent tree clearing for construction that brings the SFIA land below the 20 contiguous acres and/or 50 percent forest land minimum conditions for enrollment, or tree clearing for maintenance purposes that does not comply with the woodland stewardship plan or forest management guidelines, and could lead to a violation of the conditions for enrollment and removal from the SFIA program. The impacts of covenant termination on the landowner include a forfeiture of rights to further annual incentive payments. All other routes avoid SFIA land entirely. Thus, impacts to SFIA land would be significant if BSSR11 or BSSR12 were constructed, and the proposed alignment is not adjusted.

Table 5-7 Big Stone Subregion, Public and Designated Lands within Route Width and ROW

Public and Designated Land Type	Units	Route											
		BSSR01	BSSR02	BSSR03	BSSR04	BSSR05	BSSR06	BSSR07	BSSR08	BSSR09	BSSR10	BSSR11	BSSR12
National Wildlife Refuge	Acres in ROW (route width)	0 (0)	0.01 (<1)	0 (0)	0.01 (<1)	0 (0)	0.01 (<1)	0 (0)	0.01 (<1)	0 (0)	0.01 (<1)	0.1 (10)	0.1 (10)
Waterfowl Production Areas	Acres in ROW (route width)	33 (274)	47 (355)	49 (352)	31 (278)	45 (342)	36 (291)	45 (333)	54 (419)	52 (406)	48 (350)	36 (284)	48 (368)
Conservation Reserve Enhancement Program (CREP)	Acres in ROW (route width)	0 (0)	0 (13)	0 (0)	0 (13)	0 (13)	0 (0)	0 (0)	0 (13)	0 (13)	0 (0)	0 (0)	0 (0)
Reinvest in Minnesota (RIM) Reserve Partnership Easement	Acres in ROW (route width)	0 (0)	0 (10)	0 (10)	0 (0)	0 (10)	0 (0)	0 (10)	0 (0)	0 (0)	0 (10)	0 (0)	0 (10)
Sustainable Forest Initiative Act (SFIA)	Acres in ROW (route width)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4 (33)	4 (33)

5.2.6.7 Vegetation

The ROI for vegetation is the ROW. Potential construction and operation-related impacts to vegetation for the project as a whole are discussed in Section 4.7.7.2. Potential long-term impacts on vegetation would occur where structures are located or where conversion of forested vegetation to low-growing vegetation would be required. Impacts would be localized, and unavoidable. Impacts to vegetation are primarily evaluated by examining vegetative landcover types within the ROW of each routing option. Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation, as described in Section 4.7.7.3.

Map 11-1 and Map 11-2 provide an overview of landcover types across the Big Stone Subregion, and Table 5-8 summarizes the landcover types within the ROW of each route in the Big Stone Subregion. Agricultural vegetation, particularly cultivated cropland, represents the dominant vegetative landcover type within the ROW of all of the routes, BSSR01 through BSSR12, in the Big Stone Subregion. Other sizable land cover types in the route ROWs include pasture/hay, herbaceous wetland, low intensity development or open space, and barren land. Some areas of open water are present among the routes, all of which are expected to be spanned completely by the transmission line.

Forested land is the vegetation that would be impacted the most by ROW clearing. Removal of woody vegetation will result in conversion to low-stature vegetation (shrubs and grasses) throughout the ROW. The ROW would be maintained with low-growing vegetation during operations to minimize potential interference with the transmission line. Conversion of wooded landscapes to open landscapes could indirectly affect native vegetation by potentially increasing the spread of invasive and non-native species, which could permanently alter ecosystem functions. Co-locating the route with existing infrastructure right-of-way, for example, roadways or transmission lines, might limit tree removal. Use or paralleling of existing ROWs is discussed in Section 5.2.1 for the Big Stone Subregion.

Land cover in the route ROWs considered forested land include woody wetlands and deciduous forest, which are present in minimal amounts. BSSR11 and BSSR12 have the most forested land cover, with 1.3 acres of deciduous forest each and 1.9 acres of woody wetlands each, together comprising approximately 1.2% of the total ROW acreage. Conversely, BSSR06 and BSSR10 have the least forested land cover, with 0.8 acres of deciduous forest each and 1.0 acre of woody wetlands each, together comprising approximately 0.6% of the total ROW acreage.

Although BSSR06 and BSSR10 would minimize impacts to forested vegetation, given the small amount of forested vegetation in the ROW for all of the routes, impacts are anticipated to be minimal for all routes in the Big Stone Subregion. Potential impacts to agricultural vegetation and wetlands are discussed Section 5.2.4.1 and Section 5.2.6.12, respectively.

Table 5-8 Big Stone Subregion, Landcover Types in the ROW

Landcover Data	Unit	BSSR01	BSSR02	BSSR03	BSSR04	BSSR05	BSSR06	BSSR07	BSSR08	BSSR09	BSSR10	BSSR11	BSSR12
Area Within ROW	Acres	289.8	248.7	271.1	267.0	272.4	283.8	290.3	267.1	290.7	284.3	256.7	257.2
Barren Land (Rock / Sand / Clay)	Acres (percentages)	5.9 (2.0)	2.6 (1.0)	4.8 (1.8)	3.6 (1.4)	2.6 (0.9)	5.9 (2.1)	5.9 (2.0)	2.6 (1.0)	2.6 (0.9)	5.9 (2.1)	3.4 (1.3)	3.4 (1.3)
Cultivated Crops	Acres (percentages)	185.2 (63.9)	97.6 (39.2)	136.7 (50.4)	145.2 (54.4)	122.2 (44.9)	175.3 (61.8)	153.4 (52.8)	148.2 (55.5)	172.8 (59.4)	143.5 (50.5)	170.8 (66.5)	139.0 (54.0)
Deciduous Forest	Acres (percentages)	0.2 (0.1)	1.0 (0.4)	0.2 (0.1)	1.0 (0.4)	0.4 (0.2)	0.8 (0.3)	0.2 (0.1)	1.0 (0.4)	0.4 (0.1)	0.8 (0.3)	1.3 (0.5)	1.3 (0.5)
Developed, Low Intensity	Acres (percentages)	18.2 (6.3)	43.7 (17.6)	42.7 (15.7)	19.2 (7.2)	50.6 (18.6)	11.3 (4.0)	46.3 (15.9)	15.6 (5.9)	22.6 (7.8)	39.4 (13.8)	3.6 (1.4)	31.7 (12.3)
Developed, Medium Intensity	Acres (percentages)	0.3 (0.1)	0.6 (0.2)	0.6 (0.2)	0.2 (0.1)	0.8 (0.3)		0.3 (0.1)	0.6 (0.2)	0.8 (0.3)			
Developed, Open Space	Acres (percentages)	18.7 (6.4)	42.4 (17.0)	19.1 (7.0)	42.0 (15.7)	45.4 (16.7)	15.6 (5.5)	18.8 (6.5)	42.3 (15.8)	45.4 (15.6)	15.7 (5.5)	18.4 (7.2)	18.5 (7.2)
Emergent Herbaceous Wetlands	Acres (percentages)	21.0 (7.2)	29.4 (11.8)	27.3 (10.1)	24.3 (9.1)	20.9 (7.7)	31.8 (11.2)	21.4 (7.4)	28.9 (10.8)	20.5 (7.0)	32.3 (11.4)	25.3 (9.9)	25.7 (10.0)
Open Water	Acres (percentages)	2.3 (0.8)	0.4 (0.2)	2.6 (1.0)	0.1 (0.0)	0.6 (0.2)	2.1 (0.7)	2.3 (0.8)	0.4 (0.2)	0.6 (0.2)	2.1 (0.7)		
Pasture/Hay	Acres (percentages)	35.9 (12.4)	30.2 (12.1)	35.0 (12.9)	30.3 (11.4)	26.6 (9.8)	40.1 (14.1)	39.6 (13.6)	26.5 (9.9)	22.9 (7.9)	43.7 (15.4)	32.0 (12.5)	35.7 (13.9)
Woody Wetlands	Acres (percentages)	2.2 (0.8)	1.0 (0.4)	2.2 (0.8)	1.0 (0.4)	2.2 (0.8)	1.0 (0.3)	2.2 (0.8)	1.0 (0.4)	2.2 (0.8)	1.0 (0.3)	1.9 (0.8)	1.9 (0.8)

5.2.6.8 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. Potential construction and operation-related impacts to wildlife and wildlife habitat are discussed in Section 4.7.8.2. Potential short-term, localized impacts could occur from displacement during construction or maintenance activities. Potential long-term impacts could occur as a result to habitat loss, conversion, or fragmentation. Impacts to wildlife and wildlife habitat are assessed by considering wildlife inhabiting the ROI as well as evaluating the presence of potential wildlife habitat within the ROI. Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife and wildlife habitat, as described in Section 4.7.8.3.

Map 18-1 and Map 18-2 provides an overview of resources across the Big Stone Subregion, and Table 5-9 summarizes the wildlife resources within the route width of each route in the Big Stone Subregion. Designated wildlife habitat within the Big Stone Subregion ROI includes National Wildlife Refuges, Important Bird Areas, GBCAs, and WPAs. Wildlife Action Network corridors ranging from "Low rank" to "Medium-High or High rank" are present throughout the Big Stone Subregion ROI.

The Big Stone National Wildlife Refuge is within the local vicinity and route width of 7 of the 12 routes in the Big Stone Subregion (Map 18-1 and Map 18-2). Based on the anticipated alignment, BSSR02, BSSR04, BSSR06, BSSR08, BSSR10, BSSR11, and BSSR12 would all parallel the northernmost edge of the Big Stone National Wildlife Refuge before crossing the Minnesota River, with BSSR11 and BSSR12 intersecting a slightly greater length (approximately 878 feet) compared to the others. None of the anticipated alignments cross the Big Stone National Wildlife Refuge, but construction activities to establish the ROW of these routes would require tree clearing up to the refuge's boundary and could impact the habitat quality and resident wildlife. The ROW of BSSR02, BSSR04, BSSR06, BSSR08, and BSSR10 would intersect 0.01 acres of the refuge, and the ROW of BSSR11 and BSSR12 would intersect 0.13 acres of the refuge. BSSR01, BSSR03, BSSR05, BSSR07, and BSSR09 avoid the Big Stone National Wildlife Refuge entirely.

As demonstrated in Table 5-9, WPAs are within the local vicinity and route width of all routes in the Big Stone Subregion, and all anticipated alignments cross WPAs (Map 18-1 and Map 18-2). The local vicinity of BSSR08 intersects the most acres of WPAs (1,432 acres), and the local vicinities of BSSR01 and BSSR11 intersect the least acres of WPAs (962 acres). The route width of BSSR08 intersects the most acres of WPAs (419 acres), while BSSR12 crosses WPAs most frequently (eight individual crossings), and BSSR10 has the longest total length of transmission line crossing WPAs (2.8 miles). The route width of BSSR01 intersects the smallest acreage of WPAs (274 acres), while BSSR01 and BSSR09 cross WPAs the least (five individual crossings), and BSSR04 has the shortest total length of transmission line crossing WPAs (1.6 miles). Transmission line structures may be necessary in WPAs for individual crossings greater than 1,000 feet; construction activities within the ROW could impact the habitat quality and resident wildlife of the WPAs, and the establishment of new transmission line corridors within or near WPAs could increase potential impacts to flying waterfowl. Routes with lower acreage, less crossings, and lower total crossing length are expected to have fewer direct or indirect impacts to WPA habitats, resident wildlife, and waterfowl flying in these areas. However, all routes have the potential to significantly impact wildlife due the acreage of WPA habitats affected and the waterfowl flying near these areas.

The Lac Qui Parle – Big Stone Important Bird Area covers almost the entire Big Stone Subregion, is within the local vicinity and route width of all routes, and is crossed by all routes (Map 18-1 and Map 18-2). Due to the extent of the Lac Qui Parle – Big Stone Important Bird Area, which covers essentially the entire length of each route, there is limited variation between routes at the individual level. The acreage intersected by routes in the Big Stone Subregion ranges from approximately 6,015 acres (BSSR06) to 5,449 acres (BSSR12), and the acreage intersected by the route widths ranges from approximately 1,873 acres (BSSR10) to 1,638 acres (BSSR02). All routes in the Big Stone subregion cross the Lac Qui Parle – Big Stone Important Bird Area once, with the total length of transmission line crossing ranging from approximately 15.5 miles (BSSR09) to 13.5 miles (BSSR02). All routes would establish new transmission line corridors within the Lac Qui Parle – Big Stone Important Bird Area that could increase potential impacts to flying birds; lower acreage and lower total crossing length indicate fewer impacts to birds flying in this area.

GBCAs cover almost the entire Big Stone Subregion, are within the local vicinity and route width of all routes, and the anticipated alignments of all routes would cross these resources (Map 18-1 and Map 18-2). The local vicinity and route width of BSSR07 intersects the greatest acreage of GBCAs (5,079 acres and 1,576 acres, respectively), while the local vicinity and route width of BSSR11 intersects the smallest acreage of GBCAs (3,978 acres and 1,240 acres, respectively). All routes would establish new transmission line corridors within the GBCAs that could increase potential impacts to flying birds; lower acreage indicates fewer impacts to birds flying in this area.

Wildlife Action Network corridors cover almost the entire Big Stone Subregion, are within the local vicinity and route width of all routes, and the anticipated alignments of all routes would cross these resources (Map 17-1 and Map 17-2). Generally, lower acreage, lower number of crossings, and lower total crossing length indicate fewer impacts to corridors.

All routes would cross through a Medium-High rank Wildlife Action Network corridor when they cross the Minnesota River (Map 17-1). The areas surrounding the Minnesota River crossing are densely wooded. BSSR01, BSSR03, BSSR05, BSSR07, and BSSR09 would cross the Minnesota River corridor paralleling an existing transmission line; impacts to wildlife and associated habitat would be minimized because the existing transmission line has already fragmented riparian habitat in this area. BSSR02, BSSR04, BSSR06, BSSR08, BSSR10, BSSR11, and BSSR12 would cross the Minnesota River corridor paralleling no existing infrastructure; these routes would result in riparian habitat fragmentation in this area. In its scoping comment letter (scoping comment # 96, reference (2)), the DNR identified a strong preference for routes that use an existing crossing over the Minnesota River, as they would prevent unnecessary additional vegetation clearing and fragmentation of riparian habitat. The DNR noted that using side-by-side pole structures for Minnesota River crossings are preferable to stacked line pole structures as side-by-side pole structures have fewer vertical planes resulting in potential bird impacts.

All routes would cross through a Medium rank Wildlife Action Network corridor when they cross Stony Run Creek (Map 17-1). The areas surrounding the Stony Run Creek crossing contain grasslands, patches of native prairie, scattered trees, and dense pockets of woods. BSSR02, BSSR04, BSSR05, BSSR08, and BSSR09 would cross the Stony Run Creek paralleling an existing road ROW; impacts to wildlife and associated habitat would be minimized because riparian habitat fragmentation has already occurred in this area. BSSR01, BSSR03, BSSR06, BSSR07, BSSR10, BSSR11, and BSSR12 would cross the Stony Run Creek paralleling no existing infrastructure; these routes would result in some degree of riparian habitat fragmentation in the respective areas of the Stony Run Creek. The area where BSSR01, BSSR03, BSSR06, BSSR07, and BSSR10 would cross the Stony Run Creek contains grasslands and some tree cover, thus BSSR01, BSSR03, BSSR06, BSSR07, and BSSR10 would result in minimal riparian habitat fragmentation in this area of the Stony Run Creek. The area where BSSR11 and BSSR12 would cross the Stony Run Creek contains a dense pocket of woods, thus BSSR11 and BSSR12 would result in moderate riparian habitat fragmentation in this area of the Stony Run Creek. A calcareous fen is within the ROIs of BSSR11 and BSSR12 at the location where they cross the Stony Run Creek. Habitat fragmentation in this area could result in the spread of invasive plant species, posing a risk to calcareous fen community. Impacts to this calcareous fen are discussed in Section 5.2.6.12.

The routes in the Big Stone Subregion would parallel little to no existing transmission line ROW, with BSSR03 paralleling the most (17 percent of its length) and BSSR02, BSSR04, BSSR08, BSSR11, and BSSR12 paralleling none. Avian species traversing wildlife areas along new transmission line corridors could potentially experience increased impacts resulting from electrocution or collision with transmission line structures or conductors. As discussed in Section 4.7.8.3, avian impacts can be minimized through use of bird flight diverters.

The routes in the Big Stone Subregion would parallel some existing non-transmission line infrastructure rights-of-way such as roads, with BSSR05 paralleling the most (55 percent of its length) and BSR11 paralleling the least (12 percent of its length). All routes in the Big Stone subregion would minimize potential wildlife and habitat impacts associated with habitat fragmentation and/or edge effects by paralleling existing infrastructure rights-of-way, because habitat fragmentation has already occurred in these areas.

Table 5-9 Big Stone Subregion, Wildlife Management and Conservation Areas within Route Width

Resource Area	Unit	Route											
		BSSR01	BSSR02	BSSR03	BSSR04	BSSR05	BSSR06	BSSR07	BSSR08	BSSR09	BSSR10	BSSR11	BSSR12
National Wildlife Refuge	Acres	0	<1	0	<1	0	<1	0	<1	0	<1	10	10
Important Bird Areas	Acres	1,853	1,638	1,728	1,759	1,735	1,871	1,855	1,759	1,857	1,873	1,692	1,694
	Crossing Length (miles)	15.4	13.4	14.4	14.5	14.5	15.4	15.4	14.5	15.5	15.4	13.9	13.9
Waterfowl Production Areas	Acres	274	355	352	278	342	291	333	419	406	350	284	368
	Crossing Count	5	7	6	6	6	6	6	6	5	7	7	8
	Crossing Length (miles)	1.9	2.4	2.7	1.6	2.3	2.0	2.6	2.7	2.6	2.8	1.9	2.6
Grassland Bird Conservation Areas	Acres	1,441	1,318	1,448	1,306	1,456	1,419	1,576	1,307	1,445	1,553	1,240	1,374
Wildlife Action Network Corridors	Low Rank (Acres, Crossing Count, Crossing Length [miles])	617 6 4.9	692 6 6.0	665 6 6.0	637 6 4.9	692 6 6.0	617 6 4.9	697 7 6.1	665 7 5.1	665 7 5.1	697 7 6.1	503 5 3.8	583 6 5.1
	Medium-Low or Low Rank (Acres, Crossing Count, Crossing Length [miles])	301 6 2.6	201 6 1.7	268 6 2.1	238 6 2.1	201 6 1.7	301 6 2.6	323 7 2.5	250 7 2.5	250 7 2.5	323 7 2.5	314 7 2.7	335 8 2.6
	Medium Rank (Acres, Crossing Count, Crossing Length [miles])	452 6 3.7	433 5 3.7	428 6 3.4	457 5 4.0	477 5 3.9	523 6 4.4	452 6 3.7	434 5 3.7	479 5 3.9	523 6 4.4	372 5 3.3	372 5 3.3
	High or Medium-High Rank (Acres, Crossing Count, Crossing Length [miles])	194 3 1.8	78 2 0.6	177 2 1.6	95 3 0.8	177 2 1.6	95 3 0.8	194 3 1.8	78 2 0.6	177 2 1.6	95 3 0.8	173 4 1.1	173 4 1.1

5.2.6.9 Rare and Unique Natural Resources

Rare and unique natural resources encompass protected species and sensitive ecological resources. The ROI for protected species is the project area (one mile), and the ROI for sensitive ecological resources is the route width. Potential construction and operation-related impacts to protected species and sensitive ecological resources are discussed in Section 4.7.9.2. Potential direct or indirect impacts to protected species could occur should they be present within or near the ROW during construction or maintenance activities. While more mobile species would leave the area for nearby comparable habitats, non-mobile species, such as vascular plants or nesting birds, could be directly impacted. Construction activities also have the potential for direct impacts to sensitive ecological resources if they are present within the area subject to construction disturbance. Long-term impacts would involve permanent clearing of vegetation in areas identified as sensitive ecological resources which could indirectly impact any protected species associated with these habitats.

Impacts to protected species are evaluated by reviewing documented occurrences of these species within the ROI. Potential impacts to sensitive ecological resources, which could provide suitable habitat for protected species, are evaluated by assessing the presence of these resources within the ROI. Several measures that could be implemented to avoid, minimize, or mitigate impacts to protected species and sensitive ecological resources, including those provided in the DNR's Natural Heritage Review response (Appendix N), are described in Section 4.7.9.3.

Sensitive ecological resources within the Big Stone Subregion are shown on Map 15-1 and Map 15-2. To secure federally and state protected species from exploitation or destruction, documented locations of these species are not identified on maps.

5.2.6.9.1 Protected Species

According to the NHIS database, between nine and thirteen protected species have been documented within one mile of each route in the Big Stone Subregion; two to three of these species have been documented within each route's ROW; these are summarized in Table 5-10. In addition, several state special concern species have been documented within one mile of the routes in the Big Stone Subregion; records of state special concern species are summarized in Appendix N.

Ball cactus has been found in the ROW of all routes and larger water starwort has been found in the ROW of all routes except BSSR11 and BSSR12. Water hyssop and hair-like beak rush have only been found in the ROW of BSSR11 and BSSR12. The Poweshiek skipperling, both a federal and state protected species, has been documented within the ROW of BSSR03, BSSR03, BSSR05, BSSR08, and BSR09; however, as discussed in Section 4.7.9.2, given the rarity of the species in Minnesota, it is unlikely to be found in the area today.

Formal protected species surveys have not been conducted for the project; as such, it is possible that additional protected species could be present where suitable habitat is available within the ROW or route width of the routes in the Big Stone Subregion. As part of project permitting, the applicants could be required to conduct field surveys for the potential presence of protected species; these surveys would occur prior to construction in coordination with the USFWS and/or DNR.

Table 5-10 Big Stone Subregion, Natural Heritage Information System Database Records of Protected Species Within One Mile

Scientific Name	Common Name	Type	State/Federal Status	Route											
				BSSR01	BSSR02	BSSR03	BSSR04	BSSR05	BSSR06	BSSR07	BSSR08	BSSR09	BSSR10	BSSR11	BSSR12
Coryphantha vivipara	Ball cactus	Vascular plant	Endangered/not listed	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]
Eleocharis wolfii	Wolf's spikerush	Vascular plant	Endangered/ not listed		X		X		X		X		X	X	X
Hesperia dacotae	Dakota skipper	Butterfly	Endangered/threatened	X	X	X	X	X	X	X	X	X	X	X	X
Isoetes melanopoda	Prairie quillwort	Vascular plant	Endangered/ not listed		X		X		X		X		X	X	X
Lanius ludovicianus	Loggerhead shrike	Bird	Endangered/ not listed	X	X	X	X	X	X	X	X	X	X	X	X
Marsilea vestita	Hairy waterclover	Vascular plant	Endangered/ not listed		X		X		X		X		X	X	X
Oarisma poweshiek	Poweshiek skipperling	Butterfly	Endangered/endangered	X	X[1]	X[1]	X	X[1]	X	X	X[1]	X[1]	X	X	X
Actinonaias ligamentina	Mucket	Mussel	Threatened/ not listed	X	X	X	X	X	X	X	X	X	X	X	X
Bacopa rotundifolia	Waterhyssop	Vascular plant	Threatened/ not listed	X	X	X	X	X	X	X	X	X	X	X[1]	X[1]
Berula erecta	Stream parsnip	Vascular plant	Threatened/ not listed											X	X
Callitriche heterophylla	Larger water starwort	Vascular plant	Threatened/ not listed	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X[1]	X	X
Cicindela lepida	Ghost tiger beetle	Beetle	Threatened/ not listed	X	X	X	X	X	X	X	X	X	X	X	X
Rhynchospora capillacea	Hair-like beak rush	Vascular plant	Threatened/ not listed	X	X	X	X	X	X	X	X	X	X	X[1]	X[1]

[1] Species has been documented within the ROW.

5.2.6.9.2 Sensitive Ecological Resources

The route widths and rights-of-way of all routes in the Big Stone Subregion would intersect sensitive ecological resources, including Sites of Biodiversity Significance, native plant communities, and Prairie Conservation Plan prairie core areas (Table 5-11; Map 15-1 and Map 15-2). The rights-of-way of all routes would intersect between 21 and 41 acres of Sites of Biodiversity Significance ranked high, moderate, and below, with BSSR01 and BSSR07 intersecting the least total acreage and BSSR06 and BSSR10 intersecting the most total acreage. The rights-of-way of BSSR01, BSSR03, BSSR05, BSSR07, and BSSR09 would intersect the least acreage of Sites of Biodiversity Significance ranked high.

The anticipated alignments of all routes would cross native plant communities, with their rights-of-way intersecting between 7 and 11 acres of native plant communities. BSSR05 and BSSR09 would intersect the least acreage and BSSR11 and BSSR12 would intersect the most acreage.

The anticipated alignments of all routes would cross Prairie Conservation Plan prairie core areas, with their rights-of-way intersecting between 118 and 157 acres of Prairie Conservation Plan prairie core areas. BSSR05 would intersect the least acreage, and BSSR10 would intersect the most acreage.

The route widths and rights-of-way of BSSR02, BSSR04, BSSR05, BSSR08, and BSSR09 would intersect the same amount of a native prairie bank easement (Odessa 19-1) and their anticipated alignments would intersect the edge of the native prairie bank easement while following a road ROW (Table 5-11; Map 15-1 and Map 15-2). The remaining seven routes would avoid the prairie bank easement. Impacts to the native prairie bank easement would include vegetation and clearing in the ROW, which would require coordination with the landowner and the DNR.

The anticipated alignments of all routes would cross sensitive ecological resources that may be too large to span (>1,000 feet), thus potentially requiring the placement of a transmission line structure with these areas. The anticipated alignments of all routes would cross one native plant community that may be too large to span and between two and four Sites of Biodiversity Significance that are too large to span, with BSSR05 and BSSR09 crossing the least Sites of Biodiversity Significance greater than 1,000 feet and BSSR06 and BSSR10 crossing the most. Given the extensive mapping of Prairie Conservation Plan prairie core areas in the Big Stone Subregion, all routes would require the placement of multiple structures within these areas. A transmission line structure may be necessary along the edge of the Odessa 19-1 prairie bank easement if BSSR02, BSSR04, BSSR05, BSSR08, or BSSR09 were constructed, as the crossing distance is greater than 1,000 feet wide. The Commission could request the alignment be adjusted within the route width to avoid Odessa 19-1, but the tradeoff in impact would be routing over a residential parcel within 150 feet of the residence.

Table 5-11 Big Stone Subregion, Sensitive Ecological Resources within the ROW and Route Width

Resource	Units	BSSR01	BSSR02	BSSR03	BSSR04	BSSR05	BSSR06	BSSR07	BSSR08	BSSR09	BSSR10	BSSR11	BSSR12
Sites of Biodiversity Significance	High rank (acres in ROW (route width))	4 (32)	18 (132)	5 (46)	18 (119)	5 (46)	18 (119)	4 (32)	18 (132)	5 (46)	18 (119)	19 (137)	19 (137)
	Moderate rank (acres in ROW (route width))	10 (85)	10 (74)	13 (105)	7 (54)	8 (72)	12 (87)	10 (85)	10 (74)	8 (72)	12 (87)	10 (67)	10 (67)
	Below rank (acres in ROW (route width))	7 (48)	6 (65)	7 (49)	7 (66)	11 (89)	12 (72)	7 (53)	6 (59)	11 (84)	12 (77)	1 (17)	1 (23)
	Total (acres in ROW (route width))	21 (165)	34 (271)	25 (199)	32 (239)	23 (207)	41 (278)	21 (170)	34 266)	23 (201)	41 (283)	30 (222)	30 (227)
Native Plant Communities	Conservation Status S1, S2, or S3 (acres in ROW (route width))	8 (64)	8 (86)	8 (87)	8 (63)	7 (75)	9 (76)	8 (64)	8 (86)	7 (75)	9 (76)	11 (66)	11 (66)
Native Prairie Bank Easement	Total acres in ROW (route width))	0 (0)	4 (18)	0 (0)	4 (18)	4 (18)	0 (0)	0 (0)	4 (18)	4 (18)	0 (0)	0 (0)	0 (0)
Prairie Conservation Plan	Prairie Core Area (acres in ROW (route width))	127 (842)	136 (912)	132 (847)	136 (912)	118 (786)	144 (968)	140 (932)	131 (882)	113 (756)	157 (1,058)	131 (895)	144 (984)

5.2.6.10 Soils

The ROI for soils is the ROW. Common soil impacts include rutting, compaction, and erosion. Potential impacts would be short-term during construction, localized, and can be minimized. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicants would obtain a NPDES/SDS Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicles trips, and decompacting soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored a suitable location. Disturbed areas would be promptly seeded after construction. Additional details regarding potential impacts to soils and potential mitigation measures are provided in Section 4.7.10

Map 20-1 and Map 20-2 show the surface soil textures across the subregion. Soil types within the ROW were reviewed to identify soil characteristics that could be more prone to impacts in some areas compared to others (Table 5-12). Less than one-third of the soils within the ROW of the Big Stone Subregion routes are susceptible to erosion or are classified as hydric soils. Soils that are compaction-prone vary by route. Nearly all soils within the Big Stone Subregion have a moderate or severe rutting hazard rating. Generally, all of the routes within the Big Stone Subregion have similar soil characteristics. There is no route that is better suited to reduce the potential rutting, compaction, and erosion that could occur during construction.

Table 5-12 Big Stone Subregion, NRCS Mapped Soils Within ROW

Soil Data	Unit	BSSR01	BSSR02	BSSR03	BSSR04	BSSR05	BSSR06	BSSR07	BSSR08	BSSR09	BSSR10	BSSR11	BSSR12
Area within ROW	Acres	290	249	271	267	272	284	290	267	291	284	257	257
Compaction Prone[1]	Acres (Percentage)	168 (58)	10 (41)	115 (42)	155 (58)	102 (38)	168 (59)	128 (44)	153 (57)	154 (53)	128 (45)	159 (62)	120 (47)
Susceptible to Erosion Hazard[2]	Acres (Percentage)	28 (10)	25 (10)	24 (9)	28 (11)	22 (8)	30 (11)	23 (8)	31 (12)	28 (10)	26 (9)	25 (10)	20 (8)
Hydric Soils[3]	Acres (Percentage)	61 (21)	60 (24)	68 (25)	53 (20)	61 (23)	60 (21)	70 (24)	54 (20)	56 (19)	68 (24)	51 (20)	59 (23)
Revegetation Concerns[4]	Acres (Percentage)	146 (50)	106 (42)	130 (48)	121 (45)	108 (40)	143 (51)	134 (46)	128 (48)	131 (45)	132 (46)	113 (44)	101 (39)
Susceptible to Rutting Hazard[5]	Acres (Percentage)	277 (96)	244 (98)	265 (98)	256 (96)	268 (98)	271 (96)	278 (96)	262 (98)	286 (98)	272 (96)	253 (99)	253 (99)

[1] Soils considered to be Compaction Prone soils include those with a rating of "Medium" or higher.
[2] Soils considered susceptible to erosion hazard soils include those with a rating of “Medium”, “Severe”, or “Very Severe”.
[3] Hydric soil include hydric soils (100% hydric) and predominantly hydric soils (67-99% hydric).
[4] Soils considered to have revegetation concerns include soils with a non-irrigated land capability classification of 3 or greater.
[5] Soils considered susceptible to Rutting Hazard include those with a rating of "Moderate" or “Severe”.

5.2.6.11 Surface Water

The ROI for surface water is the route width. Direct impacts caused by structures placed in surface waters would be avoided by spanning the surface waters. Direct impacts to other resources can cause indirect impacts to surface waters. For example, construction activities near surface waters could cause riparian vegetation disturbance and surface erosion, which can lead to runoff impacting surface waters. Impacts to surface waters could be avoided by prudent routing, selecting the routes that cross the fewest watercourses or waterbodies and/or special or impaired waters.

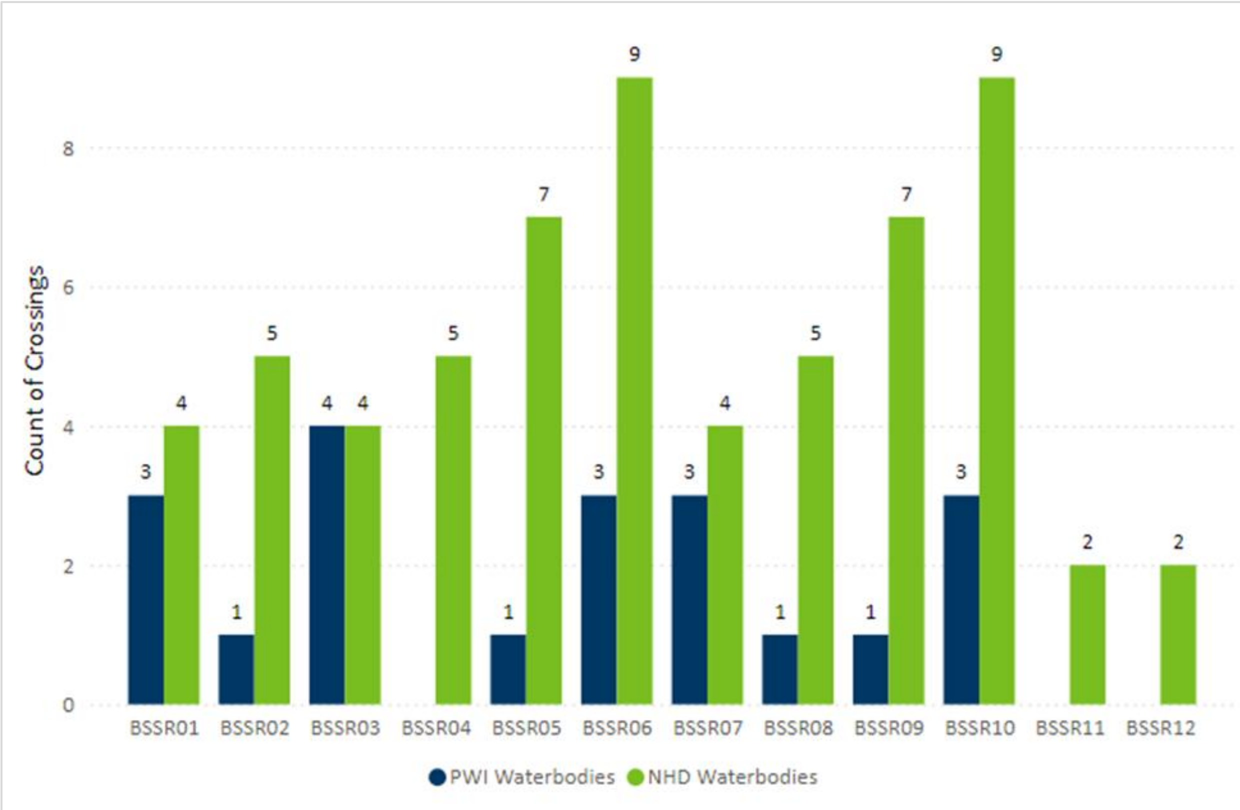
Impacts would be mitigated by using BMPs. Crossing PWI waters would require a DNR license to cross public waters and work near special or impaired waters would require additional BMPs as detailed in the construction stormwater permit. Additional detail regarding potential impacts to surface waters and potential mitigation measures, including those provided in the DNR's Natural Heritage Review response (Appendix N), is provided in Section 4.7.11.

Map 14-1 shows the waterbodies and watercourses across the region. There are no trout streams or state-designated outstanding resource value waters. There is one state wild and scenic river that is within the ROI of the Big Stone Subregion.

All of the routes in the Big Stone Subregion cross the Minnesota River which is a state-designated outstanding resource value water and a state-designated wild and scenic river (Map 14-1). BSS01, BSS03, BSS05, BSS07, and BSS09 all cross the Minnesota River at a location where existing transmission lines are present, but additional tree clearing would likely be required. BSS02, BSS04, BSS06, BSS08, BSS10, BSS11 and BSS12, cross the Minnesota River at a location where there is no existing transmission line crossing. The crossings where there are no existing transmission lines will require more tree clearing than the crossings where there are existing transmission lines.

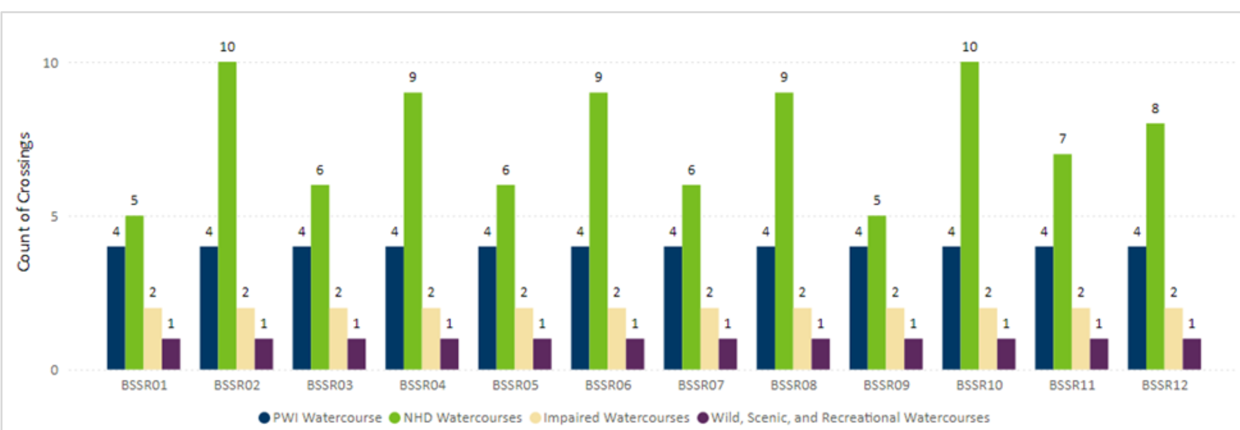
Each route has one waterbody within the ROI (Figure 5-7). Of the waterbodies present in the Big Stone Subregion, one is designated as a PWI basin. The PWI basin, an unnamed basin, is within the route width of BSSR05, BSSR08, and BSSR09, and each of them also cross the PWI basin.

Figure 5-7 Big Stone Subregion, Number of Waterbody Crossings by Type



The total count of watercourse crossings by the routes in the Big Stone subregion varies between 5 and 10 (Figure 5-8). BSSR09 crosses the fewest watercourses while BSSR02 and BSSR10 cross the most watercourses. The routes cross the same number of PWI watercourses (four each) and watercourses classified as impaired (two each). PWI watercourses crossed in the Big Stone Subregion are the Minnesota River and the Stony Run Stream.

Figure 5-8 Big Stone Subregion, Number of Watercourse Crossings by Type



Impacts to floodplains during construction would include soil disturbance and vegetation removal. Vegetation clearing within a floodplain, especially tree removal, can greatly destabilize the area, make it more prone to ongoing erosion and sediment issues, and further contribute to water quality issues. The project might require that transmission line structures be placed within FEMA-designated floodplain. In the Big Stone Subregion, each routing alternative has either one or two crossings of a floodplain that exceeds 1,000 feet (the average span length for the project). BSSR02, BSSR03, BSSR05, BSSR07, BSSR10, and BSSR12 each have two crossings that exceed 1,000 feet, compared to the others that have only one (Table 5-13). Routes that could not span the floodplain due to a crossing that exceeds 1,000 feet would have higher potential to impact the floodplain’s function and management capabilities.

Table 5-13 Big Stone Subregion, Count of Floodplain Crossings Over 1,000 feet

Route	Count of Floodplain Crossings Over 1,000 feet
BSSR01	1
BSSR02	2
BSSR03	2
BSSR04	1
BSSR05	2
BSSR06	1
BSSR07	2
BSSR08	1
BSSR09	1
BSSR10	2
BSSR11	1
BSSR12	2

5.2.6.12 Wetlands and Calcareous Fens

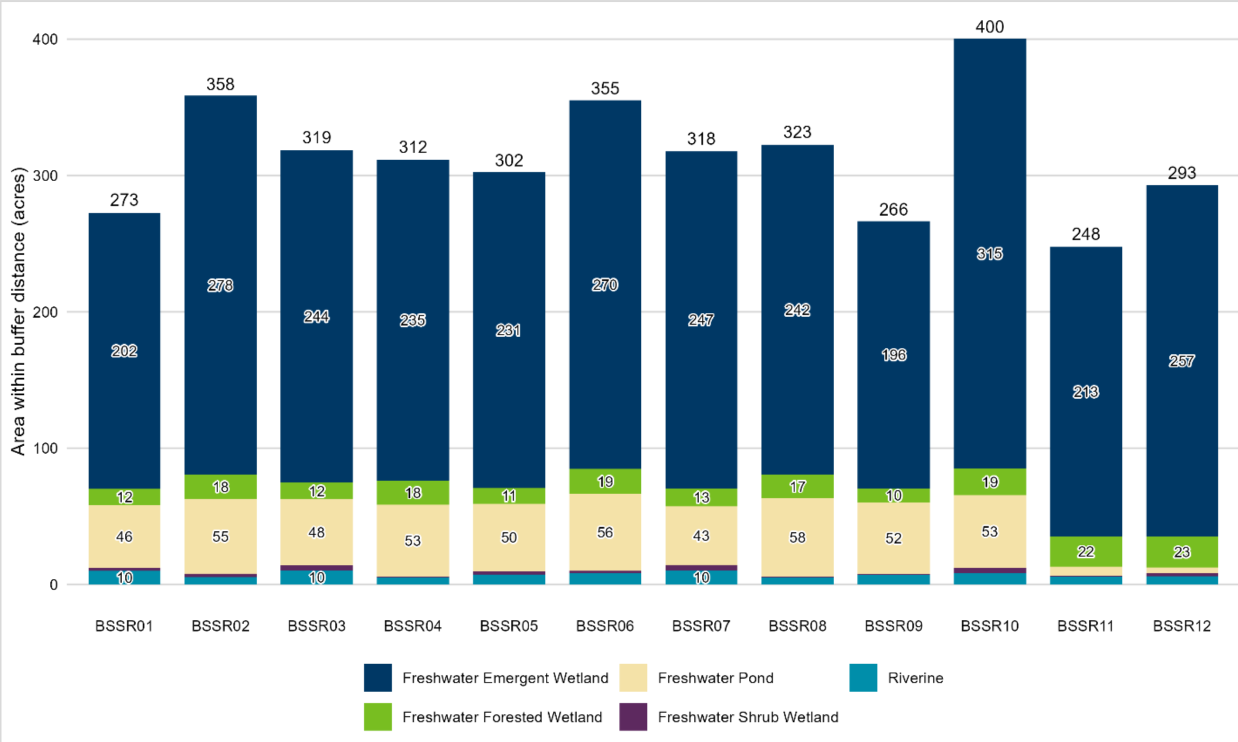
The ROI for wetlands is the route width, except for forested wetlands where it is the ROW due to permanent conversion within that area. Short-term and long-term potential impacts to wetlands are discussed in Section 4.7.10.2. Impacts to wetland are evaluated by examining wetland types, sizes, and potential for spanning. Localized direct impacts to wetlands would include vegetation clearing, movement of soils, and construction traffic which could alter or impair wetland function. Forested wetlands would be subject to long-term impacts given their conversion to non-forested wetlands. Wetland crossings longer than 1,000 feet might require one or more structures to be placed in the wetland, resulting in small, localized permanent wetland impacts.

Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width. Wetland impacts would be regulated as described in 4.7.10.2. Additional details regarding potential impacts to wetlands, including those provided in the DNR's Natural Heritage Review response, and potential mitigation measures are provided in Section 4.7.10.3.

Map 14-1 and Map 14-2 show the mapped wetlands within the ROI of the potential routes in the Big Stone Subregion. Direct wetland impacts would occur within the construction workspace within or adjacent to the ROW. Wetlands wholly or partly within the ROI for the Big Stone Subregion consist mainly of emergent wetlands, ponds, and a smaller subset of forested, shrub, and riverine wetlands (Figure 5-9).

Figure 5-9 shows acres of wetland by type within the ROI for each route. Within the Big Stone Subregion, BSSR10 contains the most NWI wetland (400 acres). BSSR06 contains the highest number of individual wetlands (94) and has the most overall length of wetland crossings (2.65 miles). BSSR11 contains the fewest acres of wetland (247 acres), while BSSR12 has the fewest number of individual wetland crossings (50) and BSSR12 has the lowest total length of wetland crossings (1.4 miles). Routes with lower acreage and less crossings are expected to have fewer direct or indirect impacts to wetlands.

Figure 5-9 Big Stone Subregion, Wetland Area within ROI by Route



The ROI for the following routes cross PWI wetlands: BSSR01 crosses 5 with approximately 33 acres in the ROI, BSSR03 crosses 4 with approximately 31 acres in the ROI, BSSR04 crosses 1 with in approximately 2 acres in the ROI; BSSR06 and BSSR07 each cross 5, BSSR10 crosses 5 with approximately 33 acres in the ROI, and BSSR11 crosses 1 PWI wetland resulting in approximately 2 acres in that ROI.

The ROI for each of the routes in the Big Stone Subregion cross a mixture of emergent wetlands, ponds, and a smaller subset of forested, shrub, and riverine wetlands. Because transmission lines cannot be safely or reliably operated with trees growing within the ROW, existing trees must be removed throughout the ROW, including forested wetlands. Forested wetlands, within any new transmission line ROW, would likely undergo a long-term to potentially permanent change in wetland/vegetation type lasting as long as the transmission line operates in the area. In the Big Stone Subregion, BSSR11 and BSSR12 cross the most forested wetland at 3 acres, while BSSR09 crosses the fewest acres at 0.3. Forested wetlands subject to permanent impacts due to conversion from ROW clearing would be contained within the ROW. BSSR11 and BSSR12 would cause moderate impacts due to forested wetland acreage whereas BSSR09 would cause more minimal impacts. Forested wetlands that are subject to permanent impacts due to their conversion would be limited to the ROW.

In most cases, wetlands can be spanned to avoid placing structures within them. However, wetland crossings longer than 1,000 feet might require one or more structures to be placed within the wetland. Table 5-14 shows the total number of crossings greater than 1,000 linear feet that would be required by each route in the Big Stone Subregion. These crossings could require placement of structures within wetlands to facilitate transmission line routing would result in both short term and localized impacts associated with construction as well as long-term impacts to the wetland resource where the structure occupies or displaces wetland vegetation.

Table 5-14 Big Stone Subregion, Wetland Crossings Greater than 1000 feet

Route	Count of Crossings > 1,000 ft
BSSR11	3
BSSR12	3
BSSR02	2
BSSR04	2
BSSR06	2
BSSR08	2
BSSR10	2
BSSR01	1
BSSR03	1
BSSR05	1
BSSR07	1
BSSR09	1

For this project, listed calcareous fens only occur in the Big Stone Subregion. BSSR11 and BSSR12 each include a calcareous fen within the ROI. The Stony Run fen is north of where these routes cross Stony Run stream (Map 14-1). Dewatering to install structure foundations near the Stony Run stream could draw down groundwater levels at the Stony Run calcareous fen. Loss of groundwater supply would dry out the peat, leading to peat breakdown and nutrient release. Water discharge or vehicle movement in the ROW along the Stony Run stream bank could cause flooding that drowns fen species and deposits sediment carrying excess nutrients into the Stony Run fen.

Disturbances to the Stony Run fen from dewatering, discharge, or vehicle movement could result in invasion of non-fen plant species, such as shrubs, upland plants, and reed canary grass or other invasive species, altering the unique calcareous fen plant community. Invading plant species can outcompete the unique fen species, resulting in the loss of the Stony Run fen. The loss of the Stony Run fen could be a permanent impact, as calcareous fens can be difficult to restore. Impacts to the Stony Run fen could result in impacts to protected species. The unique conditions in calcareous fens support uncommon and rare plant species, and several state-listed plant species are found in calcareous fens. Impacts to protected species are discussed in Section 5.2.6.9.

The applicants would be required to coordinate with the DNR’s Calcareous Fen Program Coordinator to determine if impacts to the Stony Run fen could occur during any phase of the project. BSSR11 and BSSR12 have the potential to impact the Stony Run fen, and depending on the DNR’s impact determination, the applicants could be required to develop a Calcareous Fen Management Plan in coordination with the DNR, as specified in Minnesota Statute § 103G.223.

5.2.7 Costs that are Dependent on Design and Route

Total project costs range from $465 million to $535 million and vary based on the combination of routes selected. Estimates include permitting, engineering, materials (for example: steel, conductor, and insulators), land rights and ROW, and construction costs. Costs are generally proportional to length with the exception of the additional factors described in Section 4.8. For comparison purposes, the construction costs for the 12 routes in the Big Stone Subregion are included in Table 5-15. Estimated construction costs associated with route segments and alignment alternatives in the Big Stone Subregion are discussed in Section 5.2.9.

The route with the lowest estimated cost is BSSR11 ($67,878,600); although it is not the shortest route, it has the fewest number of angle structures. BSSR02 is the shortest route and has the second lowest estimated cost. The route with the highest estimated cost is BSSR09 ($84,575,500); it is also the longest route.

Table 5-15 Big Stone Subregion, Summary of Estimated Cost by Route

Route Alternative	Length (mi)	Estimated Cost
BSSR01	15.9	$78,683,000
BSSR02	13.7	$71,358,000
BSSR03	14.9	$76,388,500
BSSR04	14.7	$75,664,900
BSSR05	15.0	$80,270,000
BSSR06	15.6	$77,468,100
BSSR07	16.0	$81,605,000
BSSR08	14.7	$75,178,700
BSSR09	16.0	$84,575,500
BSSR10	15.6	$80,303,500
BSSR11	14.1	$67,878,500
BSSR12	14.1	$67,934,000

5.2.8 Relative Merits of the Big Stone Subregion Routes

The 14 routing factors that the Commission must consider when designating transmission line routes (Minnesota Rules 7850.4100) are summarized at the subregional level. Some elements of these factors have minimal impacts or do not vary significantly by route within the subregion and thus are not further discussed in this Section.

The relative merits analysis uses graphics (Table 5-16) to provide a visual assessment of the relative merits for each route in the Big Stone Subregion. The graphic for a specific routing factor or element is not meant to be indicative of the "best" route but is provided as a relative comparison to be evaluated together with all other routing factors.

For routing factors where impacts are anticipated to vary, the graphic represents the magnitude of anticipated difference between these anticipated impacts and compares them across the different routes within a given subregion. For routing factors that express the state of Minnesota's interest in the efficient use of resources (for example, the use and paralleling of existing rights-of-way), the graphic represents the consistency of the routes with these interests and compares them to each other. Table 5-17 summarizes the relative merits analysis of the 12 routes in the Big Stone Subregion for the routing factors that are anticipated to vary amongst the routes.

Table 5-16 Guide to Relative Merits Analysis

Consistency with Routing Factor or Anticipated Impacts	Symbol
• Route is consistent with the routing factor OR • Impacts are anticipated to be negligible to minimal and able to be mitigated OR • Impact is positive	
• Route is consistent with routing factor but less so than the other options OR • Impacts are anticipated to be minimal but the potential for impacts is greater than the other routes or require special permit conditions OR • Impacts are anticipated to be moderate	
• Route is not consistent with routing factor or consistent only in part OR • Impacts might be moderate but the potential for impacts is greater than the other routes or might require special permit conditions OR • Impacts are anticipated to be significant	

Table 5-17 Big Stone Subregion, Relative Merits of Subregion Routes

Routing Factor / Resource	BSSR01	BSSR02	BSSR03	BSSR04	BSSR05	BSSR06	BSSR07	BSSR08	BSSR09	BSSR10	BSSR11	BSSR12	Summary
Factor A Human Settlement													
Aesthetics	◒	●	◒	◒	◒	●	◒	◒	◒	●	◒	◒	The fewest total residences are on BSSR02, BSSR06, BSSR10, BSSR11, and BSSR12 whereas the most are on BSSR01, BSSR03, BSSR05, BSSR07, and BSSR09. BSSR01, BSSR03, BSSR05, BSSR07 and BSSR09 would box in two residential parcels on two sides of their property with transmission lines. BSSR04 and BSSR08 have the least amount of residences within 75-250 feet of the alignment, but compared to more favorable routes, require more ROW tree clearing to cross the Minnesota River; this factor weighed against BSSR04 and BBSR08 but not the other routes in this area as they have less total residences. Mileage and total percentage of the route that parallel with existing infrastructure was similar among options and did not influence the merits of most routes where other factors were given more weight. Total paralleling weighed against BSSR04 (73%). Recreational resource impacts were not significant enough to influence merits except for BSSR11 and BSSR12 which have the most length of Scenic Byways in the ROI.
Displacement	◒	●	◒	●	●	◒	◒	●	●	◒	●	●	There are no residences within the ROW of any of the routes. Routes BSSR01, BSSR03, BSSR06, BSSR07, and BSSR10 each include one non-residential structure within their ROW. The other routes do not have any non-residential structures in their ROW.
Recreation	●	●	●	●	●	●	●	●	●	●	◒	◒	BSSR11 and BSSR12 have more snowmobile crossings and a greater length of snowmobile trails than the other routes.
Factor C Land-Based Economies													
Agriculture	●	●	●	●	●	◒	●	●	●	●	●	●	BSSR06 has the greatest distance that does not parallel existing infrastructure. Other impacts are similar among the routes.
Mining	●	●	●	●	●	●	●	●	●	●	●	●	Impacts to mining are anticipated to be negligible among the routes.
Factor D Archaeological and Historic Resources													
Archaeological	○	●	○	●	○	●	○	●	○	●	●	●	Routes BSSR01, BSSR03, BSSR05, BSSR07, and BSSR09 may contain sites 21BS0008 and 21BS0009 in the route widths. Because these sites represent precontact burial mounds, if any of these five routes are selected then consultation with OSA and MIAC would be required pursuant to the Minnesota Private Cemeteries Act (Minnesota Statute § 307.08). The remaining routing alternatives do not contain previously identified archaeological sites in the route widths.
Historic	◒	◒	◒	●	◒	●	◒	●	◒	◒	◒	●	All of the proposed routes contain at least one NRHP eligible resource within the ROI (XX-RRD-CSP010/Chicago Milwaukee and St. Paul Railroad). However, Resource XX-RRD-CSP010 functions as an active railroad and, as such, would be minimally impacted by the project. Routes BSSR04, BSSR06, and BSSR08 have only XX-RRD-CSP010 and no unevaluated resources within their ROIs and therefore have the least potential to impact significant historic resources. Route BSSR12 contains XX-RRD-CSP010 and two unevaluated resources within the ROI while Routes BSSR01, BSSR03, BSSR05, and BSSR07 each contain two eligible resources and three unevaluated resources in their ROIs. Routes BSSR01, BSSR03, BSSR05, and BSSR07 therefore have the most potential to impact significant historic resources. However, one eligible resource (BS-OTN-00005) and two unevaluated resources are within the 'extra' route width area for these routes; therefore, if the anticipated alignment remains unchanged, these resources would fall outside the ROI for these routes.

Routing Factor / Resource	BSSR01	BSSR02	BSSR03	BSSR04	BSSR05	BSSR06	BSSR07	BSSR08	BSSR09	BSSR10	BSSR11	BSSR12	Summary
Factor E Natural Resources													
Public and Designated Lands	●	○	○	○	○	○	◓	○	○	◓	○	○	All routes would cross WPAs; routes that cross more acres of WPAs would have greater impacts. USFWS identified the Hillman WPA as one of the most important WPAs they manage. The ROI of BSSR01 intersects the fewest acres of WPAs, no other public lands, conservation easements, or covenants; therefore, BSSR01 has the least potential to impact public and designated lands. The ROI of BSSR06, BSSR07, and BSSR10 intersect more acres of WPAs compared to BSSR01 and the ROI of BSSR06 and BSSR10 intersect the Big Stone National Wildlife Refuge; therefore BSSR06, BSSR07, and BSSR10 have a moderate potential to impact public and designated lands. Compared to BSSR01, the ROI of BSSR02, BSSR03, BSSR04, BSSR05, BSSR08, BSSR09, BSSR11, and BSSR12 intersect more acres of WPAs, parallel the Big Stone National Wildlife Refuge (BSSR02, BSSR04, BSSR08, BSSR11, and BSSR12), cross the Hillman WPA (BSSR02, BSSR03, BSSR05, BSSR09, and BSSR09), may require transmission structure placement in a Native Prairie Bank easement (BSSR02, BSSR04, BSSR05, BSSR08, and BSSR09), and cross an SFIA covenant, which could require tree clearing (BSSR11 and BSSR12); therefore BSSR02, BSSR03, BSSR04, BSSR05, BSSR08, BSSR09, BSSR11, and BSSR12 have the greatest potential to impact public and designated lands.
Soils	●	●	●	●	●	●	●	●	●	●	●	●	Nearly all the soils in the region have a moderate or severe rutting hazard rating. Impacts could be minimized with BMPs or mitigated if long-term re-vegetation impacts extend beyond construction. Impacts to soils would be independent of the route selected.
Surface Water	●	◓	●	◓	●	◓	●	◓	●	◓	◓	◓	The total count of watercourse crossings by the anticipated alignments of routes in the Big Stone Subregion varies from 5 to 10. BSS01, BSS03, BSS07, BSS09 cross the Minnesota River, a designated wild and scenic river, at a location where there is existing transmission line. BSS02, BSS04, BSS06, BSS08, BSS10, BSS11, and BSS12 cross the Minnesota River, but at a location where existing transmission lines are present. The routes cross the same number of PWI watercourses (four each) and impaired watercourses (two each). BSSR02, BSSR03, BSSR05, BSSR07, BSSR10, and BSSR12 each have two crossings in floodplains that exceed 1,000 feet, compared to the others that have only one. No in-water work would occur.
Vegetation	●	●	●	●	●	●	●	●	●	●	◓	◓	BSSR11 and BSSR12 have the most forested land cover within their rights-of-way, each with 3.2 acres or 1.2% of the total ROW acreage. BSSR06 and BSSR10 have the least with 1.8 acres each, or 0.6% of the total ROW acreage. All of the routes are considered to have a minimal amount of forested vegetation.
Wetlands	●	◓	◓	●	◓	●	◓	●	●	◓	○	○	All routes have some acres of forested wetlands in the ROW. BSSR11 and BSSR12 cross the most, while BSSR01 and BSSR09 cross the least. BSSR02, BSSR03, BSSR05, and BSSR10, BSSR11, and BSSR12 have multiple crossings greater than 1,000 feet in width where spanning at this crossing is not expected to be feasible. BSSR11 and BSSR12 each include a calcareous fen within the ROI and could potentially have significant impacts to the fen.

Routing Factor / Resource	BSSR01	BSSR02	BSSR03	BSSR04	BSSR05	BSSR06	BSSR07	BSSR08	BSSR09	BSSR10	BSSR11	BSSR12	Summary
Wildlife and Wildlife Habitat	◒	○	○	○	○	○	○	○	○	○	○	○	All routes would cross the Lac Qui Parle Important Bird Area and GBCAs for their entire length, creating an avian collision risk. All routes would cross WPAs, which could impact WPA habitat quality and create an avian collision risk. All routes would cross Wildlife Action Network corridors in areas where there is not an existing infrastructure, which could result in habitat fragmentation. All routes could cause habitat fragmentation along their length, as no routes follow existing transmission or non-transmission line infrastructure for the majority of their length. Of the routes in the Big Stone Subregion, BSSR01 intersects fewer acres of WPAs with its route width, crosses WPAs the least for a shorter total crossing length, and would not fragment riparian habitat where it crosses the Minnesota River; therefore BSSR01 would have a slightly lower potential to impact wildlife and habitat compared to the other routes.
Factor F Rare and Unique Natural Resources													
Rare and Unique Natural Resources	◒	◒	◒	◒	◒	◒	◒	◒	◒	◒	◒	◒	The rights-of-way of BSSR01 and BSSR07 intersect the fewest (21 acres) of Sites of Biodiversity Significance, while BSSR06 and BSSR10 intersect the most (41 acres). The rights-of-way of all routes intersect a similar acreage of native plant communities (7 to 11 acres). The rights-of-way of all routes intersect Prairie Conservation Plan core areas, with BSSR05 intersecting the fewest (118 acres) and BSSR10 intersecting the most (157 acres). The rights-of-way of BSSR02, BSSR04, BSSR05, BSSR08, and BSSR09 would intersect the edge of a prairie bank easement, while the other routes would avoid it. Between nine and thirteen protected species have been documented within one mile of each route; two to three of these species have been documented within each route's ROW. While there are slight differences between routes in terms of intersection sensitive ecological resources and presence of protected species, they are relatively small. In addition, protected species surveys have not been conducted across any of the routes.
Factor H Paralleling Division Lines													
Paralleling existing survey lines, natural division lines, and agricultural field boundaries	●	●	●	●	●	●	●	●	●	●	●	●	All routes parallel existing division lines for 73.1 percent or more of their length. BSSR05 will follow existing transmission lines for the largest percent of its length (89.1 percent).
Factor J Paralleling Existing Infrastructure **Minnesota Statute § 216E.03 - Subdivision 7 (8) (roads/railroads) and (15e)(transmission lines)**													
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.	◒	●	●	◒	●	○	◒	◒	◒	●	○	◒	BSSR05 follows the most existing infrastructure (68.5 percent). BSSR02, BSSR07, and BSSR09 follow existing infrastructure for between 49.9 and 53.3 percent of their routes. The percent that the rest of the routes follow existing infrastructure varies between 12.3 percent (BSSR11) and 38.9 percent (BSSR04) of their lengths.

Routing Factor / Resource	BSSR01	BSSR02	BSSR03	BSSR04	BSSR05	BSSR06	BSSR07	BSSR08	BSSR09	BSSR10	BSSR11	BSSR12	Summary
Factor L Costs													
Costs Dependent on Design and Route													The route with the lowest estimated cost is BSSR11 ($67,878,600). The route with the highest estimated cost is BSSR09 ($84,575,500). BSSR09 has an estimated cost more than 10% higher than the average estimated cost of the applicants’ proposed routes.

5.2.9 Route Segments and Alignment Alternatives for the Big Stone Subregion

Route segments and alignment alternatives were included in the scoping decision for the Big Stone Subregion but are not part of Routes BSSR01 through BSSR12. Rather, they are refinements to Routes BSSR01 through BSSR12. Figure 5-10 provides the locations of the route segments and alignment alternatives in the Big Stone Subregion. Table 5-18 summarizes the three route segments and alignment alternative in the Big Stone Subregion and indicates which route each would replace a portion of. These replacements are compared to the same portion of the original route that they diverge from, known as route segment equivalents. For purposes of analysis, route segments and alignment alternatives are considered in standalone comparisons to their route equivalents.

Figure 5-10 Big Stone Subregion Route Segments and Alignment Alternatives

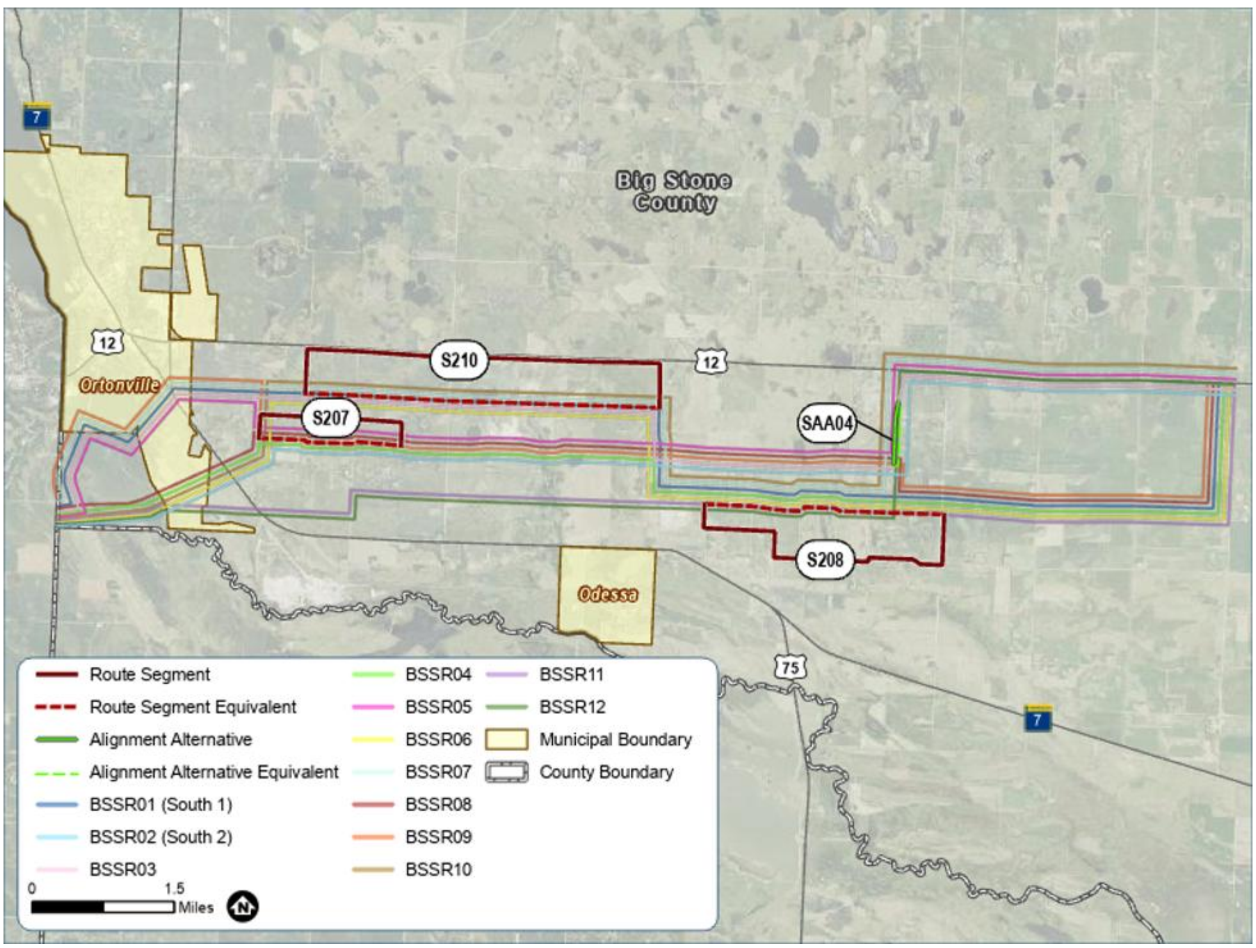


Table 5-18 Big Stone Subregion Route Segments and Alignment Alternatives

Routing Alternative	Subregion	Type	Description
S207	Big Stone	Route Segment	Proposed during scoping to mitigate impacts to federally protected USFWS lands. It can be used to modify routes BSSR02, BSSR04, BSSR05, BSSR09, or BSSR12.
S208	Big Stone	Route Segment	Proposed during scoping to mitigate impacts to federally protected USFWS lands. It can be used to modify routes BSSR01, BSSR03, BSSR06, BSSR07, BSSR08, BSSR10, or BSSR12.
S210	Big Stone	Route Segment	Proposed during scoping to mitigate impacts to waterbodies. It can be used to modify routes BSSR01, BSSR03, BSSR06, BSSR10, or BSSR11.
SAA04	Big Stone	Alignment Alternative	Proposed during scoping to decrease potential impacts to farming operations. It can be used to modify routes BSSR02, BSSR04, BSSR06, BSSR08, or BSSR10.

5.2.9.1 Route Segment S207

Route Segment S207 is 1.0 mile long and is an alternative to a part of Routes BSSR02, BSSR04, BSSR05, and BSSR09. Route Segment S207 was proposed to mitigate impacts to federally protected USFWS lands. Route Segment S207 is shown on Figure 5-10, and Table 5-19 summarizes differences in potential impacts of Route Segment S207 compared to its equivalent.

Table 5-19 Route Segment S207 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment S207 would follow existing infrastructure (transmission lines, roads, railroads) for less than one percent of its length compared to its equivalent following for 66.1 percent of its length. It would follow division lines (field, parcel, or section lines) for 50.5 percent of its length compared to the equivalent following division lines for 100 percent of its length. S207 parallels less total ROW than its equivalent (74.9 percent and 100 percent, respectively).
Cost	Route Segment S207 is nearly 0.5 miles longer than its equivalent but has an estimated construction cost of $12,405,500 which is nearly $1.3 million (9 percent) less than the estimated cost of its equivalent which is $13,657,000.

Resource	Summary
Human Settlement – Aesthetics	Route Segment S207 follows existing infrastructure for less than 1 percent of its length whereas its equivalent follows for 66 percent. S207 follows natural division lines for 50.5 percent of its length whereas its equivalent follows 100 percent. The nearest residences to S207 are over 1,600 feet from the alignment and there is a total of two. S207's equivalent has one residence within 250 feet, two within 500 feet, and two within 1,600 feet. S207's equivalent has a nigher number of residences at closer distances, ultimately resulting in higher aesthetic impacts.
Human Settlement – Displacement	There are no residences or non-residential structures within the ROW of Route Segment S207 or its equivalent.
Human Settlement – Recreation	Route Segment S207 would increase linear feet of snowmobile trails by approximately 2,300 compared to its equivalent.
Land-Based Economies – Agriculture	Route Segment S207 would traverse more agricultural land than its equivalent and would cut through three agricultural fields without following natural division lines.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	There are no previously identified archaeological sites or historic resources in Route Segment S207 or its equivalent.
Natural Environment – Public and Designated Lands	Public lands within the ROI of Route Segment S207 and its equivalent include Big Stone County WPAs which are owned by USFWS. The equivalent would have greater impacts on federally protected wetlands within Big Stone County WPAs compared to S207. There are no conservation easement lands within the ROI of S207 or its equivalent. While S207 still routes through other federal land, USFWS indicated that the wetlands themselves within those parcel boundaries would be avoided compared to S207's equivalent (reference(217)).
Natural Environment - Vegetation	Route Segment S207 has the same impacts to vegetation as its equivalent as they both have no forested landcover within their ROWs based on the proposed alignments. If the alignment were to move within the permitted route width, S207 would have 0.9 acres of forested landcover that could be impacted whereas its equivalent would have 0.5 acres.
Natural Environment – Wildlife and Wildlife Habitat	S207 would intersect more acres of WPAs than its equivalent (139 acres and 93 acres, respectively) for a longer crossing length (one mile and 0.5 miles, respectively); more acres of Important Bird Areas (257 acres and 201 acres, respectively) for a longer crossing length (1.9 miles and 1.5 miles, respectively); more acres of Wildlife Action Network corridors (201 acres and 156 acres, respectively) for a longer crossing length (1.5 miles and 1.1 miles, respectively); and more acres of GBCAs (257 acres and 201 acres, respectively).

Resource	Summary
Natural Environment – Rare and Unique Natural Resources	Both Route Segment S207 and its equivalent have one record of a state endangered species within one mile; no records of federal or state protected species have been documented within the ROW of Route Segment S207 or its equivalent. The ROW of Route Segment S207 would intersect more acres of Sites of Biodiversity Significance (ranked below; 14 acres versus 9 acres for its equivalent) and Prairie Conservation Plan prairie core areas (11 acres versus 6 acres for its equivalent).
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Both Route Segment S207 and its equivalent have one watercourse within the ROI but do not cross watercourses. Both Route Segment S207 have one waterbody within the ROI and two waterbody crossings; both of these would not require in water work. There are no PWI watercourses or waterbodies.
Natural Environment – Wetlands and Calcareous Fens	Route Segment S207 would cross fewer wetlands in the ROW and has a shorter total length of crossings (approximately 300 feet shorter) when compared to the equivalent, and avoids a freshwater pond NWI wetland. S207 avoids all forested wetland. There are no changes between S207 and its equivalent for calcareous fen impacts.

5.2.9.2 Route Segment S208

Route Segment S208 is 3.6 miles long and is an alternative to a part of Routes BSSR01, BSSR03, BSSR06, BSSR07, BSSR08, BSSR10, and BSSR12. Route Segment S208 was proposed to mitigate impacts to federally protected USFWS lands. Route Segment S208 is shown on Figure 5-10, and Table 5-20 summarizes differences in potential impacts of Route Segment S208 compared to its equivalent.

Table 5-20 Route Segment S208 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment S208 would follow existing infrastructure (transmission lines, roads, railroads) for 37.2 percent of its length compared to its equivalent following no existing infrastructure. S208 would follow division lines (field, parcel, or section lines) for 79 percent of its length compared to the equivalent following division lines for 73.5 percent of its length. S208 parallels more total ROW than its equivalent (79 percent and 73.5 percent, respectively).
Cost	Route Segment S208 is over a mile longer than its equivalent and costs an estimated $14 million more, over double the cost; $27,334,000 compared to $13,327,000 for its equivalent.

Resource	Summary
Human Settlement – Aesthetics	Route Segment S208 would box in a residence with the new transmission line on two boundaries of its property, causing significant aesthetic impacts. S208 is also nearer to the Minnesota River Valley to the south, increasing impacts for the four residences north of the proposed alignment. S208 has 15 total residences within 1,600 feet whereas its equivalent has none. One of these residences is within 250 feet and four are within 500 feet. Aesthetic impacts are significantly higher along S208 compared to its equivalent.
Human Settlement – Displacement	There are no residences within the ROW of Route Segment S208 or its equivalent. There is one non-residential structure within the ROW of Route Segment S208.
Human Settlement – Recreation	There are no changes to impacts to recreation.
Land-Based Economies – Agriculture	Route Segment S208 would traverse more agricultural land than its equivalent, but it would parallel more existing roads. Route Segment S208 would also cut through fewer agricultural fields.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	There are no previously identified archaeological sites or historic resources in Route Segment S208 or its equivalent.
Natural Environment – Public and Designated Lands	Public lands within the ROI of Route Segment S208 and its equivalent include Big Stone County WPAs which are owned by USFWS. Public lands within the ROI of only S208 include the Northern Tallgrass Prairie National Wildlife Refuge which are owned by USFWS. The equivalent would have greater impacts on federally protected wetlands and grasslands within Big Stone County WPAs compared to S208. S208 would not impact federally protected lands within the Northern Tallgrass Prairie National Wildlife Refuge. There are no conservation easement lands within the ROI of S208 or its equivalent.
Natural Environment – Surface Water	Both Route Segment S208 and its equivalent have one waterbody within the ROI, but no waterbody crossings. There are no PWI water basins in the ROI. Both Route Segment S208 and its equivalent have one watercourse within their ROI. Route Segment S208 has three watercourse crossings, while its equivalent does not have any. There are no PWI watercourses within the ROI of either route segment.
Natural Environment – Wetlands and Calcareous Fens	Route Segment S208 would cross fewer wetlands and has a shorter total length of crossings (approximately 400 feet shorter) when compared to the equivalent. S208 crosses about a half-acre more forested wetland compared to its equivalent. There are no changes between S208 and its equivalent for impacts to calcareous fens.
Natural Environment - Vegetation	Route Segment S208 has the same impacts to vegetation as its equivalent as they both have no forested landcover within their ROWs based on the proposed alignments. If the alignment were to move within the permitted route width, S208 would have 1.4 acres of forested landcover that could be impacted whereas its equivalent would have 2.6 acres.

Resource	Summary
Natural Environment – Wildlife and Wildlife Habitat	S208 would intersect more acres of Important Bird Areas than its equivalent (453 acres and 327 acres, respectively) for a longer crossing length (3.6 miles and 2.6 miles, respectively); more acres of Wildlife Action Network corridors (451 acres and 327 acres, respectively) for a longer crossing length (3.6 miles and 2.5 miles, respectively); and more acres of GBCAs (453 acres and 327 acres, respectively). The equivalent would cross WPAs more frequently than S208 (3 crossings and 1 crossing, respectively), intersecting more acres of WPAs (149 acres and 117 acres, respectively) for a longer crossing length (0.9 miles and 0.6 miles, respectively). S208 intersects, but does not cross, 5 acres of the Northern Tallgrass Prairie National Wildlife Refuge; the equivalent avoids this resource.
Natural Environment – Rare and Unique Natural Resources	Route Segment S208 has three records of state endangered species within one mile, one of which (loggerhead shrike) has been documented within the ROW. The equivalent of Route Segment S208 has two records of state endangered species within one mile, neither of which has been documented within its ROW. The ROW of Route Segment S208 would intersect more acres of Prairie Conservation Plan prairie core areas than its equivalent (52 acres versus 37 acres for the equivalent). However, the ROW of the equivalent would intersect 6 acres of native plant communities and 7 acres of Sites of Biodiversity Significance, while Route Segment S208 would avoid these sensitive ecological resources.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Both Route Segment S208 and its equivalent have one waterbody within the ROI, but no waterbody crossings. There are no PWI water basins in the ROI. Both Route Segment S208 and its equivalent have one watercourse within their ROI. Route Segment S208 has three watercourse crossings, while its equivalent does not have any. There are no PWI watercourses within the ROI of either route segment. S208 would not require in water work.

5.2.9.3 Route Segment S210

Route Segment S210 is 4.7 miles long and is an alternative to a part of Routes BSSR01, BSSR03, BSSR06, BSSR10, and BSSR11. Route Segment S210 was proposed to mitigate impacts to a waterbody. Route Segment S210 is shown on Figure 5-10, and Table 5-21 summarizes differences in potential impacts of Route Segment S210 compared to its equivalent.

Table 5-21 Route Segment S210 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment S210 would follow existing infrastructure (transmission lines, roads, railroads) for its entire length compared to its equivalent following existing infrastructure for less than one percent of its length. S210 would follow division lines (field, parcel, or section lines) for 100 percent of its length compared to the equivalent following division lines for 93.8 percent of its length. S210 parallels more total ROW than its equivalent (100 percent and 93.8 percent, respectively).

Resource	Summary
Cost	Route Segment S210 is approximately a mile longer than its equivalent and costs and estimated $6.2 million (36 percent) more; $23,736,500 compared to $17,511,500 for its equivalent.
Human Settlement – Aesthetics	Route Segment S210 and its equivalent would box in the same residence on two boundaries of its property, however, this resident submitted S210 as its preference to mitigate impacts. S210 and its equivalent both have six total residences within 1,600 feet. S210 has three residents within 500 feet whereas its equivalent has two. Route Segment S210 would follow existing infrastructure (transmission lines, roads, railroads) for its entire length compared to its equivalent following existing infrastructure for less than one percent of its length. S210 would have an incremental impact relative to the existing elements it parallels along its landscape, making its aesthetic impacts slightly less than its equivalent.
Human Settlement – Displacement	There are no residences within the ROW of Route Segment S210 or its equivalent. There are no non-residential structures within the ROW of Route Segment S210, but there is one non-residential structure within the ROW of Route Segment S210's equivalent.
Human Settlement – Recreation	Route Segment S210 would increase linear feet of snowmobile trails by approximately 3,700 compared to its equivalent.
Land-Based Economies – Agriculture	Route Segment S210 would traverse more agricultural land than its equivalent, but it would entirely parallel existing roads. Route Segment S210 would also cut through fewer agricultural fields.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	The ROI for Route Segment S210 would intersect two historic architectural resources that are not within the ROI for the BSSR01 equivalent. This includes BS-ODS-00005/Bridge 1060 (a concrete box culvert crossing U.S. Highway 12 over the Stony Run River, determined not eligible for listing on the NRHP) and BS-ODS-00003/Russel & Dorienne Huizenga Farmstead (a farmstead constructed in 1914 with Classical Revival-style architecture, unevaluated for the NRHP). Therefore, S210 would have more potential to impact cultural resources than its equivalent.
Natural Environment – Public and Designated Lands	Public lands within the ROI of Route Segment S210 and its equivalent include Big Stone County WPAs which are owned by USFWS. Public lands within the ROI of only S210 include the Northern Tallgrass Prairie National Wildlife Refuge and the Redhead Marsh WPA, both of which are owned by USFWS. Both S210 and the equivalent would impact federally protected wetlands in Big Stone County WPAs. S210 would impact federally protected grasslands in the Redhead Marsh WPA and the Northern Tallgrass Prairie National Wildlife Refuge that the equivalent avoids (reference (217)). There are no conservation easement lands within the ROI of S210 or its equivalent.
Natural Environment - Vegetation	Route Segment S210 has the same vegetation impacts as its equivalent as they both have no forested landcover within their ROWs based on the proposed alignments. If the alignment were to move within the permitted route width, S210 would have 0.8 acres of forested landcover that could be impacted whereas its equivalent would have none.

Resource	Summary
Natural Environment – Wildlife and Wildlife Habitat	S210 would cross Wildlife Action Network corridors more frequently than its equivalent (9 crossings and 7 crossings, respectively), intersecting more acres of corridors (556 acres and 424 acres, respectively) for a longer crossing length (4.4 miles and 3.3 miles, respectively); intersect more acres of Important Bird Areas (581 acres and 471 acres, respectively) for a longer crossing length (4.7 miles and 3.7 miles, respectively); and intersect more acres of GBCAs (581 acres and 471 acres, respectively). The equivalent would cross WPAs more frequently than S210 (2 crossings and 1 crossing, respectively) for a longer crossing length (1.0 miles and 0.5 miles, respectively), but S210 would intersect more acres of WPAs than its equivalent (123 acres and 98 acres, respectively). S210 intersects, but does not cross, 6 acres of the Northern Tallgrass Prairie National Wildlife Refuge; the equivalent avoids this resource.
Natural Environment – Rare and Unique Natural Resources	Route Segment S210 has three documented records of state endangered or threatened species within one mile, its equivalent has four records. Neither Route Segment S210 nor its equivalent have any records of state endangered or threatened species within their ROW. The ROW of Route Segment S210 would intersect more acres of Prairie Conservation Plan prairie core areas than its equivalent (76 acres versus 58 acres for the equivalent) and more acres of Sites of Biodiversity Significance ranked below (9 acres versus <1 acre for the equivalent). However, the ROW of the equivalent would intersect 3 acres of native plant communities and 6 acres of Sites of Biodiversity Significance ranked moderate, while Route Segment S210 would avoid these sensitive ecological resources.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Both Route Segment S210 and its equivalent have one waterbody within their ROIs. Route Segment S210 has one waterbody crossing and its equivalent has three waterbody crossings. There are no PWI waterbodies in the ROI. Route Segment S210 has two watercourses within the ROI and two watercourse crossings. Its equivalent has only one watercourse within the ROI and one watercourse crossing. Both routes have one PWI watercourse and one PWI watercourse crossing (Stony Run), which is also an impaired watercourse. No in water work would be required.
Natural Environment – Wetlands and Calcareous Fens	Route Segment S210 would cross fewer wetlands and has a shorter total length of crossings (approximately 1000 feet shorter) when compared to the equivalent. S210 crosses less forested wetland in the ROW (by approximately 7 acres) compared to its equivalent. S210 is more distant than its equivalent from the Stony Run calcareous fen, however, impacts are expected to be the same.

5.2.9.4 Alignment Alternative SAA04

Alignment Alternative SAA04 is 0.7 miles long and is an alternative to a part of Routes BSSR02, BSSR04, BSSR06, BSSR08, and BSSR10. Alignment Alternative SAA04 was proposed to decrease potential impacts to farming operations by following a route preferred by the property owner with parcels on both sides of the proposed alignment rather than following property lines. Alignment Alternative SAA04 is shown on Figure 5-10, and Table 5-22 summarizes differences in potential impacts of Alignment Alternative SAA04 compared to its equivalent.

Table 5-22 Alignment Alternative SAA04 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment SAA04 would follow existing infrastructure (transmission lines, roads, railroads) for its entire length compared to its equivalent following existing infrastructure for less than one percent of its length. S210 would follow division lines (field, parcel, or section lines) for 100 percent of its length compared to the equivalent following division lines for 93.8 percent of its length. S210 parallels more total ROW than its equivalent (100 percent and 93.8 percent, respectively).
Cost	Alignment Alternative SAA04 is estimated to cost approximately $0.8 million (20 percent) more than its equivalent; $4,967,500 compared to $4,127,000 for its equivalent.
Human Settlement – Aesthetics	SAA04 appears to require less vegetative clearing for the ROW compared to its equivalent based on aerial imagery. No other aesthetic factors apply, thus, SAA04 has slightly less aesthetic impacts than its equivalent.
Human Settlement – Displacement	There are no residences or non-residential structures within the ROW of Alignment Alternative SAA04 or its equivalent.
Human Settlement – Recreation	There are no changes to impacts to recreation.
Land-Based Economies – Agriculture	There are no changes to impacts to agriculture.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	There are no previously identified archaeological sites or historic resources in Route Segment SAA04 or its equivalent.
Natural Environment – Public and Designated Lands	Public lands within the ROI of Alignment Alternative SAA04 and its equivalent include a Big Stone County WPA which is owned by USFWS; impacts to this resource would not substantially differ between SAA04 and its equivalent. There are no conservation easement lands within the ROI of SAA04 or its equivalent.
Natural Environment - Vegetation	SAA04 and its equivalent do not have any vegetative landcover within their ROWs or route widths, however, aerial imagery appears to demonstrate that SAA04 would require less vegetative clearing for the ROW.
Natural Environment – Wildlife and Wildlife Habitat	SAA04 would intersect 2 less acres of Important Bird Areas, 2 less acres of WPAs, 2 less acres of GBCAs, and 4 less acres of Wildlife Action Network corridors compared to its equivalent; impacts to these resources would not substantially differ between SAA04 and its equivalent.

Resource	Summary
Natural Environment – Rare and Unique Natural Resources	Neither Alignment Alternative SAA04 nor its equivalent have any documented records of federal or state protected species within one mile. The ROW of Alignment Alternative SAA04 would intersect more acres of Prairie Conservation Plan prairie core areas than its equivalent (12 acres versus 6 acres for the equivalent). The ROW of Alignment Alternative SAA04 would intersect 1 acre of a Site of Biodiversity Significance ranked below, while its equivalent would avoid it.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	There are no differences between SAA04 and its equivalent.
Natural Environment – Wetlands and Calcareous Fens	Alignment alternative SAA04 would impact 1 less acre than its equivalent, with no other changes in impacts.

5.3 Swift Subregion Routes

The Swift Subregion includes four routes, six route segments, and three alignment alternatives. The four routes are shown in Figure 5-11 and summarized in Table 5-23. The six route segments and three alignment alternatives are discussed in Section 5.3.9.

Figure 5-11 Swift Subregion Routes

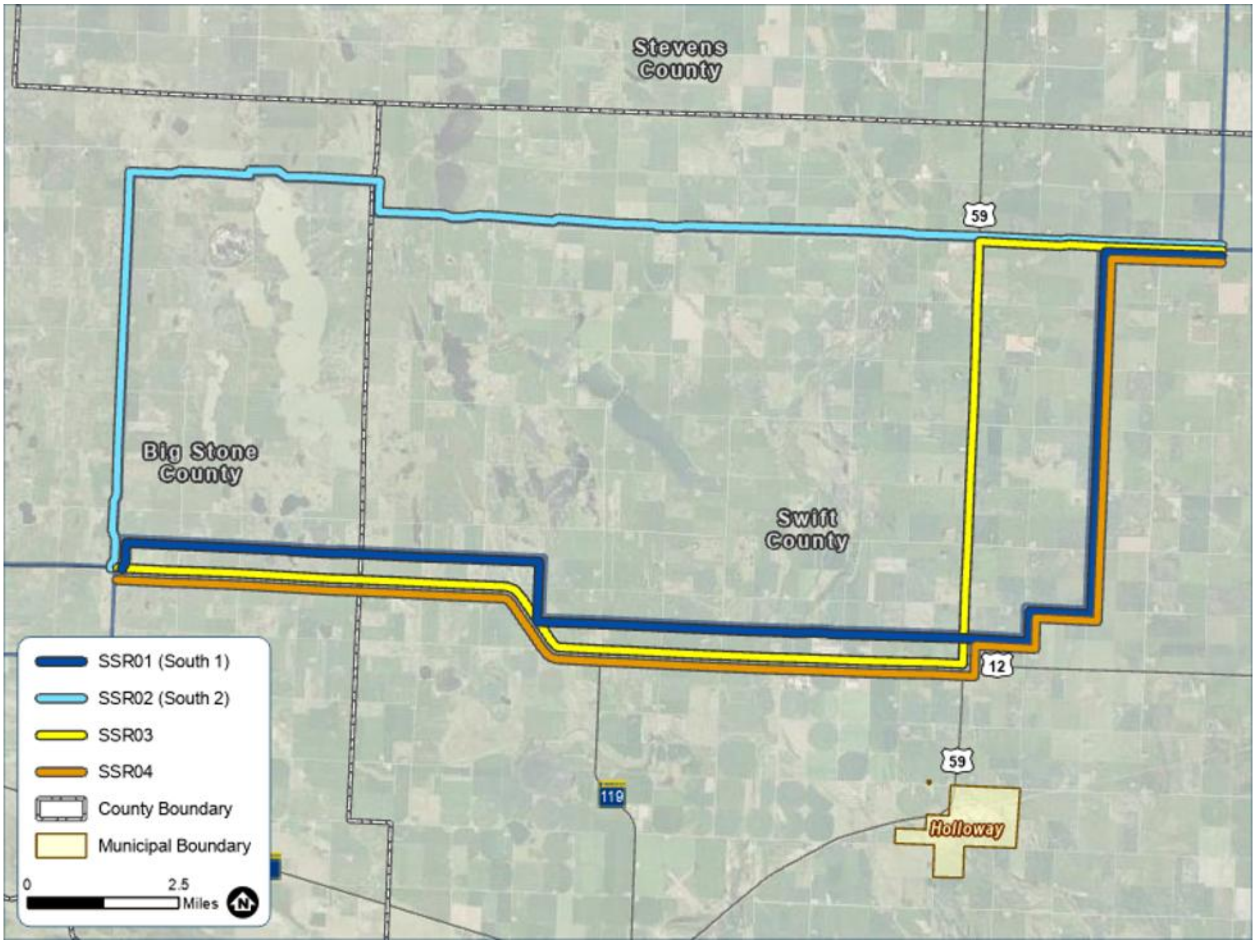


Table 5-23 Swift Subregion Routes

Routing Alternative	Type	Description
SSR01	Route	Follows the applicants' proposed South 1.
SSR02	Route	Follows the applicants' proposed South 2.
SSR03	Route	Uses route segment S211 proposed during scoping to follow Hwy 12, then connects back to the applicants' proposed South 2.
SSR04	Route	Uses a portion of route segment S211 proposed during scoping to follow Hwy 12, then connects back to the applicants' proposed South 1.

5.3.1 Use or Paralleling of Existing Rights-of-Way

The use and paralleling of existing ROW is considered by the Commission when determining the most appropriate route for the project. Opportunities for ROW sharing for the project include public roads, existing transmission lines, and railroads.

Paralleling and/or sharing other types of existing ROW would have an incremental impact relative to existing horizontal elements, such as existing transmission lines, highways and county roads, and/or railroads (collectively referred to as “existing infrastructure”). In some cases, portions of a route could parallel ROW with more than one of these existing features at the same time (e.g., be sharing or paralleling transmission line and be paralleling road ROW). Map 7 illustrates where ROW paralleling occurs and shows existing infrastructure.

As shown in Figure 5-12 and Table 5-24, SSR01 through SSR04 are all between 25.2 miles (SSR02) and 26 miles long (SSR01). SSR02, SSR03, and SSR04 all follow existing ROW for 50 or more percent of their lengths, with SSR03 following existing ROW for the entirety of its length (100 percent). SSR01 follows existing ROW for the smallest percentage of its length (40.4 percent).

Figure 5-12 Swift Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

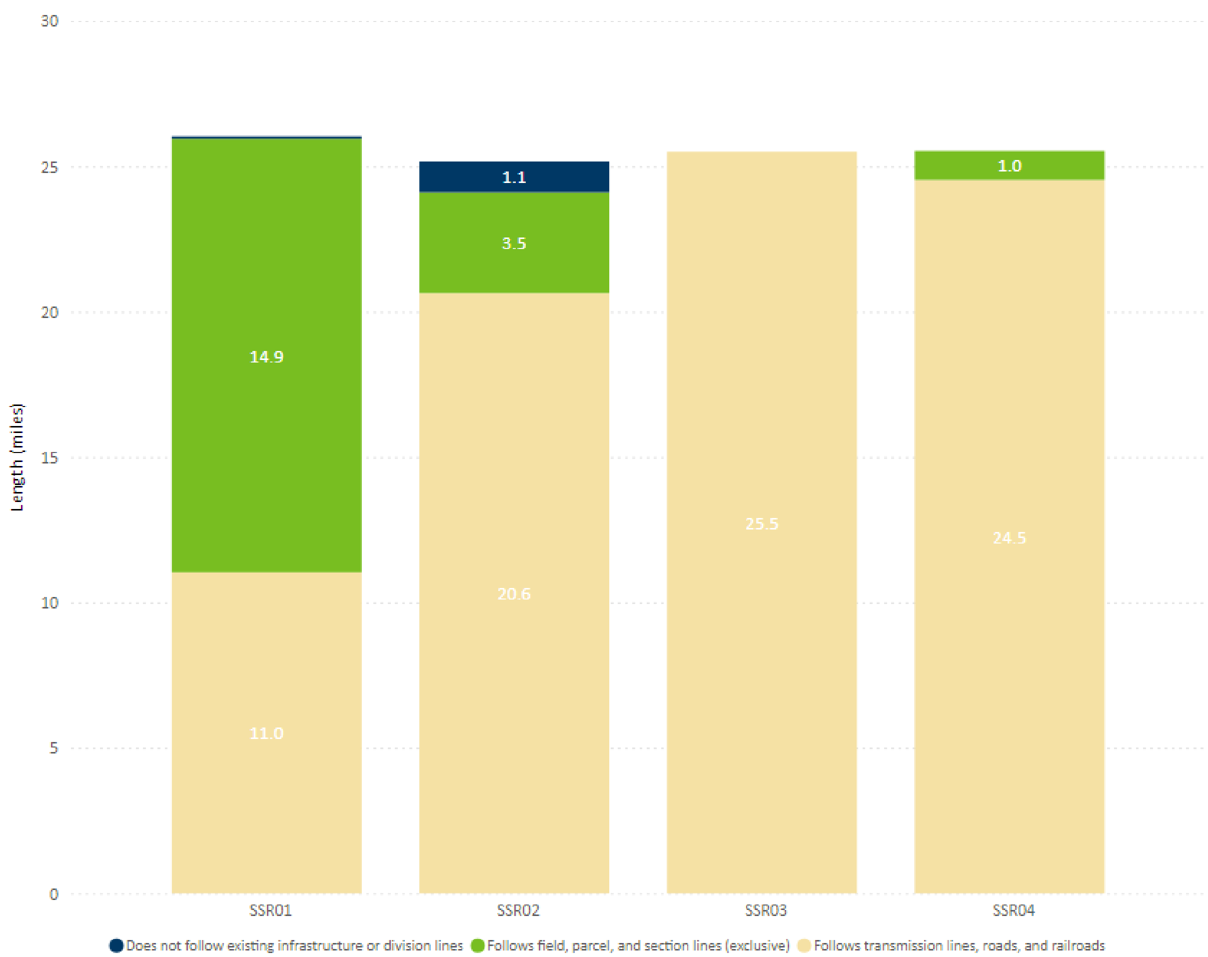


Table 5-24 Swift Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

			Follows existing transmission lines	Follows existing roads		Follows existing infrastructure (transmission lines, roads, and railroads)		Follows field, parcel, and section lines	
Document Name	Total Length (mi)	Length (mi)	%	Length (mi)	%	Length (mi)	%	Length (mi)	%
SSR01	26.0	0.0	0.0	10.5	40.4	10.5	40.4	25.5	98.1
SSR02	25.2	0.0	0.0	19.8	78.7	19.8	78.7	23.5	93.5
SSR03	25.5	0.0	0.0	25.5	100.0	25.5	100.0	25.5	100.0
SSR04	25.5	0.0	0.0	24.5	96.1	24.5	96.1	25.5	100.0

5.3.2 Human Settlement

5.3.2.1 Aesthetics

The ROI for aesthetics is the local vicinity. Transmission lines alter a viewshed (Section 4.3.1). Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes. Determining the relative scenic value or visual importance in any given area is subjective and depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question.

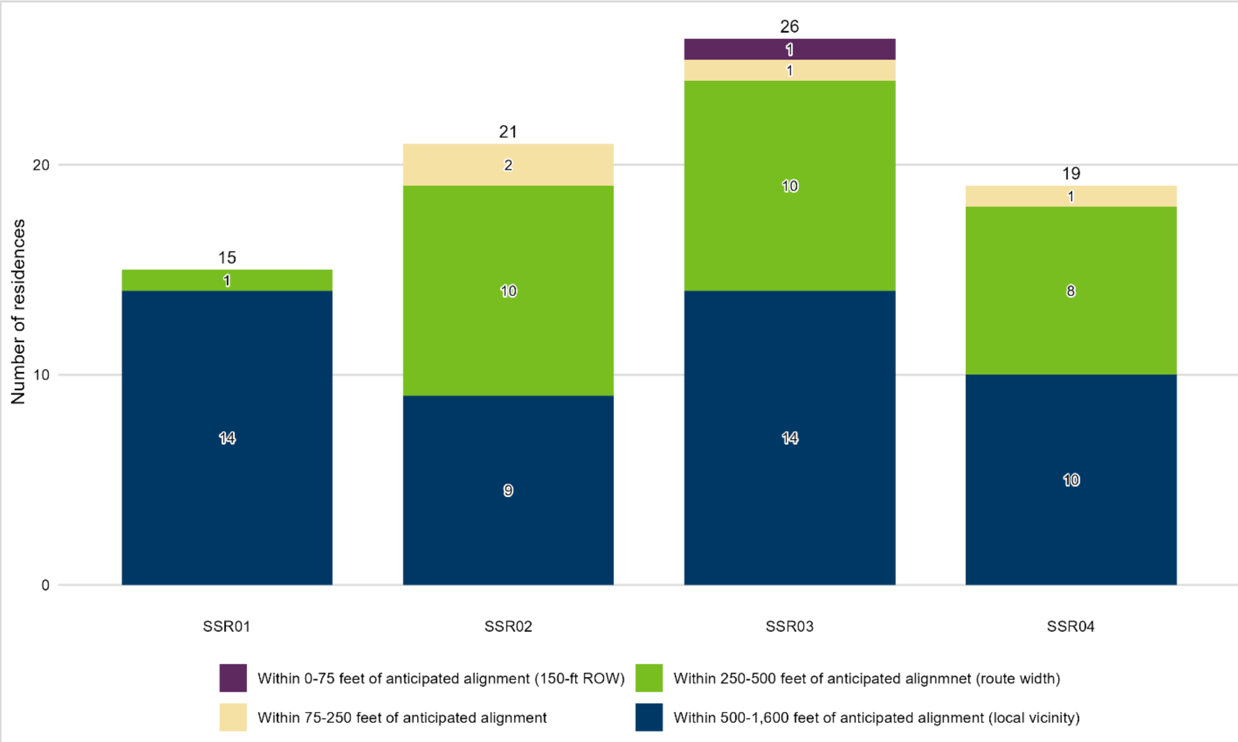
Aesthetic impacts can be minimized by selecting routes farther from homes, schools, businesses, and other places where people congregate such as recreational areas. Aesthetic impacts can also be minimized by following existing transmission line ROW where elements of the built environment already define the viewshed and the addition of a transmission line would have an incremental impact. Following other infrastructure, such as roads and railroads, would also be expected to reduce potential impacts but not to the same extent. Additional details regarding potential impacts to aesthetics and potential mitigation measures for the project as a whole are provided in Section 4.3.1.

Appendix F shows human settlement features such as residences and nursing homes in the local vicinity of the routes in the Swift Subregion. The proximity of residential structures (homes) and non-residential structures to routes at various distances is shown in Figure 5-13 and Table 5-25, respectively. SSR01 and SSR04 have the fewest residences (15 and 19, respectively) in the ROI. SSR01 and SSR02 have the fewest non-residential structures (133 and 152, respectively) within the local vicinity. SSR03 has the most residences (26) and non-residential structures (194) within the local vicinity.

Recreational resources where people might congregate identified within the ROI include the West Central Trail Blazer snowmobile trails, Ridge Runner snowmobile trails, Big Stone Lake Sno-Rider snowmobile trails, and Pomme de Terre River State Water Trail (Map 10-1 through Map 10-5;

Section 5.3.2.8) and the Old Gravel Pit WMA (Map 18-3). Recreational resources are defined and discussed for the project as a whole in Section 4.3.9.

Figure 5-13 Swift Subregion, Proximity of Residential Structures



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

Table 5-25 Swift Subregion, Proximity of Non-Residential Structures

Non-Residential Structures	Route			
Distances from Anticipated Alignment	SSR01	SSR02	SSR03	SSR04
0-75 feet (150-foot-ROW)	0	0	5	0
75-250 feet	9	19	25	18
250-500 feet (generally route width)	11	45	41	31
500-1,600 feet (local vicinity)	113	88	123	112
Total	133	152	194	161

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

Aesthetic impacts to snowmobile trails in the Swift Subregion are expected to be minimal due to the limited length of trail within the ROI (approximately 1.2 to 3.2 miles). In addition, all of the snowmobile trail cross routes rather than run in parallel except along SSR02 where snowmobile trails already follow road ROW (Map 10-3). Where snowmobile trails run in parallel along roads, the addition of a transmission line would have minimal aesthetic impacts due to the existing built environment. SSR02 has seven snowmobile trail crossings, whereas all other routes cross snowmobile trails twice.

All routes in the Swift Subregion except SSR02 contain the Pomme de Terre River State Water Trail in the ROI and cross it once (Map 10-4). The Pomme de Terre River is not designated as a state water trail where SSR02 crosses it. There is public water access on this river near the anticipated alignment for SSR04. The Pomme de Terre River State Water Trail would be most impacted by SSR01 which has approximately 9,250 of the river in its ROI, mostly near the alignment. This winding stretch of state water trail would be visible in the ROI when in recreational use. This stretch also currently buffers view of the anticipated alignment with tall growing vegetation that would be partially removed to accommodate a 150-foot-wide ROW for SSR01. Impacts to aesthetics to the Pomme de Terre River State Water Trail for SSR01 would be moderate given that local impacts are more significant but also isolated in comparison to the entire length of water trail.

Several streams, creeks, and public ditches are crossed by routes in the Swift Subregion (Map 14-2 through Map 14-5). The Pomme de Terre River is the major watercourse in the subregion, which is crossed once each by SSR01, SSR02, and SSR04. SSR04 follows State Highway 12 with existing infrastructure and vegetative clearing that crosses the river, whereas SSR01 would create a new river crossing. New river crossings with existing forested vegetation would require clearing and create significant aesthetic impacts. This clearing and impact would be prevalent for SSR01 and SSR02. Small water basins are crossed by some of the routes as well, most of which could be avoided if the current alignment were to move within the route width. The north end of Artichoke Lake, the largest waterbody in the subregion, can be avoided by all routes, however, SSR02’s route width could cause a crossing. Vegetation clearing would be required, and impacts would be minimized if SSR02 follow the anticipated alignment along existing road ROW.

Aesthetic impacts will be greater in areas where no existing infrastructure that is linear, such as other transmission lines or railroads, are present. All routes cross existing transmission lines once except for SSR02 which crosses existing transmission lines five times. The main transmission line in the ROI generally follows 620th Avenue (Map 7-2 and Map 7-3). There are no railroads in the Swift Subregion. Section 5.3.1 has further discussion on the use or paralleling of existing right of way for each route in the Swift Subregion.

Each route would parallel with existing infrastructure or division lines as shown in Map 7-2 through Map 7-5. These maps illustrate existing infrastructure and division lines in the region, including roads, railroads, transmission lines, and parcel lines. In some cases, portions of a route could parallel ROW with more than one of these existing features at the same time. Table 5-24 quantifies the length and percentage of each type of paralleling for each route in the Swift Subregion. Figure 5-12 demonstrates the same information in a chart based on length.

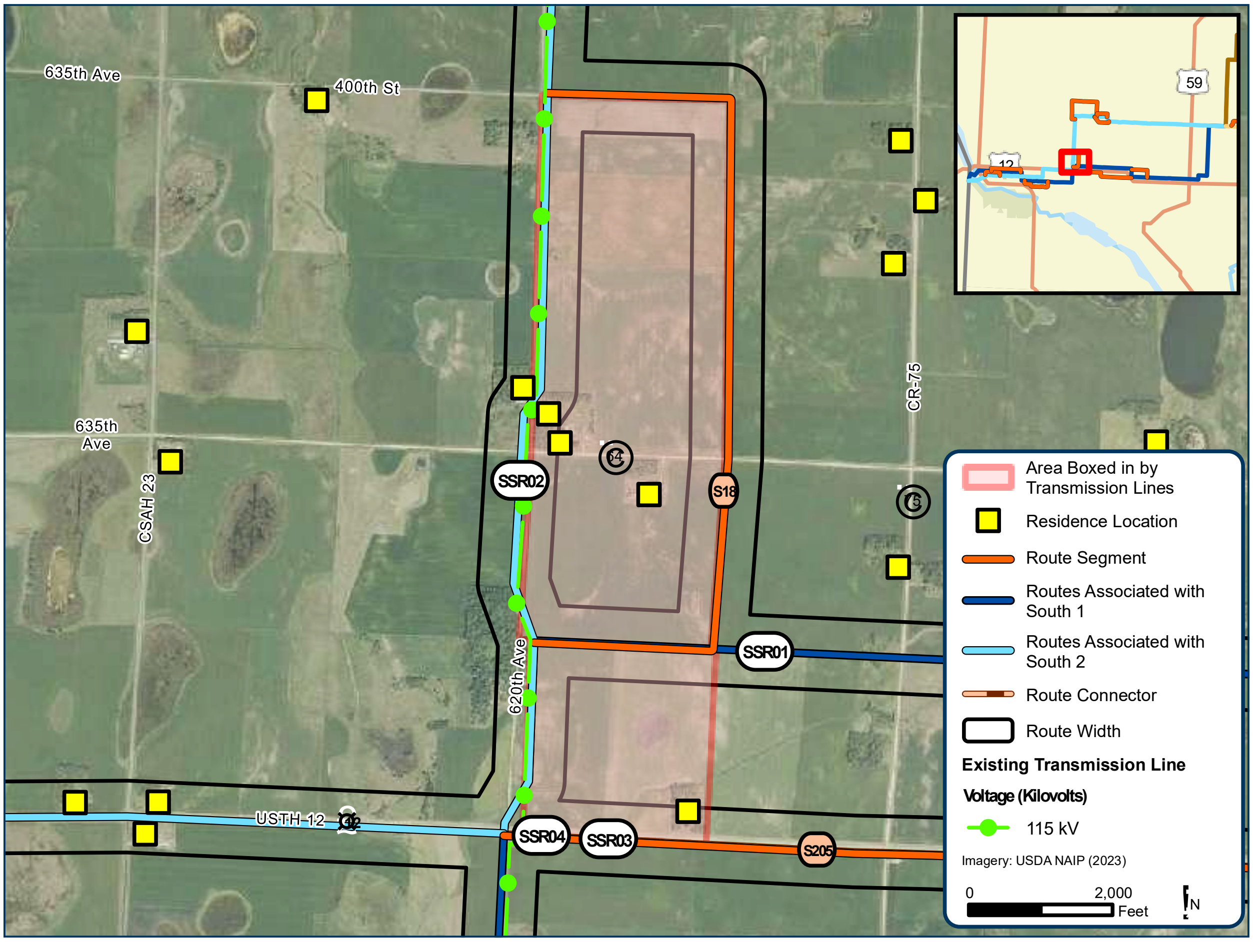
All routes are relatively similar in the percentage of parallelling with all types of existing infrastructure and all routes have similar total lengths. SSR03 and SSR04 parallel the most with 100 percent (25.5 miles) of their lengths. SSR02 parallels the least existing infrastructure with approximately 96 percent

(24 miles) of its length. Aesthetics are minimized by paralleling with existing transmission line ROW rather than all types of existing ROW, which includes roads and parcel lines. Where transmission line structures already define the viewshed, more transmission line structures would have an incremental impact. SSR02 follows the most existing transmission lines for approximately 32 percent of its length (8 miles) whereas SSR03 and SSR04 follow no existing transmission lines (0 miles). Aesthetic impacts are more moderate for residents in the ROI along routes that parallel with less existing transmission lines.

There are three areas in the Swift Subregion where routes box in parcels on two sides of their property with existing transmission lines and portions of the proposed transmission line. Area 1, as shown in Figure 5-14 is in Big Stone County, north of Akron Township. The southernmost parcel is bordered by an existing line on the west side and SSR03 or SSR04 on the south or SSR01 on the north. The middle parcel is bordered by an existing line on the west and SSR01 on the south side. The existing line is a 115 kV line. If SSR02 is combined with route segment S18, the parcel would be bordered on three sides. The parcels in this area would be subject to significant aesthetic impacts.

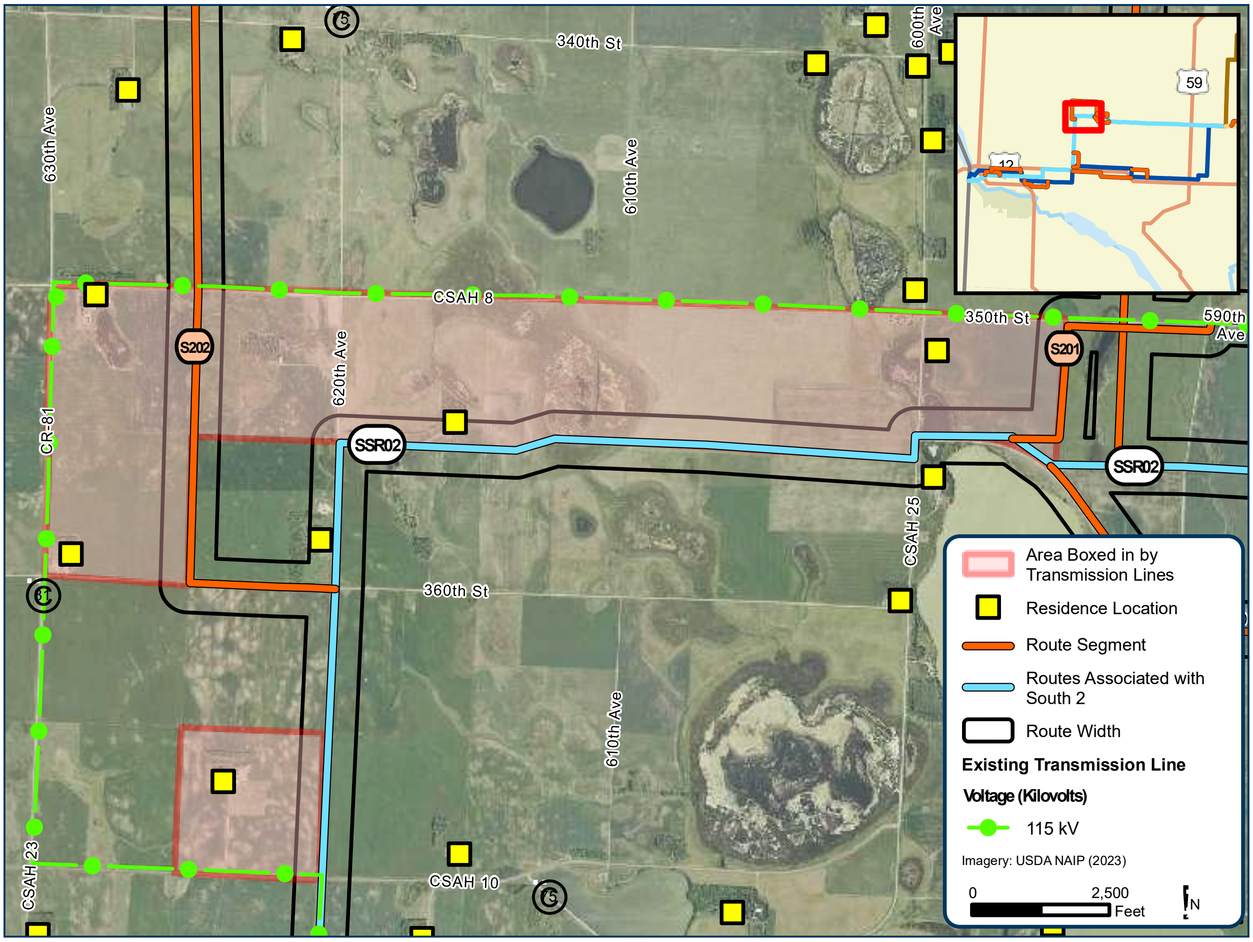
There is one area in the Swift Subregion where a pinch point would be created between two residences by an existing transmission line and SSR02 as shown on Figure 5-14. This location is also in Area 1, Big Stone County, in Akron Township. The existing line is a 115 kV line. These residences would be subject to significant aesthetic impacts.

Figure 5-14 Swift Subregion Area 1 Bordered by Existing Transmission and SSR01, SSR02, SSR03, and SSR04



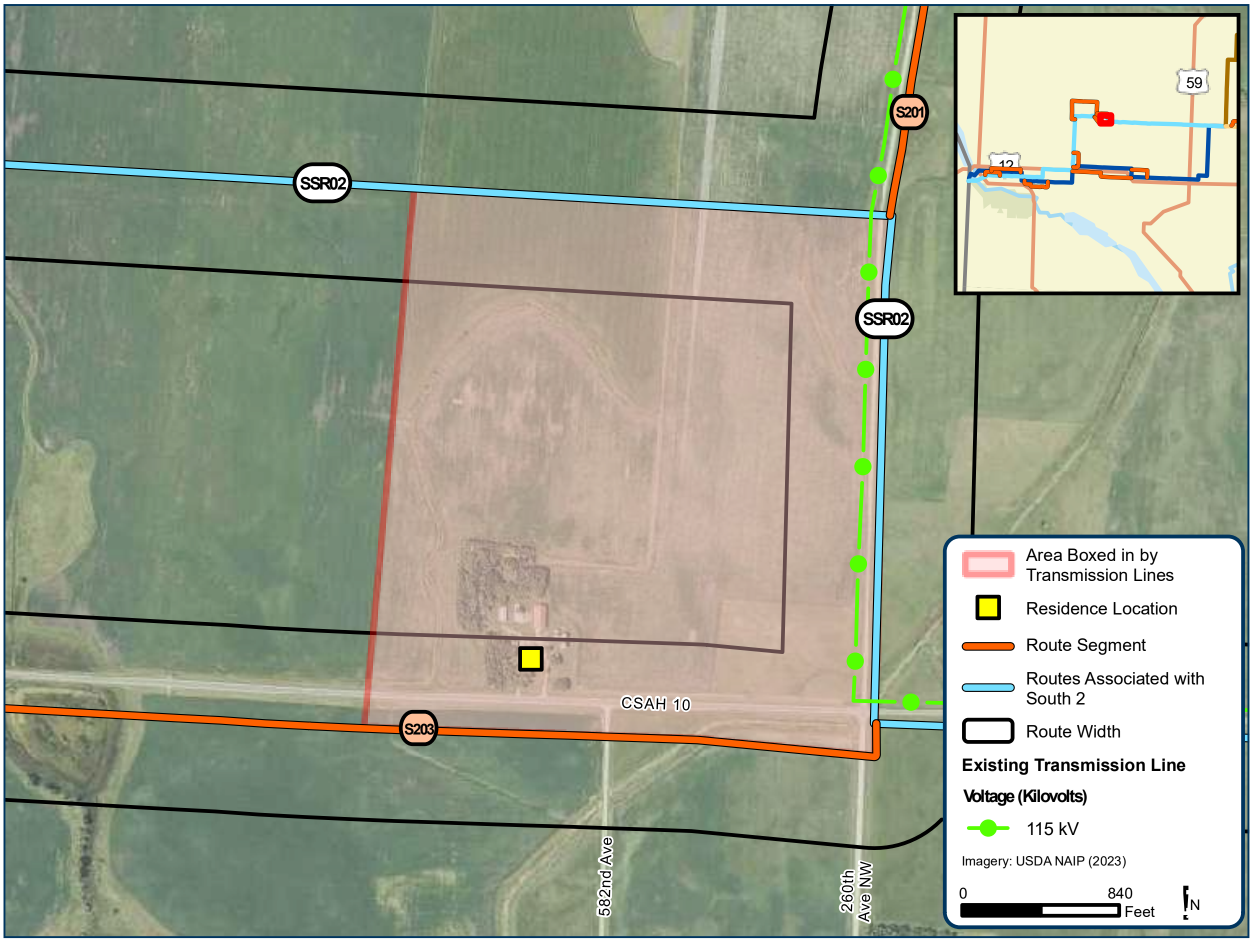
SSR02 would box in two residential parcels on two sides of their property with existing transmission lines and portions of the proposed transmission line. Area 2, as shown in Figure 5-15, is in Big Stone County, within Artichoke Township. The existing line is a 115 kV line. These residences would be subject to significant aesthetic impacts.

Figure 5-15 Swift Subregion Area 2 Bordered by Existing Transmission and SSR02



SSR02 would box in one residential parcel on two sides of their property with an existing transmission line and portions of the proposed transmission line. Area 3, as shown in Figure 5-16, is in Big Stone County, within Artichoke Township. The existing line is a 115 kV line. This residence would be subject to significant aesthetic impacts.

Figure 5-16 Swift Subregion Area 3 Bordered by Existing Transmission and SSR02



5.3.2.2 Cultural Values

An assessment of potential impacts to cultural values is discussed for the entire project in Section 4.3.2. The impact assessment was completed for the project as a whole because there is limited variability in cultural values across the routing alternatives. Impacts to cultural values are independent of the route selected.

5.3.2.3 Displacement

There is one residence within the ROW of SSR03 within the Swift Subregion. There are five non-residential structures (agricultural buildings) within SSR03's ROW. The residential and non-residential structures are shown in Map 9-2 through Map 9-5. There are no other residences or non-residential structures within the ROI of the other routes. An overview regarding displacement, the general impacts from construction and operation of the project, and ways to avoid, minimize, and mitigate these impacts are in Section 4.3.3.

If this residence cannot be avoided by prudent routing or adjustment of the ROW within the route width, impacts would be significant. It is expected that even if SSR03 is chosen, the ROW would be able to be adjusted within the route width to avoid displacement; if a route permit is issued, it may become apparent after final engineering and design that impacts to this residence are unavoidable. The applicants would work with landowners on a case-by-case basis to address potential displacement and may need to conduct a site-specific analysis to determine if displacement would occur.

5.3.2.4 Environmental Justice

Census Tract 9604 is crossed by SSR01, SSR02, SSR03, and SSR04, and was identified as a potential area of concern for environmental justice. Section 4.3.5 discusses the impact assessment of this census tract and potential impacts.

5.3.2.5 Land Use and Zoning

An assessment of potential impacts to land use and zoning is discussed in Section 4.3.6. The impact assessment for land use and zoning was completed for the project as a whole because there is limited variability in zoning impacts among the routing alternatives.

5.3.2.6 Noise

An assessment of potential impacts from noise is discussed for the entire project in Section 4.3.7. The impact assessment for noise was completed for the project as a whole because there is limited variability in the potential for noise across the routing alternatives.

5.3.2.7 Property Values

An assessment of potential impacts to property values is discussed for the entire project in Section 4.3.8. The impact assessment for property values was completed for the project as a whole because there is limited variability in the potential for property value impacts across the routing alternatives and changes to a specific property's value are difficult to predict. Potential impacts would be minimized by minimizing aesthetic impacts; aesthetic impacts are analyzed by subregion in Chapters 5 through 7.

5.3.2.8 Recreation

The ROI for recreation is the route width. Intermittent and localized indirect impacts could occur during construction (for example – increased noise levels); long-term impacts during operation could occur in the form of aesthetic impacts (Section 4.3.1.2). Given that direct long-term effects are predominantly related to aesthetics, the indirect long-term repercussions on recreation are anticipated to be subjective, meaning that responses vary based on individual perspectives and experiences. Impacts to recreation are assessed through identification of recreational resources within the ROI. The project is not anticipated to directly impede recreational activities within the ROI such as snowmobiling, golfing, canoeing, hunting, or fishing. Additional details regarding potential impacts to recreation and potential mitigation measures for the project are provided in Section 4.3.9.

A state water trail and snowmobile trails are present within the Swift Subregion (Map 10-2 through Map 10-5 and Table 5-26). Routes in the Swift Subregion do not cross any land-based public trails, wild and scenic rivers, or scenic byways.

The Pomme de Terre River is designated as a state water trail, as described in Section 4.3.9. SSR01, SSR03, and SSR04 cross the river in one location (Map 10-4). SSR02 does not cross the river. Aesthetic impacts related to the watercourse crossings are discussed in Section 5.3.2.1.

One public water access, Pomme De Terre River Hwy 12 Public Water Access Site, is within the route width of SSR03 and SSR04 (Map 10-4). The anticipated alignment does not cross or restrict access to the public water access; no impacts are anticipated as described in Section 4.3.9.

Multiple snowmobile trails are present in the Swift Subregion including the Big Stone Lake Sno-Rider Trails, Ridge Runner Trails, and West Central Trail Blazers Trails. SSR02 has the most snowmobile crossings (7) and linear length (1.4 miles) in the ROI while the other route ROIs have two snowmobile crossings and 0.4 miles of linear length within them.

Public lands, including Waterfowl Production Areas, in the Swift Subregion are publicly accessible and can be used for recreational purposes. These public lands are also used for wildlife management and are discussed in Section 5.3.6.8.

Table 5-26 Swift Subregion, Recreational Resources within Route Width

Recreational Resource	Unit	Routes			
		SSR01	SSR02	SSR03	SSR04
Pomme de Terre River State Water Trail	Crossings (linear feet) [1]	1 (4,144)	0 (0)	1 (1,012)	1 (1,012)
Pomme De Terre River Hwy 12 Public Water Access Site	Crossings	0	0	1	1
Snowmobile Trail [2]	Crossings (miles)	2 (0.4)	7 (1.4)	2 (0.4)	2 (0.4)

[1] Linear feet totals are taken from the DNR Minnesota State Water Trails Dataset
[2] Snowmobile trails within Swift Subregion include: Big Stone Lake Sno-Rider Trails, Ridge Runner Trails, West Central Trail Blazers Trails

5.3.2.9 Socioeconomics

An assessment of potential impacts to socioeconomics is discussed for the entire project in Section 4.3.10 because there is limited variability in socioeconomic impacts among the routing alternatives.

5.3.2.10 Transportation and Public Services

An assessment of potential impacts to transportation and public services, including roadways, railroads, emergency services, airports, and utilities, is discussed for the entire project in Section 4.3.11. The impact assessment for transportation and public services was not analyzed at the subregional level because there is limited variability across the routing alternatives.

5.3.3 Human Health and Safety

An assessment of potential impacts to human health and safety is discussed for the entire project in Section 4.4. The impact assessment was completed for the project as a whole because there is limited variability across the routing alternatives and impacts would be minimized by prudent routing and adhering to applicable transmission line standards and codes.

5.3.4 Land-based Economies

Impacts to land-based economies are assessed by considering four elements: agriculture, forestry, mining, and tourism. Impacts and mitigation related to land-based economies are analyzed for the project as a whole in Section 4.5. The primary land-based economic activity in the project area is agriculture. The primary means of mitigating impacts to land-based economies is prudent routing; that is, by choosing routing alternatives that avoid such economies.

5.3.4.1 Agriculture

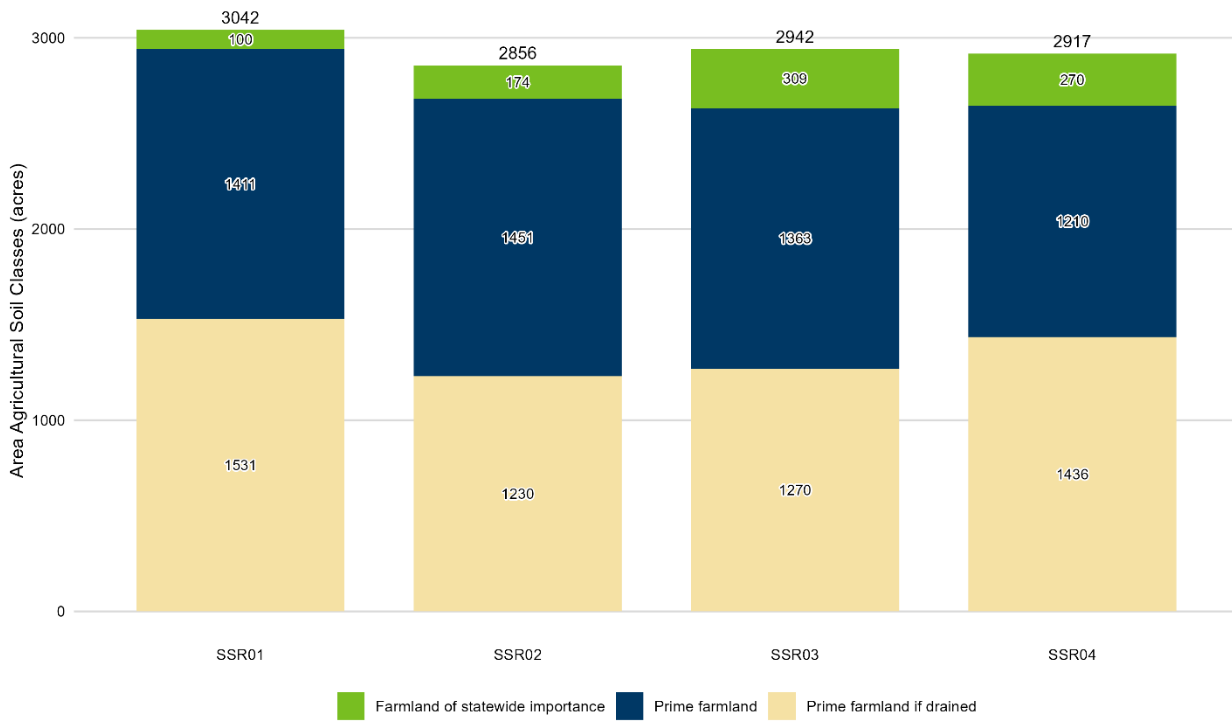
The ROI for agriculture is the route width. Construction and operation of a transmission line impacts agriculture (Section 4.5.1.2). During construction, impacts would include limited use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Permanent impacts would also occur when the footprint of the transmission line structures directly impedes agricultural production and/or impedes efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields.

Prudent routing (paralleling existing infrastructure and/or paralleling division lines) could minimize potential impacts. Implementation of the AIMP (Appendix K) would minimize and mitigate impacts to agriculture. Additional detail regarding potential impacts to agriculture and potential mitigation measures is provided in Section 4.5.1.

Figure 5-17 summarizes the total acres within the route widths of the Swift Subregion routes that have designated soil classifications for prime farmland and farmland of statewide importance. Figure 5-18 summarizes the total acres within the route widths of the Swift Subregion routes that are designated agricultural land use. Most land (70 percent or more) within the route widths of the routes in the Swift Subregion is designated as agricultural land use (cultivated crops and hay/pasture; see Section 5.3.2.5). SSR02 has the most prime farmland, while SSR04 has the least prime farmland. SSR01 has the most agricultural land. SSR03 has the least agricultural land.

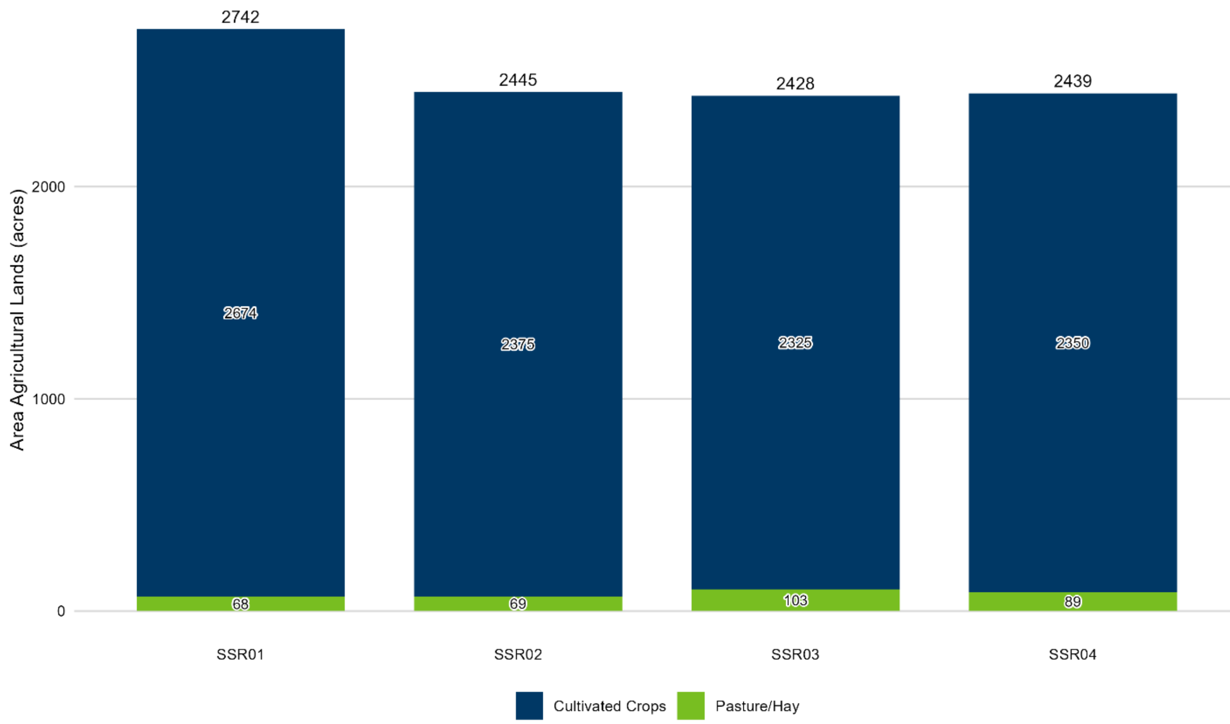
Routing with existing infrastructure or division lines, such as parcel or agricultural fields, would reduce impacts to agriculture. As noted in Table 5-24, SSR03 parallels the most existing infrastructure (100 percent of its total length) while SSR01 parallels the least amount (40 percent). SSR02 has the greatest distance that does not follow existing infrastructure or division lines (1.1 miles), while SSR03 and SSR04 completely follow existing infrastructure or division lines (Figure 5-12).

Figure 5-17 Swift Subregion, Prime Farmland within Route Widths



Source: Prime farmland/farmland of statewide importance, SSURGO (Appendix D)
Not all prime farmland is farmed.

Figure 5-18 Swift Subregion, Acres of Agricultural Lands within Route Width



Source: Agricultural land, NLCD (Appendix D)

Center pivot irrigation systems present in the Swift Subregion are shown on Map 13-2 through Map 13-5

While not crossed by its anticipated alignment, there is one center pivot irrigation system within the route width of SSR01. The anticipated alignment is north of the center pivot irrigation system outside of the agricultural field, thus impacts are not expected (Map 13-4).

While not crossed by its anticipated alignment, there are four center pivot irrigation systems within the route width of SSR02. The anticipated alignment avoids impacts to all of the center pivot irrigation systems because it parallels 60th Street NW and does not cross into the agricultural fields (Map 13-4).

One center pivot irrigation system is crossed by the anticipated alignment of SSR03 and SSR04 (Map 13-4). These structures could potentially impede or eliminate usability of the center pivot irrigation systems by necessitating reconfiguration to accommodate structures or by reducing crop revenue due to changes in irrigation practice. Impacts could range from minimal to significant and include restrictions that may limit future irrigation options such as linear irrigation and corner system irrigation. There are two other pivot irrigation systems within the route width of SSR03 and SSR04; however, the anticipated alignments avoid impacts to the center pivot irrigation systems because they parallel Highway 12 SW or do not cross the center pivot irrigation system portion of the agricultural fields (Map 13-4).

The RIM/CREP program provides financial incentives to farmers to remove land from production (Section 4.7.6). Farmers within the route widths of the routes in the Swift Subregion participate within the CREP and RIM programs (Section 5.3.6.6); however, no anticipated alignment in this subregion crosses an easement area. If one of these routes are permitted, it is anticipated that the easements will be avoided if the alignment is adjusted during final design. Additional discussion regarding the potential to avoid the easement areas is provided in Section 5.3.6.6. Impacts can be mitigated by compensating individual landowners through negotiated easement agreements.

5.3.4.2 Forestry

An assessment of potential impacts to forestry is discussed for the entire project in Section 4.5.2. Impacts to forestry are anticipated to be negligible to minimal and independent of the route selected.

5.3.4.3 Mining

The ROI for mining is the route width. Impacts to aggregate mining could include interference with access to aggregate resources or the ability to successfully mine these reserves (Section 4.5.3.2). If future geophysical surveys are planned, the surveying technology could also be impacted. Potential impacts are assessed through identification of known, existing and prospective mining operations and assessing potential impacts to those current or potential future operations. If the potential for impacts to mining operations would occur, the applicants would be required to coordinate those impacts with the mining operator (Section 4.5.3.3).

Two active mining operations, including MN ASIS Number 76010, are present with the route width of routes in the Big Stone Subregion. However, the anticipated alignment of the routes does not cross mining workspaces; therefore, impacts are anticipated to be negligible.

5.3.4.4 Tourism

An assessment of potential impacts to tourism is discussed for the entire project in Section 4.5.4. Impacts to tourism are anticipated to be negligible to minimal and independent of the route selected.

5.3.5 Archaeological and Historic Resources

The ROI for archaeological sites and historic cemeteries is the route width. The ROI for historic resources is the 1600-foot buffer on either side of the anticipated alignment, which accounts for resources outside of the route width but within visual range of the project.

The analysis of impacts to archaeological and historic resources takes NRHP eligibility into account. Pursuant to state (Minnesota Statutes § 138.661 to 138.669) and federal law (36 CFR 800), only resources that are eligible, listed, or unevaluated for the NRHP have the potential to be adversely affected by the project. For additional information regarding NRHP eligibility, see Section 4.6.1.

Impacts to archaeological and historic resources could result from construction activities such as ROW clearing, placement of structures, the construction of access roads, temporary construction areas, and vehicle and equipment operation (Section 4.6.2). Impacts could also result from the removal of

historic buildings or structures, or if the project is near or within view of a resource (typically a historic building, structure, or TCP). Additional details concerning potential impacts and mitigation regarding archaeological and historic resources for the project as a whole are provided in Section 4.6.3.

Documented archaeological and historic resources within the Swift Subregion are summarized in Table 5-27 and Table 5-28. Table 5-27 summarizes the number of archaeological and historic resources within the ROI (which is the route width for archaeological sites and historic cemeteries, and a 1,600-foot buffer on either side of the anticipated alignment for historic architecture). Table 5-28 provides descriptions of the resources located within the ROIs.

Additional cultural resources may be in the ROIs; reconnaissance survey and evaluation would be necessary to determine whether any other significant archaeological and/or historic resources are present and could be impacted by project activities. If a route permit is issued, the applicants would coordinate with landowners to proceed with these surveys in the permitted route and surrounding areas to include access roads and other areas of potential ground disturbance.

Table 5-27 Swift Subregion, Cultural Resource counts within Route's ROI

Route	Archaeological Sites				Historic Architecture				Historic Cemeteries
	Not Eligible	Unevaluated	Eligible or Listed	Total	Not Eligible	Unevaluated	Eligible or Listed	Total	
SSR01	0	1	0	**1**	3	1	0	**4**	1
SSR02	0	3	0	**3**	3	7	0	**10**	2
SSR03	0	2	0	**2**	4	3	0	**7**	0
SSR04	0	2	0	**2**	4	2	0	**6**	0

Table 5-28 Swift Subregion, Descriptions of Cultural Resources within Route's ROI

Route	Site / Resource Number	Resource Type	Resource Name/Type	NRHP Status	Description
SSR01, SSR03, SSR04	21SW0013	Archaeological Site	The Roadside Park Site/Precontact Lithic Scatter	Unevaluated	Archaic Period 800m X 150m lithic scatter consisting of lithic debitage and tools, including two diagnostic projectile points (reference (218))
SSR03, SSR04	21SW0028	Archaeological Site	Mary Emde Site/Precontact Lithic Scatter	Unevaluated	Archaic Period 400m x 150m lithic scatter consisting of lithic debitage and tools, including one diagnostic projectile point (reference (219))
SSR02	21SW0049	Archaeological Site	Minnesota Farms Site/Precontact Lithic Scatter	Unevaluated	Woodland Period 20m X 20m lithic scatter consisting of lithic debitage and tools, including one diagnostic projectile point (reference (220))
SSR02	21SW0050	Archaeological Site	Precontact lithic scatter	Unevaluated	Precontact lithic scatter 40m x 40m, consisting of lithic debitage (reference (221))
SSR02	21BSf	Archaeological Site	Undetermined artifact scatter	Unevaluated	Alpha site of undetermined time period; reported artifact scatter (reference (222))
SSR02	BS-ART-00002	Historic Architecture	School	Unevaluated	Surveyed 1984; constructed 1885

Route	Site / Resource Number	Resource Type	Resource Name/Type	NRHP Status	Description
SSR02	SW-FAI-00002	Historic Architecture	Fairfield Store	Unevaluated	Surveyed 1983; constructed in 1920
SSR02	SW-FAI-00003	Historic Architecture	Fairfield Town Hall	Unevaluated	Surveyed 1983; constructed in 1905
SSR03	SW-FAI-00008	Historic Architecture	Farmstead	Unevaluated	Surveyed 1983; constructed 1900
SSR02	SW-FAI-00010	Historic Architecture	Bridge No. 89463	Unevaluated	Bridge crossing CSAH 22 over the Pomme de Terre River; constructed 1948
SSR02	SW-FAI-00013	Historic Architecture	Bridge No. 76518	Not Eligible	Bridge crossing CSAH 22 over the Pomme de Terre River
SSR02	SW-HEG-00001	Historic Architecture	Drywood Lutheran Church	Unevaluated	Surveyed 1983; constructed 1925
SSR02	SW-HEG-00002	Historic Architecture	James McGuire Farmstead	Unevaluated	Surveyed 1983; constructed 1890
SSR02	SW-HEG-00003	Historic Architecture	St. Agnes Church	Unevaluated	Surveyed 1983; constructed 1879
SSR01	SW-MOY-00005	Historic Architecture	Bridge No. 3858	Unevaluated	Pratt through truss bridge crossing 190th Avenue over the Pomme de Terre River; constructed 1923
SSR03, SSR04	SW-MOY-00006	Historic Architecture	Bridge No. 5359	Unevaluated	Bridge crossing U.S. Hwy 12 over the Pomme de Terre River; constructed 1934
SSR03, SSR04	SW-MOY-00007	Historic Architecture	Pomme de Terre Parking Area	Not eligible	Constructed 1935/1960
SSR03, SSR04	SW-MOY-00008	Historic Architecture	Bridge No. 5359	Unevaluated	Bridge crossing TH 26 over the Pomme de Terre River; constructed 1934
SSR01	SW-MOY-00009	Historic Architecture	Bridge No. 2335	Not eligible	Bridge crossing the Pomme de Terre River
SSR03, SSR04	SW-SHI-00004	Historic Architecture	Bridge No. 1121	Not Eligible	Bridge crossing U.S. Hwy 12 over a stream

Route	Site / Resource Number	Resource Type	Resource Name/Type	NRHP Status	Description
SSR01, SSR02, SSR03, SSR04	XX-ROD-00111	Historic Architecture	Trunk Highway 12	Not eligible	Active U.S. Highway 12; constructed 1921
SSR01, SSR02, SSR03, SSR04	XX-ROD-00168	Historic Architecture	Trunk Highway 59	Not eligible	Active Trunk Highway 59; constructed 1935
SSR01	19406	Historic Cemetery	Unknown Cemetery	N/A	"Burials of 3 small children on E. G. Redfield farm, 1879" (reference (113))
SSR02	24356	Historic Cemetery	Good Shepard Church Cemetery	N/A	Also known as Drywood Cemetery, this is an existing, delineated cemetery consisting of 193 memorials, c. 1887 (reference (223))
SSR02	24357	Historic Cemetery	St. Agnes Church Cemetery	N/A	Existing, delineated cemetery consisting of 56 memorials, established 1879 (reference (224)).

5.3.5.1 Archaeological Resources

Five documented archaeological sites, none of which have been evaluated for listing on the NRHP, are present within various route widths in the Swift Subregion (Table 5-28). Four of these sites consist of precontact lithic scatters, all identified during a Phase I archaeological survey conducted in 2010 by Minnesota State University, Moorhead (references (225); (226); (227)). These sites are concentrated along the Pomme de Terre River and in the lakes region near Artichoke, Minnesota.

Site 21BSf is an alpha site, which is an archaeological site that has been reported based on maps, first-hand accounts or other historic documentation, but has not been investigated by a qualified archaeologist. Site 21BSf is reported to consist of an artifact scatter from an unknown time period and no additional information is available.

SSR01 contains one unevaluated archaeological site within the route width and therefore would have the least potential to impact known archaeological resources. SSR03 and SSR04 each contain two unevaluated sites within their route widths. SSR02 contains three unevaluated archaeological sites in the route width and therefore has the most potential to impact known archaeological resources. However, one site (21BSf) could be avoided by using route segment S202, which contains no cultural resources within its ROI.

5.3.5.2 Historic Resources

Historic architectural resources within the Swift Subregion include 13 unevaluated resources and six ineligible resources, as shown in Table 5-28. Unevaluated resources include churches, bridges, farmsteads, a school, a town hall, and a retail store, constructed between the late nineteenth and mid-twentieth centuries. The majority of these resources were surveyed in 1983-1984, and it is unclear whether the original structures currently remain standing.

All of the proposed routes contain at least one historic architectural resource that has not been evaluated for listing on the NRHP within the ROI. SSR01 contains just one unevaluated resource within the ROI, and therefore would have the least potential impact to significant historic architectural resources. SSR02 contains seven unevaluated resources within the ROI and thus would have the most potential impact to significant historic architectural resources.

5.3.5.3 Historic Cemeteries

There are three unrecorded, historic cemeteries mapped within the Swift Subregion route widths.

SSR01 may contain one historic cemetery within the route width (19406/Unknown Cemetery). This cemetery is reported to consist of three child burials on a family farmstead. However, this cemetery is mapped at the PLS Forty level, and its exact location is not known. SSR02 contains two historic cemeteries (24356/Good Shepard Church and 24357/Agnes Church cemeteries). These are marked cemeteries and, assuming structure spanning to avoid the cemetery footprints, impacts would be limited to visual impacts to the setting and environment surrounding the resources.

5.3.6 Natural Environment

Electric infrastructure, such as transmission lines, can impact the natural environment. The Commission must consider effects on the natural environment when designating transmission lines routes and making a decision on a route permit. Impacts are dependent upon many factors, such as how the project is designed, constructed, and maintained. Other factors, such as the environmental setting, influence potential impacts.

5.3.6.1 Air Quality

An assessment of potential impacts to air quality is discussed for the entire project in Section 4.7.1. The impact assessment for air quality was not analyzed at the subregional level because impacts are anticipated to largely be independent of the route selected.

5.3.6.2 Climate Change

An assessment of potential impacts from climate change is discussed for the entire project in Section 4.7.2. The impact assessment for climate change was completed for the project as a whole because there is limited variability in the potential for climate change across the routing alternatives.

5.3.6.3 Greenhouse Gases

An assessment of potential impacts from greenhouse gases is discussed for the entire project in Section 4.7.3. The impact assessment for greenhouse gases was completed for the project as a whole because there is limited variability in the potential for greenhouse gases across the routing alternatives.

5.3.6.4 Geology and Topography

An assessment of potential impacts to geology and topography is discussed for the entire project in Section 4.7.3. The impact assessment for geology and topography was not analyzed at the regional level because impacts are anticipated to largely be independent of the route selected.

5.3.6.5 Groundwater

An assessment of potential impacts to groundwater is discussed for the entire project in Section 4.7.5. The impact assessment for groundwater was not analyzed at the subregional level because impacts are anticipated to largely be independent of the route selected.

5.3.6.6 Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands often involve unique resources intended for protection and/or preservation and would be subject to short and long-term impacts depending upon their use (Section 4.7.6.2). Public and designated lands within the ROI are first identified and then further reviewed to better understand potential impacts such as vegetation clearing. Occupying public and designated lands would require coordination with the landowner (Section 4.7.6.3).

Public lands and designated lands with existing easements or covenants that are within the route widths and rights-of-way of routes in the Swift Subregion are summarized in Table 5-29 and shown in Map 10-2 through Map 10-5, Map 15-2 through Map 15-5, and Map 18-2 through Map 18-5.

There are no state WMAs or national wildlife refuges in the ROI of the Swift Subregion. Federal public lands in the Swift Subregion ROI include several WPAs.

WPAs owned and managed by USFWS are within the ROIs of all routes in the Swift Subregion, and the anticipated alignments of SSR01 and SSR02 would cross WPAs. Impacts to crossed WPAs would include vegetation clearing in the ROW and wildlife as analyzed in Section 3.3.1. Construction activities in this area could temporarily impact public enjoyment of WPAs, and the visibility of transmission line structures could create long-term impacts to public enjoyment of WPAs. SSR01 would have slightly greater impacts on WPAs compared to SSR02, as the ROW of SSR01 intersects four more acres of WPAs than the ROW of SSR02. SSR03 and SSR04, which do not cross WPAs, would have limited temporary and long-term impacts to public enjoyment of WPAs. The applicants requested narrower route widths at two locations along SSR01 and two locations along SSR02 (Section 3.3.1) in the Swift Subregion (Map 6). The narrower route widths were requested in areas where WPA easements exist to avoid USFWS lands or easements to the greatest extent practicable. If a route were permitted in these areas, the narrower route width would ensure placing transmission structures directly into these lands would be avoided.

SSR02 would cross the Artichoke Lake WPA (Map 18-3). In its additional comments based on new routing alternatives (reference (178)), the USFWS identified the Artichoke Lake WPA as "an important waterfowl habitat area."

Three conservation easement programs, including CREP, the RIM reserve program, and WRP have lands in the Swift Subregion ROI (Map 15-2, Map 15-3, Map 15-4, Map 15-5). The applicants intend to avoid conservation easements to the greatest extent practicable.

There are 5 acres of one riparian CREP easement and 9 acres of WRP land within the ROI of SSR02. Neither the CREP easement nor the WRP land is crossed by the anticipated alignment or associated ROW of SSR02. The route parallels an existing road ROW across the road from the CREP easement, and parallels a driveway across the road from the WRP land. Thus, both the CREP easement and the WRP land are anticipated to be avoided during final design. Impacts to the CREP easement and WRP land are not anticipated. Within the ROI of SSR01, SSR03, and SSR04, CREP easements and WRP land are avoided entirely.

There are 4 acres of one riparian RIM easement within the ROI of SSR03. The RIM easement is not crossed by the anticipated alignment or associated ROW of SSR03. The route parallels an existing road ROW across the road from the RIM easement; thus, it is anticipated to be avoided during final design. Impacts to the RIM easement are not anticipated. Within the ROI of SSR01, SSR02, and SSR04 RIM easements are avoided entirely.

Table 5-29 Swift Subregion, Public and Designated Lands within Route Width and ROW

Public and Designated Land Type	Unit	Routes			
		SSR01	SSR02	SSR03	SSR04
Waterfowl Production Areas	Acres in ROW (route width)	16 (65)	12 (85)	0 (63)	0 (63)
Conservation Reserve Enhancement Program (CREP)	Acres in ROW (route width)	0 (0)	0 (5)	0 (0)	0 (0)
Reinvest in Minnesota (RIM) Reserve Partnership Easement	Acres in ROW (route width)	0 (0)	0 (0)	0 (4)	0 (0)
Wetland Reserve Program (WRP)	Acres in ROW (route width)	0 (0)	0 (9)	0 (0)	0 (0)

5.3.6.7 Vegetation

The ROI for vegetation is the ROW. Potential construction and operation-related impacts to vegetation for the project as a whole are discussed in Section 4.7.7.2. Potential long-term impacts on vegetation would occur where structures are located or where conversion of forested vegetation to low-growing vegetation would be required. Impacts would be localized, and unavoidable. Impacts to vegetation are primarily evaluated by examining vegetative landcover types within the ROW of each routing option. Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation, as described in Section 4.7.7.3.

Map 11-2 through Map 11-5 provide an overview of landcover types across the Swift Subregion, and Table 5-30 summarizes the landcover types within the ROW of each route in the Swift Subregion. Agricultural vegetation, particularly cultivated cropland, represents the dominant vegetative landcover type within the ROW of all of the routes. Other sizable land cover types in the route ROWs include herbaceous wetland, low intensity development or open space, and some pasture/hay. Few areas of open water are present among the routes, all of which are expected to be spanned completely by the transmission line.

Table 5-30 Swift Subregion, Landcover Types in the ROW

Landcover Data	Unit	SSR01	SSR02	SSR03	SSR04
Area Within ROW	Acres	473.2	457.7	463.9	464.3
Barren Land (Rock/Sand/Clay)	Acres (percentages)			0.2 (0.1)	0.2 (0.1)
Cultivated Crops	Acres (percentages)	335.5 (70.9)	273.1 (59.7)	277.9 (59.9)	272.9 (58.8)
Deciduous Forest	Acres (percentages)		1.2 (0.3)	4.1 (0.9)	4.1 (0.9)
Developed, Low Intensity	Acres (percentages)	15.7 (3.3)	55 (12.0)	91 (19.6)	54.4 (11.7)
Developed, Medium Intensity	Acres (percentages)		0.3 (0.1)	0.1 (0.0)	0.1 (0.0)
Developed, Open Space	Acres (percentages)	89.1 (18.8)	101.2 (22.1)	60 (12.9)	101.2 (21.8)
Emergent Herbaceous Wetlands	Acres (percentages)	19.5 (4.1)	22.3 (4.9)	14.4 (3.1)	14.4 (3.1)
Open Water	Acres (percentages)	3.9 (0.8)	0.9 (0.2)		1.1 (0.2)
Pasture/Hay	Acres (percentages)	6.9 (1.5)	3.5 (0.8)	16.2 (3.5)	15.8 (3.4)
Woody Wetlands	Acres (percentages)	2.6 (0.6)	0.1 (0.0)	0.1 (0.0)	

Forested land is the vegetation that would be impacted the most by ROW clearing. Removal of woody vegetation will result in conversion to low-stature vegetation (shrubs and grasses) throughout the ROW area. The ROW would be maintained with low-growing vegetation during operations to minimize potential interference with the transmission line. Conversion of wooded landscapes to open landscapes could indirectly affect native vegetation by potentially increasing the spread of invasive and non-native species, which could permanently alter ecosystem functions. Co-locating the route with existing infrastructure ROW, for example, roadways or transmission lines, might limit tree removal. Use or paralleling of existing ROWs is discussed in Section 5.3.1 for the Swift Subregion.

Land cover in the route ROWs considered forested land include woody wetlands and deciduous forest, which are present in minimal amounts. SSR03 and SSR04 have the most forested land cover, with 4.1 acres of deciduous forest each and 0-0.1 acres of woody wetlands each, comprising approximately 0.9% of the total ROW acreage. Conversely, SSR02 has the least forested land cover, with 1.2 acres of deciduous forest and 0.1 acres of woody wetlands, comprising approximately 0.3% of the total ROW acreage.

Although SSR02 would minimize impacts to forested vegetation, given the small amount of forested vegetation in the ROW for all of the routes, impacts are anticipated to be minimal for all routes in the Swift Subregion. Potential impacts to agricultural vegetation and wetlands are discussed Section 5.3.4.1 and Section 5.3.6.12, respectively.

5.3.6.8 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. Potential construction and operation-related impacts to wildlife and wildlife habitat are discussed in Section 4.7.8.2. Potential short-term, localized impacts could occur from displacement during construction or maintenance activities. Potential long-term impacts could occur as a result to habitat loss, conversion, or fragmentation. Impacts to wildlife and wildlife habitat are assessed by considering wildlife inhabiting the ROI as well as evaluating the presence of potential wildlife habitat within the ROI. Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife and wildlife habitat, as described in Section 4.7.8.3.

Map 18-2 through Map 18-5 provide an overview of resources across the Swift Subregion, and Table 5-31 summarizes the wildlife resources within the route width of each route in the Swift Subregion. Designated wildlife habitat within the Swift Subregion ROI includes shallow wildlife lakes, Important Bird Areas, and WPAs. Wildlife Action Network corridors ranging from “Low rank” to “Medium-High or High rank” are present throughout the Swift Subregion ROI.

Two DNR-identified priority shallow wildlife lakes, Artichoke Lake and an unnamed wildlife lake, and one DNR-identified shallow wildlife lake, South Drywood Lake, are within the local vicinity and route width of SSR02 (Map 14-2 and Map 14-3). The route width of SSR02 intersects 11 acres of Artichoke Lake, 10 acres of South Drywood Lake, and 34 acres of the unnamed wildlife lake. The anticipated alignment of SSR02 would cross two of the three lakes. SSR02 would cross the southern tip of South Drywood Lake, which is separated from the main body of the lake by a road, for a length of 290 feet. SSR02 would cross the unnamed wildlife lake for a length of 1,510 feet. A transmission line structure may be necessary along the unnamed wildlife lake, as the span needed is greater than 1,400 feet, the maximum spanning distance for the project. If a single structure was constructed in the wildlife lake, impacts could range from minimal to significant depending on consultation with the DNR. Construction activities within the SSR02 ROW could impact the habitat quality and resident wildlife of the wildlife lakes. SSR02 would establish new transmission line corridor near shallow wildlife lakes, and could increase potential impacts to flying birds. SSR01, SSR03, and SSR04 avoid shallow wildlife lakes entirely.

As demonstrated in Table 5-31, WPAs are within the local vicinity and route width of all routes in the Swift Subregion; however, only SSR01 and SSR02 would cross WPAs (Map 18-2 through Map 18-5). The route width and local vicinity of SSR01 would intersect the most acres of WPAs, followed by SSR02, with the route widths and local vicinities of SSR03 and SSR04 intersecting the fewest acres of WPAs. SSR01 would cross two sections of a Big Stone County WPA that contains several large wetlands and waterbodies, some of which would be spanned, for a total crossing length of approximately 1.15 miles (6,050 feet) (Map 14-2 and Map 18-2). Several transmission line structures would be necessary in the Big Stone County WPA crossed by SSR01, as the span needed is roughly four times greater than 1,400 feet, the maximum spanning distance for the project. These impacts to the WPA could be significant as waterfowl frequent the area and are prone to collision with nearby transmission lines. SSR02 would cross three individual WPAs: one 565-foot crossing near a water basin in the Artichoke WPA, one 0.45-mile (2,370-foot) crossing near a water basin in a Big Stone County WPA, and one 330-foot crossing near wetlands in a Swift County WPA (Map 14-3 and Map 18-3). Compared to SSR01, fewer transmission line structures would be necessary in the WPAs crossed by SSR02, as only the 0.45-mile SSR02 crossing could not be spanned. Construction activities within the SSR01 and SSR02 ROW could impact the habitat quality and resident wildlife of the WPAs, and the establishment of new transmission line corridors within or near WPAs could increase potential impacts to flying waterfowl. Routes with lower acreage, less crossings, and lower total crossing length are expected to have fewer direct or indirect impacts to WPA habitats, resident wildlife, and waterfowl flying in these areas.

The Lac Qui Parle – Big Stone Important Bird Area covers almost half of the Swift Subregion, is within the local vicinity and route width of all routes, and is crossed by all routes (Map 18-1, Map 18-2, and Map 18-3). Due to the extent of the Lac Qui Parle – Big Stone Important Bird Area, which covers essentially half the length of each route, there is limited variation between routes at the individual level. The acreage intersected by the local vicinities of routes in the Swift Subregion ranges from 5,540 acres (SSR02) to 4,575 acres (SSR03 and SSR04), and the acreage intersected by the route widths of routes in the Swift Subregion ranges from 1,725 acres (SSR02) to 1,410 acres (SSR03 and SSR04). All routes in the Swift Subregion cross the Lac Qui Parle – Big Stone Important Bird Area once, with the total length of transmission line crossing ranging from 14.2 miles (SSR02) to 11.6 miles (SSR03 and SSR04). All routes would establish new transmission line corridors within the Lac Qui Parle – Big Stone Important Bird Area that could increase potential impacts to flying birds; lower acreage and lower total crossing length indicate fewer impacts to birds flying in this area.

GBCAs are within the local vicinity and route width of SSR01 and SSR02. The local vicinity and route width of SSR02 intersects the greatest acreage of GBCAs (900 acres and 325 acres, respectively) compared to the local vicinity and route width of SSR01 (285 acres and 25 acres, respectively). The anticipated alignment of SSR02 would cross a GBCA, paralleling an existing road ROW for only part of the crossing. SSR01 would not cross GCBAs. SSR02 would establish a new transmission line corridor within the GBCA that could increase potential impacts to flying birds in this area. SSR03 and SSR04 avoid GBCAs entirely.

Wildlife Action Network corridors are within the local vicinity and route width of all routes, and the anticipated alignments of all routes would cross these resources. Generally, lower acreage, lower number of crossings, and lower total crossing length indicate fewer impacts to corridors. The anticipated alignments of all routes would cross through a Medium rank Wildlife Action Network corridor when they cross the Pomme de Terre River (Map 17-4). SSR01, SSR03, and SSR04 would cross the corridor near Holloway, and SSR02 would cross the corridor near Fairfield. The areas surrounding the Pomme de Terre River in the crossing locations are densely wooded. SSR02, SSR03, and SSR04 would cross the Pomme de Terre River corridor paralleling an existing road ROW; impacts to wildlife and associated habitat would be minimized because the existing road has already fragmented riparian habitat in this area. SSR01 would cross the Pomme de Terre River corridor in an area where there is no existing infrastructure to parallel; SSR01 would result in riparian habitat fragmentation in this area.

The routes in the Swift Subregion would parallel no existing transmission line ROW. Avian species traversing wildlife areas along new transmission line corridors could potentially experience increased impacts resulting from electrocution or collision with transmission line conductors. As discussed in Section 4.7.8.3, avian impacts can be minimized through use of bird flight diverters.

The routes in the Swift Subregion would parallel a considerable amount of non-transmission line infrastructure rights-of-way such as roads, with SSR03 paralleling the most (100 percent of its length) and SSR01 paralleling the least (40 percent of its length). All routes in the Swift Subregion would minimize potential wildlife and habitat impacts associated with habitat fragmentation and/or edge effects by paralleling existing infrastructure rights-of-way, because habitat fragmentation has already occurred in these areas.

Table 5-31 Swift Subregion, Wildlife Management and Conservation Areas within Route Width

Resource Area	Unit	Routes			
		SSR01	SSR02	SSR03	SSR04
Priority Shallow Wildlife Lakes	Count	0	3	0	0
Important Bird Areas	Acres	1,502	1,723	1,409	1,409
	Crossing Length (miles)	12.4	14.2	11.6	11.6
Waterfowl Production Areas	Acres	65	85	63	63
	Crossing Count	2	3	0	0
	Crossing Length (miles)	1.2	0.6	0	0
Grassland Bird Conservation Areas	Acres	25	284	0	0
Wildlife Action Network Corridors	Low Rank (acres, crossings, length [mi])	441 4 3.3	0 0 0	589 3 5.3	589 3 5.3
	Medium-Low or Low Rank (acres, crossings, length [mi])	23 1 0.2	0 0 0	24 1 0.2	24 1 0.2
	Medium Rank (acres, crossings, length [mi])	21 1 <0.1	11 1 <0.1	3 1 <0.1	3 1 <0.1
	High or Medium-High Rank (acres, crossings, length [mi])	0 0 0	0.4 0 0	0 0 0	0 0 0

5.3.6.9 Rare and Unique Natural Resources

Rare and unique natural resources encompass protected species and sensitive ecological resources. The ROI for protected species is the project area (one mile), and the ROI for sensitive ecological resources is the route width. Potential construction and operation-related impacts to protected species and sensitive ecological resources are discussed in Section 4.7.9.2. Potential direct or indirect impacts to protected species could occur should they be present within or near the ROW during construction or maintenance activities. While more mobile species would leave the area for nearby comparable habitats, non-mobile species, such as vascular plants or nesting birds, could be directly impacted. Construction activities also have the potential for direct impacts to sensitive ecological resources if they are present within the area subject to construction disturbance. Long-term impacts would involve permanent clearing of vegetation in areas identified as sensitive ecological resources which could indirectly impact any protected species associated with these habitats.

Impacts to protected species are evaluated by reviewing documented occurrences of these species within the ROI. Potential impacts to sensitive ecological resources, which could provide suitable habitat for protected species, are evaluated by assessing the presence of these resources within the ROI. Several measures that could be implemented to avoid, minimize, or mitigate impacts to protected species and sensitive ecological resources, including those provided in the DNR's Natural Heritage Review response (Appendix N), are described in Section 4.7.9.3.

Sensitive ecological resources within the Swift Subregion are shown on Map 15-2. To secure federally and state protected species from exploitation or destruction, documented locations of these species are not identified on maps.

5.3.6.9.1 Protected Species

According to the NHIS database, no protected species have been documented within one mile of SSR02 and between two to three protected species have been documented within one mile of SSR01, SSR03, and SSR04; these are summarized in Table 5-32. In addition, several state special concern species have been documented within one mile of the routes in the Swift Subregion; records of state special concern species are summarized in Appendix N.

One state-protected mussel species, mucket, has been documented within the ROW of SSR03 and SSR04. This species was documented in the Pomme de Terre River, which would be spanned by alignments associated with SSR03 and SSR04; as such, impacts to this species are not anticipated. BMPs during construction such as soil erosion control are also expected to minimize temporary impact to the Pomme de Terre River.

Formal protected species surveys have not been conducted for the project; as such, it is possible that additional protected species could be present where suitable habitat is available within the ROW or route width of the routes in the Swift Subregion. As part of project permitting, the applicants could be required to conduct field surveys for the potential presence of protected species; these surveys would occur prior to construction in coordination with the USFWS and/or DNR.

Table 5-32 Swift Subregion, Natural Heritage Information System Database Records of Protected Species within One Mile

Scientific Name	Common Name	Type	State/Federal Status	Routes			
				SSR01	SSR02	SSR03	SSR04
Actinonaias ligamentina	Mucket	Mussel	Threatened / not listed	X		X[1]	X[1]
Alasmidonta marginata	Elktoe	Mussel	Threatened / not listed	X		X	X
Cyperus acuminatus	Short-pointed umbrella sedge	Vascular plant	Threatened / not listed	X			

[1] Species has been documented within the ROW.

5.3.6.9.2 Sensitive Ecological Resources

The route widths and rights-of-way of all routes in the Swift Subregion would intersect sensitive ecological resources (Table 5-33; Map 15-2 through Map 15-5). The rights-of-way of all routes would intersect between less than 1 acre and 11 acres of Sites of Biodiversity Significance, with SSR02 intersecting the least and SSR03 and SRR04 intersecting the most acreage. The rights-of-way of SSR02 and SSR04 would intersect Sites of Biodiversity Significance ranked below, while SSR01 and SSR03 would intersect Sites of Biodiversity Significance ranked moderate and below.

The route widths of SSR01, SSR03, and SSR04 would intersect native plant communities, while SSR02 would avoid native plant communities. The ROW of SSR01 would intersect a native plant community, while the ROW of the other three routes would avoid native plant communities.

The route width of SSR02 would intersect Artichoke Lake, a Lake of Biological Significance; however, its ROW would not intersect Artichoke Lake. The other three routes would avoid Lakes of Biological Significance.

The anticipated alignments of SSR03 and SSR04 would cross two Sites of Biodiversity Significance ranked below that may be too large to span (>1,000 feet), thus potentially requiring the placement of a transmission line structure with these areas. All other sensitive ecological resources should be spannable by the anticipated alignments for routes in the Swift Subregion.

Table 5-33 Swift Subregion, Sensitive Ecological Resources within the ROW and Route Width of Each Route

Resource	Units	SSR01	SSR02	SSR03	SSR04
Sites of Biodiversity Significance	Moderate rank (acres in ROW (route width))	1 (4)	0 (0)	1 (26)	0 (2)
	Below rank (acres in ROW (route width))	4 (58)	<1 (25)	10 (58)	10 (56)
	Total (acres in ROW (route width))	5 (62)	<1 (25)	11 (84)	10 (58)
Native Plant Communities	Conservation Status S1, S2, or S3 (acres in ROW (route width))	1 (4)	0 (0)	0 (3)	0 (3)
Lake of Biological Significance	Moderate rank (count in Row (route width))	0 (0)	0 (1)	0 (0)	0 (0)

5.3.6.10 Soils

The ROI for soils is the ROW. Common soil impacts include rutting, compaction, and erosion. Potential impacts would be short-term during construction, localized, and can be minimized. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicants would obtain a NPDES/State Disposal System Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicles trips, and decompaction of the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored a suitable location. Disturbed areas would be promptly seeded after construction. Additional details regarding potential impacts to soils and potential mitigation measures are provided in Section 4.7.10.

Map 20-2 through Map 20-5 shows the surface soil textures across the subregion. Soil types within the ROW were reviewed to identify soil characteristics that could be more prone to impacts in some areas compared to others (Table 5-34). Less than one-third of the soil within the ROW of the Swift Subregion routes are prone to erosion. Approximately one-third of the soils within the ROW of the Routes in the Swift Subregion region have a medium or high soil compaction rating and revegetation concerns. Nearly all soils within the ROW of the routes have a moderate or severe rutting hazard rating. Generally, all of the routes within the Swift Subregion have similar soil characteristics. There is no route that is better suited to reduce the potential rutting, compaction, and erosion that could occur during construction.

Table 5-34 Swift Subregion, NRCS Mapped Soils within ROW

Soils Data	Unit	SSR01	SSR02	SSR03	SSR04
Area within ROW	Acres	473	458	464	464
Compaction Prone[1]	Acres (percentage)	166 (35)	131 (29)	170 (37)	161 (35)
Susceptible to Erosion Hazard[2]	Acres (percentage)	14 (3)	20 (4)	33 (7)	26 (6)
Hydric Soils[3]	Acres (percentage)	193 (41)	218 (48)	187 (40)	209 (45)
Revegetation Concerns[4]	Acres (percentage)	144 (30)	114 (25)	165 (36)	166 (36)
Susceptible to Rutting Hazard[5]	Acres (percentage)	470 (99)	450 (98)	459 (99)	459 (99)

[1] Soils considered to be Compaction Prone soils include those with a rating of "Medium" or higher.
[2] Soils considered susceptible to erosion hazard soils include those with a rating of "Medium", "Severe", or "Very Severe".
[3] Hydric soil include hydric soils (100% hydric) and predominantly hydric soils (67-99% hydric).
[4] Soils considered to have revegetation concerns include soils with a non-irrigated land capability classification of 3 or greater.
[5] Soils considered susceptible to Rutting Hazard include those with a rating of "Moderate" or "Severe".

5.3.6.11 Surface Water

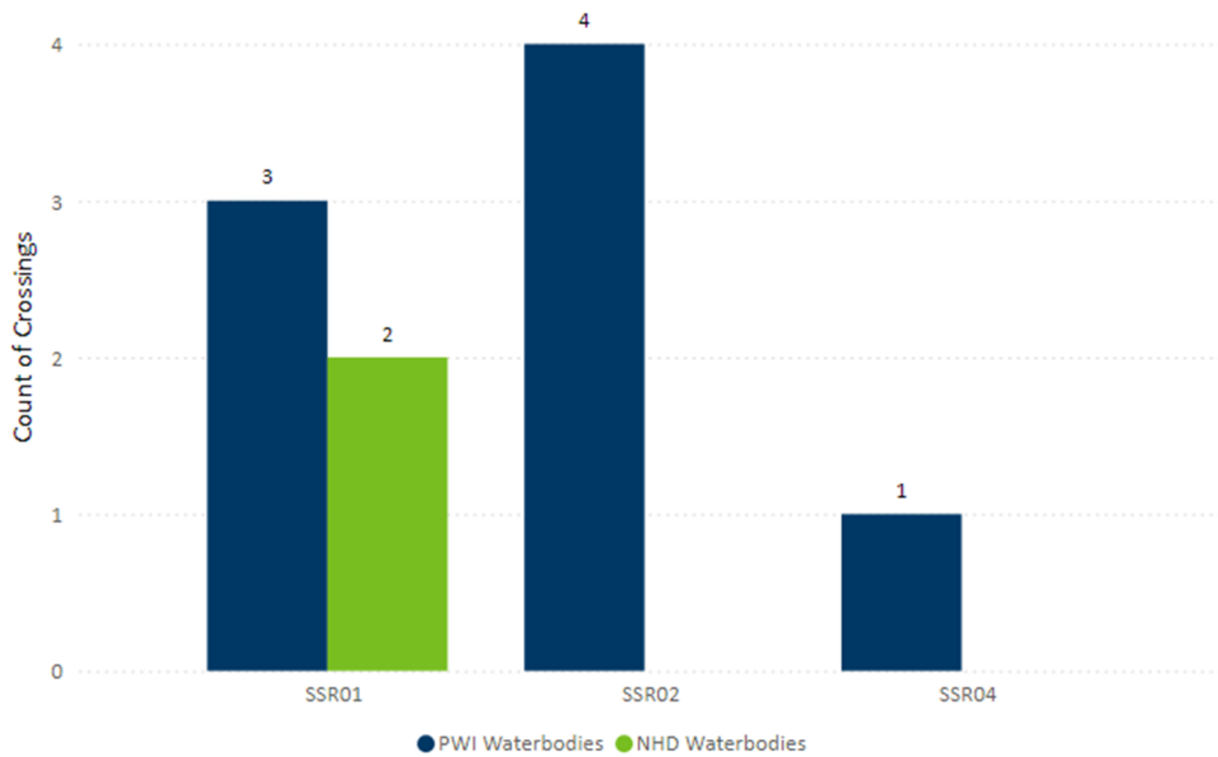
The ROI for surface water is the route width. Direct impacts caused by structures placed in surface waters would be avoided by spanning the surface waters. Direct impacts to other resources can cause indirect impacts to surface waters. For example, construction activities near surface waters could cause riparian vegetation disturbance and surface erosion, which can lead to runoff impacting surface waters. Impacts to surface waters could be avoided by prudent routing, selecting the routes that cross the fewest watercourses or waterbodies and/or special or impaired waters.

Impacts would be mitigated by using BMPs. Crossing PWI waters would require a DNR license to cross public waters, and work near special or impaired waters would require additional BMPs as detailed in the construction stormwater permit. Additional detail regarding potential impacts to surface waters and potential mitigation measures, including those provided in the DNR's Natural Heritage Review response (Appendix N), is provided in Section 4.7.11.

Map 14-2 through Map 14-5 show the waterbodies and watercourses across the region. There are no trout streams or state-designated outstanding resource value waters or state wild and scenic rivers within the ROI of the Swift Subregion.

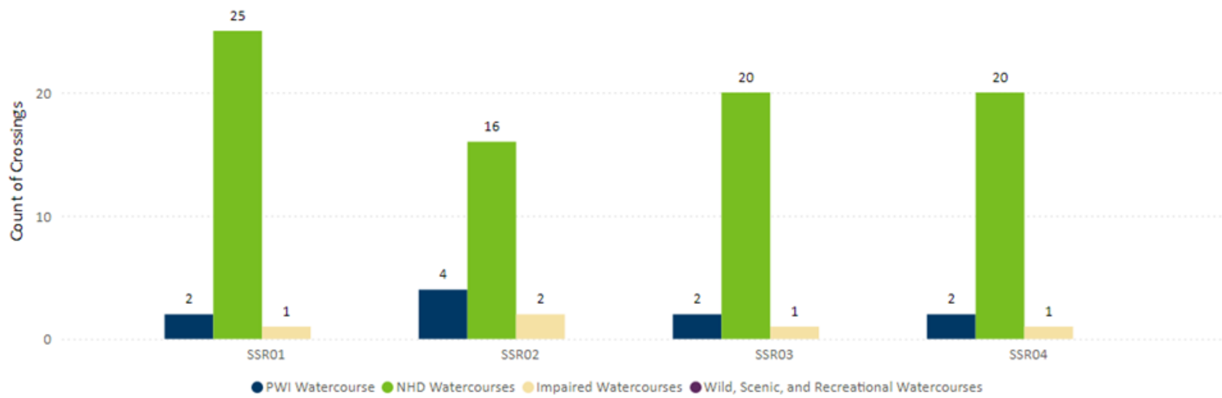
All of the routes have between one and two waterbodies within their ROI. Of the waterbodies present in the Swift Subregion, only two are designated as PWI water basins. The PWI water basins are within the route width of SSR01 (Unnamed Basin) and SSR02 (Unnamed Basin and Artichoke Lake) (Map 14-2 through Map 14-5). Both SSR01 and SSR02 cross the PWI water basins within their routes (Figure 5-19). Routes SSR03 and SSR04 do not contain PWI water basins within their ROI. There are two lakes classified as impaired within the Swift Subregion; both Artichoke Lake and South Drywood Lake are within the ROI of SSR02.

Figure 5-19 Swift Subregion, Number of Waterbody Crossings by Type



The total count of watercourse crossings by the anticipated alignments of the routes in the Swift Subregion varies between 16 and 25 (Figure 5-20). SSR02 crosses the fewest watercourses (22 crossings) while SSR01 crosses the most watercourses (29 crossings). Nearly all of the routes have two PWI watercourse crossings, except for SSR02 which has four PWI watercourse crossings. All of the routes have one crossing over a watercourse classified as impaired, except for SSR02 which has two crossings over a watercourse classified as impaired. PWI watercourses crossed in the Swift Subregion include the Pomme de Terre River and an Unnamed Creek. The crossings where there are no existing transmission lines will require more tree clearing than the crossings where there are existing transmission lines.

Figure 5-20 Swift Subregion, Number of Watercourse Crossings by Type



Impacts to floodplains during construction would include soil disturbance and vegetation removal. Vegetation clearing within a floodplain, especially tree removal, can greatly destabilize the area, make it more prone to ongoing erosion and sediment issues, and further contribute to water quality issues. The project might require that transmission line structures be placed within FEMA-designated floodplain. In the Swift Subregion, each routing alternative has one crossing of a floodplain that exceeds 1,000 feet. Routes that could not span the floodplain due to a crossing that exceeds 1,000 feet would have higher potential to impact the floodplain's function and management capabilities.

5.3.6.12 Wetlands and Calcareous Fens

The ROI for wetlands is the route width, except for forested wetlands where it is the ROW due to permanent conversion within that area. Short-term and long-term potential impacts to wetlands are discussed in Section 4.7.12.2. Impacts to wetlands are evaluated by examining wetland types, sizes, and potential for spanning. Localized direct impacts to wetlands would include vegetation clearing, movement of soils, and construction traffic which could alter or impair wetland function. Forested wetlands would be subject to long-term impacts given their conversion to non-forested wetlands. Wetland crossings longer than 1,000 feet might require one or more structures to be placed in the wetland, resulting in small, localized permanent wetland impacts.

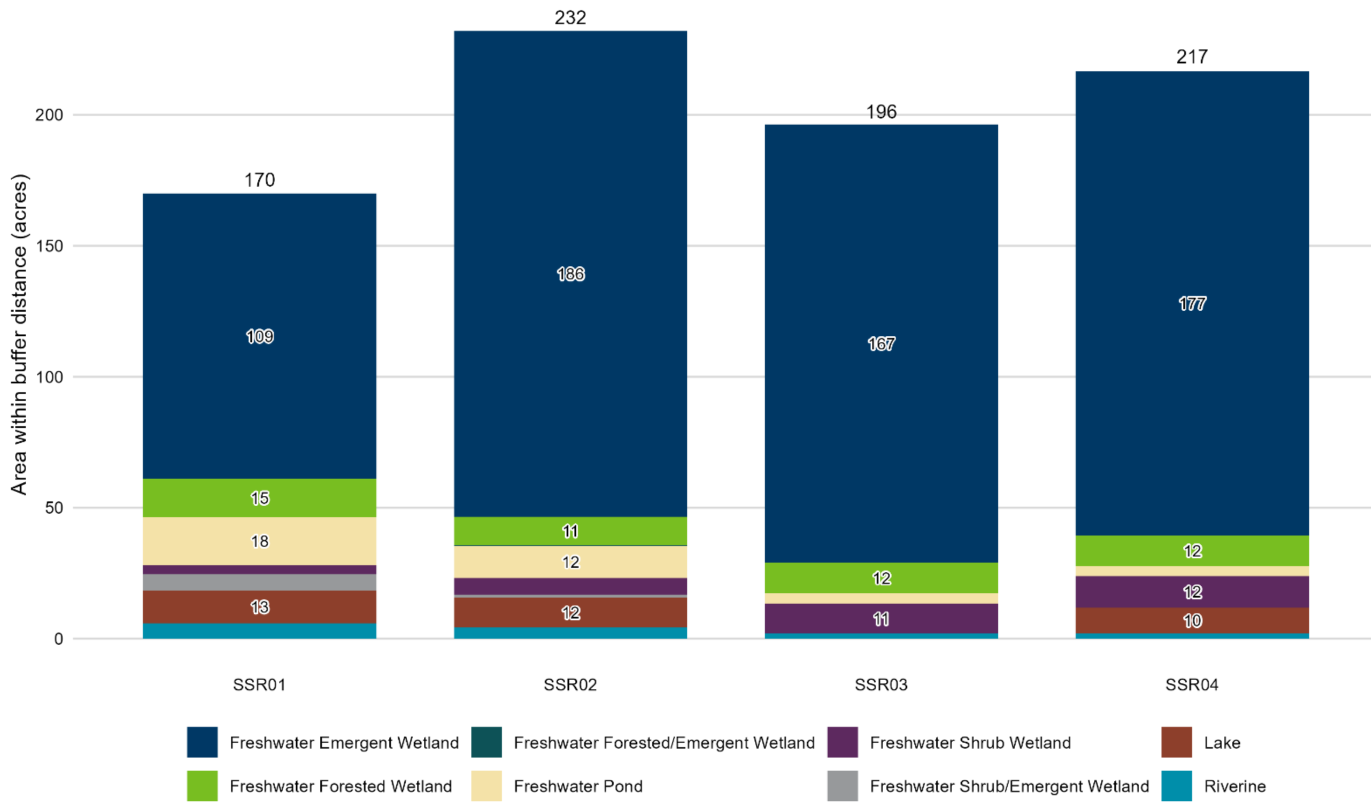
Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width. Wetland impacts would be regulated as described in Section 4.7.12.2. Additional details regarding potential impacts to wetlands, including those provided in the DNR's Natural Heritage Review response, and potential mitigation measures are provided in Section 4.7.12.3.

There are no calcareous fens in or near the ROI for this subregion.

Map 14-2, through Map 14-5 show the mapped wetlands within the ROI of the potential routes in the Swift Subregion. Direct wetland impacts would occur within the construction workspace within or adjacent to the ROW. Not all wetland areas within the ROI would be subject to direct impacts as most could be spanned. In most cases, wetlands can be spanned to avoid placing structures within them. However, wetland crossings longer than 1,000 feet might require one or more structures to be placed within the wetland. Each route would require two crossings greater than 1,000 feet in length.

Wetlands in the ROI for the Swift Subregion consist mainly of emergent wetlands, freshwater forest wetlands, and a smaller subset of pond, shrub, and riverine wetlands. Figure 5-21 shows acres of wetland within the ROI for each of the different routes. Within the Swift Subregion, the SSR02 ROI contains the most NWI wetland (232 acres), crosses the highest number of individual wetlands (57), and has the most overall length of ROI crossing wetlands (approximately 2.1 miles). In contrast, the SSR01 ROI contains the fewest NWI wetlands (170 acres), while SSR03 has the fewest number of crossings (34). SSR01 has the lowest total length of ROI crossing wetlands, at just over a mile. Lower acreage of wetlands in the ROW and lower numbers of crossings serve as an indicator of fewer direct or indirect impacts to wetlands.

Figure 5-21 Swift Subregion, Wetland Area within ROI by Route



The ROI for the following routes cross PWI wetlands: SSR01 crosses 2 with approximately 12 acres, SSR02 crosses 2 with approximately 10 acres, and SSR04 crosses 1 with approximately 11 acres.

The ROI for each of the routes in the Swift Subregion crosses forested wetlands. Because transmission lines cannot be safely or reliably operated with trees growing within the ROW, existing trees must be removed throughout the ROW, including those within forested wetlands. Forested wetlands, within any new transmission line ROW, would likely undergo a long-term to potentially permanent change in wetland/vegetation type lasting as long as the transmission line operates in the area. In the Swift Subregion, SSR03 and SSR04 crosses the most forested wetland in the ROW (3.3 acres), while SSR02 crosses the fewest (0.8 acres). Forested wetlands that are subject to permanent impacts due to their conversion would be limited to the ROW.

5.3.7 Costs that are Dependent on Design and Route

Total project costs range from $465 million to $535 million and vary based on the routes selected. Estimates include permitting, engineering, materials (for example: steel, conductor, and insulators), land rights and ROW, and construction costs. Costs are generally proportional to length with the exception of the additional factors described in Section 4.8. For comparison purposes, the construction costs for the four routes in the Swift Subregion are included in Table 5-35. Estimated construction costs associated with route segment and alignment alternatives in the Swift Subregion are discussed in Section 5.3.9.

The route with the lowest estimated cost is SSR03 ($117,994,500); though it is not the shortest route it has the fewest number of angle structures. SSR02 is the shortest and has the second highest estimated cost. The route with the highest estimated cost is SSR01 ($124,861,500); it is also the longest route.

Table 5-35 Swift Subregion, Summary of Estimated Cost by Route

Route Alternative	Length (mi)	Estimated Cost
SSR01	26.0	$124,861,500
SSR02	25.2	$121,842,000
SSR03	25.5	$117,994,500
SSR04	25.5	$121,500,000

5.3.8 Relative Merits of the Swift Subregion Routes

The 14 routing factors that the Commission must consider when designating transmission line routes (Minnesota Rules 7850.4100) are summarized at the subregional level. Some elements of these factors have minimal impacts or do not vary significantly by route within the subregion and thus are not further discussed in this Section.

The relative merits analysis uses graphics (Table 5-36) to provide a visual assessment of the relative merits for each route in the Swift Subregion. The graphic for a specific routing factor or element is not meant to be indicative of the "best" route but is provided as a relative comparison to be evaluated together with all other routing factors. For routing factors where impacts are anticipated to vary, the graphic represents the magnitude of anticipated difference between these anticipated impacts and compares them across the different routes within a given subregion. For routing factors that express the state of Minnesota's interest in the efficient use of resources (for example, the use and paralleling of existing rights-of-way), the graphic represents the consistency of the route alternative with these interests and compares them to each other. Table 5-37 summarizes the relative merits analysis of the four routes in the Swift Subregion for the routing factors that are anticipated to vary amongst the routes.

Table 5-36 Guide to Relative Merits Analysis

Consistency with Routing Factor or Anticipated Impacts	Symbol
• Route is consistent with the routing factor OR • Impacts are anticipated to be negligible to minimal or the impact is positive	
• Route is consistent with routing factor but less so than the other options OR • Impacts are anticipated to be minimal but the potential for impacts is greater than the other routes or require special permit conditions OR • Impacts are anticipated to be moderate	
• Route is not consistent with routing factor or consistent only in part OR • Impacts might be moderate but the potential for impacts is greater than the other routes or might require special permit conditions OR • Impacts are anticipated to be significant	

Table 5-37 Swift Subregion, Relative Merits of Subregion Routes

Routing Factor / Resource	SSR01	SSR02	SSR03	SSR04	Summary
Factor A Human Settlement					
Aesthetics	●	○	○	●	The fewest residences are on SSR01 and SSR04. SSR03 has the most residences, the most non-residential structures, and is the only route with a home within 75 feet of the alignment. SSR01 is the only route without a residence within 0 to 250 feet of the alignment and has 7 to 9 less residences within 250-500 feet than the rest of the routes. SSR04 follows the most existing infrastructure, mainly State Highway 12, that would require the least vegetation clearing. SSR02 follows the most existing transmission lines (32%) whereas SSR03 and SSR04 follow none. All routes cross existing transmission lines once except SSR02 which crosses five times. The Pomme de Terre River State Water Trail would be moderately impacted by SSR01 with 9,250 feet of the river that would mostly see the alignment due to tree clearing. SSR01 and SSR02 would create a new crossing over this river (in separate areas) whereas SSR03 and SSR04 would use an existing crossing. All routes would create significant impacts by boxing in residences with transmission lines, however, SSR02 boxes in the most residences (3) and is the only route that would also create a pinch point between two residences.
Displacement	●	●	○	●	There is one residence and five non-residential structures within the ROW of SSR03 that could be displaced. The other routes do not have any residences or non-residential structures within their ROW.
Recreation	●	●	●	●	SSR02 is the only route that does not cross the Pomme de Terre state water trail, but it has more snowmobile crossings and greater length of snowmobile trails than the other routes. Impacts are anticipated to be minimal across the routes.
Factor C Land-Based Economies					
Agriculture	●	●	◒	◒	The alignment of SSR03 and SSR04 crosses a center pivot irrigation system while the other routes do not.
Mining	●	●	●	●	Impacts to mining are anticipated to be negligible among the routes.

Routing Factor / Resource	SSR01	SSR02	SSR03	SSR04	Summary
Factor D Archaeological and Historic Resources					
Archaeological	◓	◓	◓	◓	SSR01 contains one unevaluated archaeological site within the route width. Routes SSR03 and SSR04 each contain two unevaluated sites within their route widths. SSR02 contains three unevaluated archaeological sites in the route width and therefore has the most potential to impact known archaeological resources. However, one site (21BSf) could be avoided by using route segment S202, which contains no cultural resources within its ROI.
Historic	◓	◓	◓	◓	All of the proposed routes contain at least one historic architectural resource that has not been evaluated for listing on the NRHP within the ROI. SSR01 contains just one unevaluated resource within the ROI, and SSRO4 contains two. TheSSR03 ROI contains three unevaluated resources. SSR02 contains six unevaluated resources within the ROI and thus would have the most potential to impact significant historic resources.
Factor E Natural Resources					
Public and Designated Lands	◓	◓	●	●	SSR03 and SSR04 would not cross WPAs, while SSR01 and SSR02 would cross WPAs. Vegetation clearing within the ROW could impact the function of these WPAs; SSR01 has more WPA acres in the ROW (16 acres) than SSR02 (12 acres). SSR02 would cross the Artichoke Lake WPA, which the USFWS identified as an important waterfowl habitat area; SSR01 would not cross the Artichoke WPA. Routes that cross WPAs (SSR01 and SSR02) would have greater impacts to public enjoyment of WPAs compared to routes that do not cross WPAs (SSR03 and SSR04). The ROI of SSR02 includes one CREP easement and WRP land. SSR02 would not cross the CREP easement or the WRP land, and impacts could be avoided during final design. The ROI of SSR03 includes one RIM easement. SSR03 would not cross the RIM easement, and impacts could be avoided during final design.
Soils	●	●	●	●	Nearly all the soils in the region have a moderate or severe rutting hazard rating. Impacts could be minimized with BMPs or mitigated if long-term re-vegetation impacts extend beyond construction. Impacts to soils would be independent of the route selected.

Routing Factor / Resource	SSR01	SSR02	SSR03	SSR04	Summary
Surface Water					The total count of watercourse crossings by the anticipated alignments of the routes varies between 16 and 25. SSR02 crosses the fewest watercourses (22 crossings) while SSR01 crosses the most watercourses (29 crossings). All of the routes have two PWI watercourse crossings, except for SSR02 which has four PWI watercourse crossings. All of the routes have one impaired watercourse crossing, except for SSR02 which has two impaired watercourse crossings. The routes cross the same number of PWI watercourses (four each) and impaired watercourses (two each). There would be no anticipated in-water work for all routes, except for SSR02. SSR02 would cross the unnamed wildlife lake for a length of 1,510 feet. A transmission line structure may be necessary along the unnamed wildlife lake, as the span needed is greater than 1,400 feet, the maximum spanning distance for the project.
Wetlands					All routes have some acres of forested wetlands in the ROW. In the Swift Subregion, SSR01 crosses the most forested wetland PWI wetlands: SSR01 crosses 2 with approximately 12 acres in the ROI, SSR02 crosses 2 with approximately 10 acres in the ROI, and SSR04 crosses 1 with approximately 11 acres in the ROI. Each route would require two crossings greater than 1,000 feet in length where spanning at the crossing is not expected to be feasible. Ratings are consistent given the equal number of crossings over 1,000 feet and the closely similar area of forested wetlands subject to conversion in SSR03 and SSR04 versus SSR01 and SSR02.
Vegetation					SSR03 and SSR04 have the most forested land cover within their ROWs, each with 4.2 acres or 0.9% of the total ROW acreage. SSR02 has the least with 1.3 acres or 0.3% of the total ROW acreage. All the routes are considered to have a minimal amount of forested vegetation.

Routing Factor / Resource	SSR01	SSR02	SSR03	SSR04	Summary
Wildlife and Wildlife Habitat					SSR03 and SSR04 would generally intersect fewer acres of wildlife resources and cross wildlife resources less frequently. All routes cross the Lac Qui Parle Important Bird Area for their entire length. SSR01 and SSR02 would cross GCBAs, which SSR03 and SSR04 avoid. SSR01 would cross WPAs in an area containing large waterbodies, which could create a significant avian collision risk. There is one location where SSR01 would cross a densely forested Wildlife Action Network corridor in an area where there is not an existing transmission line or road ROW; as a result, this corridor would fragment habitat. SSR02 would cross two shallow wildlife lakes, and a transmission structure may be necessary in one wildlife lake; this could impact the habitat quality of the wildlife lake and create an avian collision risk. All routes follow no existing transmission line corridors. The majority of SSR01 would not follow existing non-transmission line infrastructure, this could result in more habitat fragmentation relative to SSR02, SSR03, and SSR04, which follow existing non-transmission line infrastructure for most of their length.
Factor F Rare and Unique Natural Resources					
Rare and Unique Natural Resources					The rights-of-way of all routes intersect Sites of Biodiversity Significance ranked moderate and/or below with route SSR02 intersecting the least (<1 acre) and SSR03 intersecting the most (11 acres). The anticipated alignments of SSR03 and SSR04 cross a Site of Biodiversity ranked below that may be too large to span. The ROW of SSR01 would intersect a native plant community, while the ROW of the other three routes would avoid native plant communities. The route width of SSR02 would intersect Artichoke Lake, a Lake of Biological Significance; however, its ROW would not intersect Artichoke Lake. No protected species have been documented within one mile of SSR02 and between two to three protected species have been documented within one mile of SSR01, SSR03, and SSR04. Only aquatic species have been documented in the ROW; impacts to aquatic species are not anticipated.
Factor H Paralleling Division Lines					
Paralleling existing survey lines, natural division lines, and agricultural field boundaries					SSR03 and SSR04 follow existing division lines for the largest percent of all the routes lengths (100 percent). SSR02 follows division lines for the smallest percent of all the routes lengths at 93.5 percent.

Routing Factor / Resource	SSR01	SSR02	SSR03	SSR04	Summary
Factor J Paralleling Existing Infrastructure Minnesota Statute § 216E.03 - Subdivision 7 (8) (roads/railroads) and (15e)(transmission lines)					
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.					SSR03 follows the most existing infrastructure (100 percent), with SSR04 following the second largest percentage of existing infrastructure for the length of its route (96.1 percent). SSR01 follows the smallest percent of existing infrastructure for the length of its route (40.4 percent).
Factor L Costs					
Costs Dependent on Design and Route					The route with the lowest estimated cost is SSR03 ($117,994,500). The route with the highest estimated cost is SSR01 ($124,861,500). No route has an estimated cost more than 5% higher than the average estimated cost of the applicants' proposed routes.

5.3.9 Route Segments and Alignment Alternatives for the Swift Subregion

Route segments and alignment alternatives were included in the scoping decision for the Swift Subregion but are not part of Routes SSR01 through SSR04. Rather, they are refinements to Routes SSR01 through SSR04. Figure 5-22 provides the locations of the route segments and alignment alternatives in the Swift Subregion. Table 5-38 summarizes the six route segments and three alignment alternatives in the Swift Subregion and indicates which route each would replace a portion of. These replacements are compared to the same portion of the original route that they diverge from, known as route segment equivalents. For purposes of analysis, route segments and alignment alternatives are considered in standalone comparisons to their route equivalents.

Figure 5-22 Swift Subregion Route Segments and Alignment Alternatives

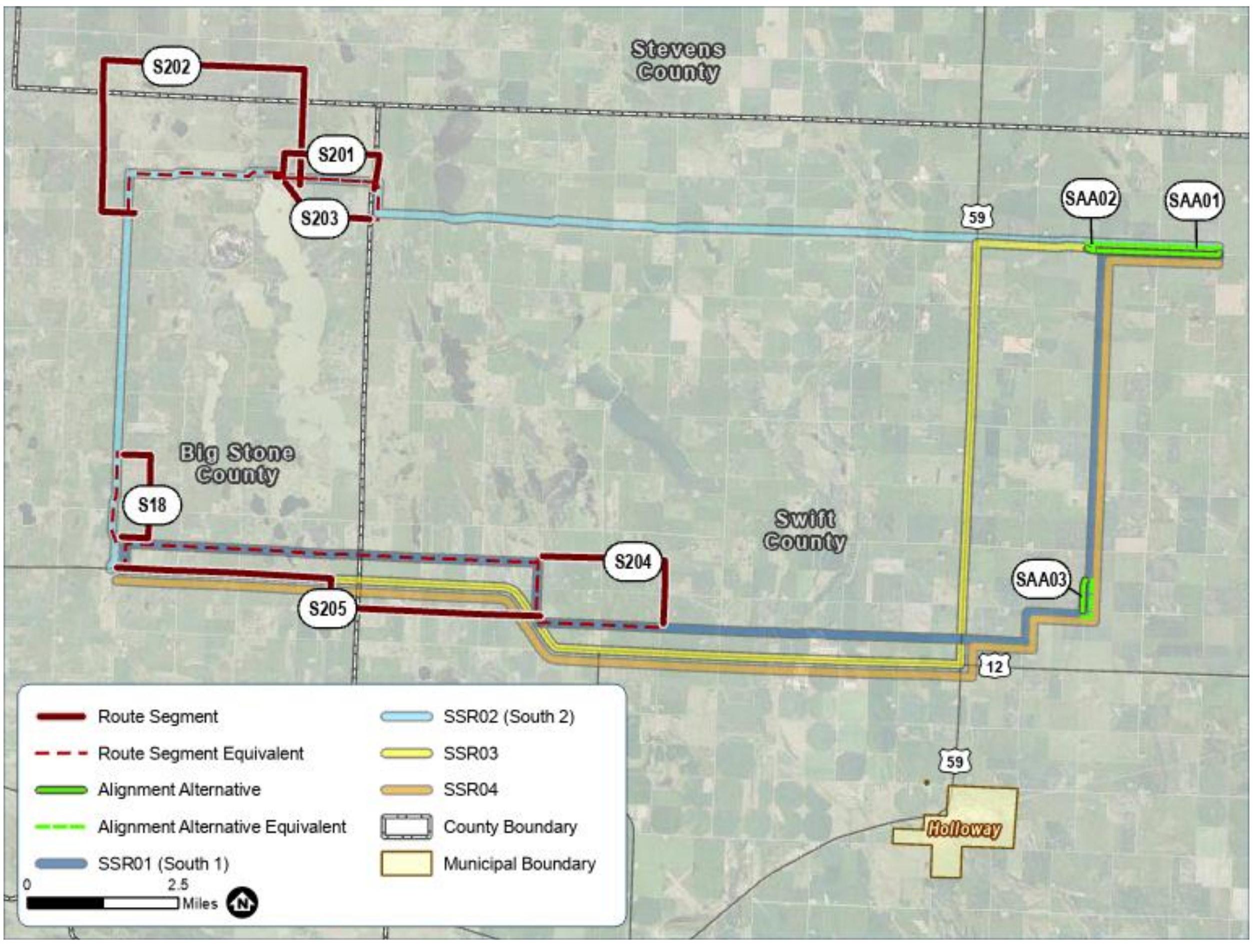


Table 5-38 Swift Subregion Route Segments and Alignment Alternatives

Routing Alternative	Subregion	Type	Description
S18	Swift	Route Segment	Included by the applicants in the route permit application as an alternative to avoid four additional homes. It can be used to modify route SSR02.
S201	Swift	Route Segment	Proposed during scoping to mitigate impacts to farming operations by following roads instead of South 2, which bisects agricultural fields. It can be used to modify route SSR02.
S202	Swift	Route Segment	Proposed during scoping to mitigate impacts to federally protected USFWS lands. It can be used to modify route SSR02.
S203	Swift	Route Segment	Proposed during scoping to mitigate impacts to farming operations by following roads instead of South 2, which bisects agricultural fields. It can be used to modify route SSR02.
S204	Swift	Route Segment	Proposed during scoping to mitigate impacts to farming operations along South 1. It can be used to modify route SSR01.
S205	Swift	Route Segment	Proposed during scoping to mitigate impacts to federally protected USFWS lands. It can be used to modify routes SSR03 or SSR04.
SAA01	Swift	Alignment Alternative	Proposed during scoping to mitigate impacts to a residence by moving the alignment to agricultural fields on the south side of 60th Street NW. It can be used to modify routes SSR01 or SSR04.
SAA02	Swift	Alignment Alternative	Proposed during scoping to mitigate impacts to a commercial building and a residence by moving the alignment to agricultural fields on the south side of 60th Street NW. It can be used to modify routes SSR02 or SSR03.
SAA03	Swift	Alignment Alternative	Proposed during scoping to mitigate potential impacts to a residence. It can be used to modify routes SSR01 or SSR04.

5.3.9.1 Route Segment S18

Route Segment S18 is 2.4 miles long and is an alternative to a part of Route SSR02. Route Segment S18 was proposed to mitigate impacts to residences. Route Segment S18 is shown on Figure 5-22 and Table 5-39 summarizes differences in potential impacts of Route Segment S18 compared to its equivalent.

Table 5-39 Route Segment S18 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment S18 would follow no existing infrastructure (transmission lines, roads, railroads) compared to its equivalent following existing infrastructure for 83.7 percent of its length. S18 would follow division lines (field, parcel, or section lines) for 100 percent of its length compared to the equivalent following division lines for 94.6 percent of its length. S18 parallels more total ROW than its equivalent (100 percent and 94.6 percent, respectively).
Cost	Route Segment S18 is approximately a mile longer than its equivalent and costs an estimated $7.1 million (95 percent) more; $14,604,000 compared to $7,506,500 for its equivalent.
Human Settlement – Aesthetics	Route Segment S18 would not create a pinch point for two residences with an existing transmission line whereas its equivalent would as shown in Figure 5-13. S18 has one residence within 1,600 feet whereas its equivalent has one within 250 feet and two within 500 feet. S18's equivalent also has more total non-residences (35) than S18 which has 22. S18 parallels more existing infrastructure but does not reduce aesthetic impacts because of the created pinch point. Route Segment S18 has fewer aesthetic impacts than its equivalent.
Human Settlement – Displacement	There are no residences or non-residential structures within the ROW.
Human Settlement – Recreation	There are no changes to impacts to recreation.
Land-Based Economies – Agriculture	Route Segment S18 would traverse more agricultural land than its equivalent. It would also parallel less existing infrastructure.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	No archaeological sites or historic resources are in the ROIs for Route Segment S18 or its equivalent.
Natural Environment – Public and Designated Lands	There are no public or conservation easement lands within the ROI of Route Segment S18 or its equivalent.
Natural Environment - Vegetation	Route Segment S18 would have no forested land within its ROW whereas its equivalent would have 0.4 acres, increasing vegetation impacts.
Natural Environment – Wildlife and Wildlife Habitat	S18 would intersect more acres of Important Bird Areas than its equivalent (306 acres and 195 acres, respectively) for a longer crossing length (2.4 miles and 1.5 miles, respectively).
Natural Environment – Rare and Unique Natural Resources	Neither Route Segment S18 nor its equivalent have any documented records of federal or state protected species within one mile. No sensitive ecological resources intersect the ROW of Route Segment S18 or its equivalent.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Route Segment S18 and its equivalent have one watercourse within its ROI. S18 has two watercourse crossings, while its equivalent has only one. There are no differences in for waterbodies present in the ROI or crossings. These would not require in water work.

Resource	Summary
Natural Environment – Wetlands and Calcareous Fens	Route Segment S18 would cross the same amount of wetlands both in terms of acreage in the ROW with a single, longer crossing by about 100 feet when compared to the equivalent which has two shorter crossings. S18 crosses less forested wetland (0 acres) compared to its equivalent (1 acre). No changes occur between the Route SegmentS18 and its equivalent when considering impacts on PWI wetlands or calcareous fens.

5.3.9.2 Route Segment S201

Route Segment S201 is 2.6 miles long and is an alternative to a part of Route SSR02. Route Segment S201 was proposed to mitigate impacts to farming operations. Route Segment S201 is shown on Figure 5-22 and Table 5-40 summarizes differences in potential impacts of Route Segment S201 compared to its equivalent.

Table 5-40 Route Segment S201 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment S201 would follow existing infrastructure (transmission lines, roads, railroads) for 79.1 percent of its length compared to its equivalent following existing infrastructure for 10.3 percent of its length. S201 would follow division lines (field, parcel, or section lines) for 94.1 percent of its length compared to the equivalent following division lines for 100 percent of its length. S201 parallels less total ROW than its equivalent (94.1 percent and 100 percent, respectively).
Cost	Route Segment S201 is approximately a mile longer than its equivalent and costs an estimated $7.4 million (72 percent) more; $17,807,500 compared to $10,358,000 for its equivalent.
Human Settlement – Aesthetics	Both Route Segment S201 and its equivalent has one residence within 1,600 feet. Neither S201 or its equivalent would box in residences. S201 would follow existing infrastructure for 79.1 percent of its length whereas its equivalent follows for only 10.3 percent of its length. Thus S201 has less aesthetic impacts then its equivalent.
Human Settlement – Displacement	There are no residences or non-residential structures within the ROW.
Human Settlement – Recreation	Route Segment S201 would increase linear feet of snowmobile trails by approximately 2,100 compared to its equivalent.
Land-Based Economies – Agriculture	Route Segment S201 would traverse more agricultural land than its equivalent, but it would parallel more existing roads. A public commenter recommended this route to decrease impacts to their agricultural operations.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	Archaeological site 21BSf is located within the ROI for both Route Segment S201 and its equivalent.

Resource	Summary
Natural Environment – Public and Designated Lands	Route Segment S201 would have greater impacts on federal public lands, crossing the Big Stone County WPA and the Olson WPA, than its equivalent, which only crosses the Big Stone County WPA. There are no conservation easement lands within the ROI of S201 or its equivalent.
Natural Environment - Vegetation	Route Segment S201 would have 0.1 acres of forested land within its ROW whereas its equivalent would have none.
Natural Environment – Wildlife and Wildlife Habitat	Route Segment S201 would intersect more acres of Important Bird Areas than its equivalent (329 acres and 216 acres, respectively) for a longer crossing length (2.6 miles and 1.6 miles, respectively), and more acres of WPAs (105 acres and 25 acres, respectively) for a longer crossing length (1.3 miles and 0.2 miles, respectively). Both S201 and its equivalent intersect <1 acre of Wildlife Action Network corridors. S201 intersects two shallow wildlife lakes (Artichoke Lake and an unnamed wildlife lake), while its equivalent only intersects one shallow wildlife lake (Artichoke Lake).
Natural Environment – Rare and Unique Natural Resources	Neither Route Segment S201 nor its equivalent have any documented records of federal or state protected species within one mile. The ROW of Route Segment S201 would intersect 14 acres of a Site of Biodiversity Significance ranked below, while its equivalent would avoid this resource.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Route Segment S201 has two waterbodies within the ROI and crosses one of them. Its equivalent has one waterbody and PWI waterbody within the ROI, and no waterbody crossings. S201 and its equivalent have one watercourse within the ROI. S201 has one impaired watercourse within its ROI. S201 has three watercourse crossings and two impaired watercourse crossings. Its equivalent has one watercourse crossing. There are no PWI watercourses within the ROI.
Natural Environment – Wetlands and Calcareous Fens	Route Segment S201 would cross more wetlands than its equivalent both in terms of acreage (70 compared to 17 acres, respectively) and length of crossing (approximately 3000 feet longer). S201 crosses more forested wetland (1 acre) compared to its equivalent (0 acres). No changes occur between the S201 and its equivalent when considering impacts on PWI wetlands or calcareous fens.

5.3.9.3 Route Segment S202

Route Segment S202 is 8.1 miles long and is an alternative to a part of Route SSR02. Route Segment S202 was proposed to mitigate impacts to federally protected USFWS lands. Route Segment S202 is shown on Figure 5-22 and Table 5-41 summarizes differences in potential impacts of Route Segment S202 compared to its equivalent.

Table 5-41 Route Segment S202 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment S202 would follow existing infrastructure (transmission lines, roads, railroads) for 6.3 percent of its length compared to its equivalent following existing infrastructure for 17.6 percent of its length. S202 would follow division lines (field, parcel, or section lines) for 76.8 percent of its length compared to the equivalent following division lines for 84.6 percent of its length. S202 parallels less total ROW than its equivalent (76.8 percent and 84.6 percent, respectively).
Cost	Route Segment S202 is approximately 5 miles longer than its equivalent and is nearly double the cost; $40,535,500 compared to $20,789,000 for its equivalent.
Human Settlement – Aesthetics	Route Segment S202 would box in a residence along two of its boundaries as shown in Figure 5-14. Route Segment S202's equivalent would box in a separate residence along two of its boundaries as shown in Figure 5-14. Route Segment S202 has one residence within 250 feet whereas its equivalent has none. Its equivalent has three residences within 500 feet and one within 1,600 feet whereas S202 has three within 1,600 feet. S202 and its equivalent follow about the same percentage of existing infrastructure and natural division lines although S202 is longer and affects more mileage, increasing aesthetic impacts. S202 has more total non-residences (47) than its equivalent which has 21. Segment S202 has slightly greater aesthetic impacts than its equivalent due to the residence within 250 feet and the total mileage.
Human Settlement – Displacement	There are no residences or non-residential structures within the ROW.
Human Settlement – Recreation	Route Segment S202 would decrease linear feet of snowmobile trails by approximately 2,100 compared to its equivalent. However, Route Segment S202 would add a Wildlife Management Area to the route width whereas its equivalent would not.
Land-Based Economies – Agriculture	Route Segment S202 would traverse more agricultural land than its equivalent and would cut through four agricultural fields without following natural division lines.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	Two cultural resources are within the ROI of the Route Segment S202 equivalent that are not within the ROI for Route Segment S202: archaeological site 21BSf, unevaluated for the NRHP, and historic architectural resource BS-ART-00002, also unevaluated for the NRHP.
Natural Environment – Public and Designated Lands	Public lands within the ROI of only Route Segment S202 include the Old Gravel Pit WMA which is owned by the DNR. Public lands within the ROI of only the equivalent include Big Stone County WPAs which are owned by USFWS. The equivalent would impact federally protected wetlands and grasslands in Big Stone County WPAs; S202 would not impact these federally protected lands (comment #48 reference (2)). The anticipated alignment of S202 does not cross the Old Gravel Pit WMA. Conservation easement lands within the ROI of the equivalent include 9 acres of WRP land; the anticipated alignment does not cross WRP land. There are no conservation easement lands within the ROI of S202.

Resource	Summary
Natural Environment - Vegetation	Route Segment S202 would have 1.0 acre of forested land within its ROW whereas its equivalent would have none.
Natural Environment – Wildlife and Wildlife Habitat	S202 would intersect more acres of Important Bird Areas than its equivalent (488 acres and 416 acres, respectively) for a longer crossing length (3.9 miles and 3.3 miles, respectively), and more acres of GBCAs (610 acres and 265 acres, respectively). The equivalent crosses WPAs twice; S202 avoids WPAs. S202 crosses Wildlife Action Network corridors twice; its equivalent does not cross Wildlife Action Network corridors. S202 intersects a very small acreage of the Old Gravel Pit WMA, its equivalent avoids WMAs entirely. The equivalent intersects two shallow wildlife lakes within the route width (Artichoke Lake and an unnamed wildlife lake), and would cross the unnamed wildlife lake; S202 avoids shallow wildlife lakes entirely.
Natural Environment – Rare and Unique Natural Resources	Neither Route Segment S202 nor its equivalent have any documented records of federal or state protected species within 1 mile. The ROW of Route Segment 202 would intersect 35 acres of Prairie Conservation Plan prairie core areas, while its equivalent would avoid this resource. Artichoke Lake, a Lake of Biological Significance, is in the route width of the equivalent but not within the route width of Route Segment 202.
Natural Environment - Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Route Segment S202 has one waterbody within the ROI, one waterbody crossing, and no PWI basins. Its equivalent has two waterbodies and two PWI basins within the ROI. The equivalent has three waterbody crossings. Route Segment S202 and its equivalent each have one watercourse within their ROIs. Route Segment S202 has two PWI watercourses within the ROI. Route Segment S202 has seven watercourse crossings and two PWI watercourse crossings. Its equivalent has two watercourse crossings and one PWI watercourse crossings.
Natural Environment – Wetlands and Calcareous Fens	Route Segment S202 would cross more wetlands than its equivalent in terms of acreage (117 compared to 83 acres, respectively) but a lower length of crossing (approximately 100 feet shorter). S202 crosses less forested wetland (0.5 acres) compared to its equivalent (4 acres). No changes occur between the Route Segment and its equivalent when considering impacts on calcareous fens.

5.3.9.4 Route Segment S203

Route Segment S203 is 1.8 miles long and is an alternative to a part of Route SSR02. Route Segment S203 was proposed to mitigate impacts to farming operations. Route Segment S203 is shown on Figure 5-22 and Table 5-42 summarizes differences in potential impacts of Route Segment S203 compared to its equivalent.

Table 5-42 Route Segment S203 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment S203 would follow existing infrastructure (transmission lines, roads, railroads) for 38.6 percent of its length compared to its equivalent following existing infrastructure for 26 percent of its length. Both S203 and its equivalent would follow division lines (field, parcel, or section lines) for 100 percent of their lengths. S202 and its equivalent would both parallel total ROW for 100 percent of their lengths.
Cost	Route Segment S203 is approximately 0.2 miles longer than its equivalent and costs an estimated $2.1 million (18 percent) more; $13,343,000 compared to $11,281,500 for its equivalent.
Human Settlement – Aesthetics	Route Segment S203 would box in the same residence as it's equivalent with an existing transmission line as shown in Figure 5-15, however S203 would box in this parcel on three boundaries rather than two. This residence would be subject to significant impacts. Route Segment S203 has one residence within each of the following buffers: 250, 500, and 1,600 feet, whereas its equivalent has no residences. S203 has 13 non-residences and its equivalent has none. S203 entirely parallels an existing roadway whereas its equivalent does not follow natural division lines until it parallels the existing transmission line along 260th Avenue NW. Aesthetic impacts are slightly less for S203's equivalent but presents tradeoffs by bisecting parcels instead of following natural division lines.
Human Settlement – Displacement	There are no residences or non-residential structures within the ROW.
Human Settlement – Recreation	Route Segment S203 would increase linear feet of snowmobile trails by approximately 3,900 compared to its equivalent.
Land-Based Economies – Agriculture	Route Segment S203 would traverse less agricultural land than its equivalent, and it would entirely parallel existing roads.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	No archaeological sites or historic resources are in the ROIs for Route Segment S203 or its equivalent.
Natural Environment – Public and Designated Lands	Public lands within the ROI of Route Segment S203 and its equivalent include a Big Stone County WPA which is owned by USFWS; impacts to this resource would not substantially differ between S203 and its equivalent. There are no conservation easement lands within the ROI of S203 or its equivalent.

Resource	Summary
Natural Environment - Vegetation	Route Segment S203 and its equivalent would have no forested land within their ROW.
Natural Environment – Wildlife and Wildlife Habitat	Route Segment S203 would intersect fewer acres of Important Bird Areas than its equivalent (231 acres and 257 acres, respectively) for a shorter crossing length (1.8 miles and 2.0 miles, respectively). S203 and its equivalent would both intersect 8 acres of WPAs, with S203 crossing WPAs for 13 more feet than its equivalent. S203 would intersect more acres of Wildlife Action Network corridors than its equivalent (11 acres and 0.2 acres, respectively) and more acres of Artichoke Lake, a shallow wildlife lake (12 acres and 0.2 acres, respectively).
Natural Environment – Rare and Unique Natural Resources	Neither Route Segment S203 nor its equivalent have any documented records of federal or state protected species within one mile. No sensitive ecological resources intersect the ROW of Route Segment S203 or its equivalent.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Both Route Segment S203 and its equivalent have the same number of waterbodies, PWI basins, and impaired waters. There are no waterbody crossings. Both Route Segment S203 and its equivalent have the same number of watercourses, PWI watercourses, and impaired watercourses. They both have the same number of crossings. S203 has one FEMA-floodplain crossing that exceeds 1,000 feet compared to its equivalent which has none.
Natural Environment – Wetlands and Calcareous Fens	Route Segment S203 would cross more wetlands than its equivalent both in terms of acreage (36 compared to 21 acres, respectively) and length of crossing (approximately 200 feet longer). S203 crosses more forested wetlands (1 acre) compared to its equivalent (0 acres). No changes occur between S203 and its equivalent when considering impacts on PWI wetlands or calcareous fens.

5.3.9.5 Route Segment S204

Route Segment S204 is 3.0 miles long and is an alternative to a part of Route SSR01. Route Segment S204 was proposed to mitigate impacts to farming operations. Route Segment S204 is shown on Figure 5-22 and Table 5-43 summarizes differences in potential impacts of Route Segment S204 compared to its equivalent.

Table 5-43 Route Segment S204 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment S204 would follow existing infrastructure (transmission lines, roads, railroads) for 33.7 percent of its length compared to its equivalent following existing infrastructure for 33.1 percent of its length. Both S204 and its equivalent would follow division lines (field, parcel, or section lines) for 100 percent of their lengths. S204 and its equivalent would both parallel total ROW for 100 percent of their lengths.
Cost	Route Segment S204 costs an estimated $0.9 million (7 percent) more than its equivalent; $15,133,500 compared to $14,212,000 for its equivalent.
Human Settlement – Aesthetics	Both Route Segment S204 and its equivalent have two residences within 1,600 feet. This routing alternative was offered by a residence within 1,600 feet to mitigate impacts of S204's equivalent (comment #54 reference (2)). S204 would be partially screened by vegetation from all of the residences within 1,600 feet whereas its equivalent would be largely unscreened for all residences. Both S204 and its equivalent follow similar amounts of existing infrastructure and natural division lines. S204 has less aesthetic impacts than its equivalent.
Human Settlement – Displacement	There are no residences or non-residential structures within the ROW.
Human Settlement – Recreation	There are no changes to impacts to recreation.
Land-Based Economies – Agriculture	There are no changes to impacts to agriculture.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	No archaeological sites are located within the route width for Route Segment S204 or its equivalent. However, two unevaluated historic resources (SW-SHI-00001; SW-SHI-00002) are located within the ROI of Route Segment S204, while one historic resource previously determined not eligible for the NRHP (XX-ROD-00111) is located within the ROI of the Route Segment S204 equivalent. Resource SW-SHI-00001 consists of the Immanuel Lutheran Church, which was constructed in 1892 and resource SW-SHI-00002 consists of a schoolhouse constructed in 1900. Therefore, Route Segment S204 has greater potential to impact historic architectural resources than its equivalent.
Natural Environment – Public and Designated Lands	There are no public lands within the ROI of Route Segment S204 or its equivalent. S204 has 13 acres of a riparian CREP easement within the ROI, and the anticipated alignment crosses the easement for a length of 1,075 feet. The equivalent would not impact conservation easements.

Resource	Summary
Natural Environment - Vegetation	Route Segment S204 would have 0.3 acres of forested land within its ROW whereas its equivalent would have none.
Natural Environment – Wildlife and Wildlife Habitat	Route Segment S204 and its equivalent would both intersect 380 acres of Important Birds Areas, with S204 crossing Important Birds Areas for 15 more feet than its equivalent. S204 would intersect fewer acres of Wildlife Action Network corridors than its equivalent (106 acres and 131 acres, respectively), but S204 and its equivalent cross Wildlife Action Network corridors for an equivalent length (1.0 miles).
Natural Environment – Rare and Unique Natural Resources	Neither Route Segment S204 nor its equivalent have any documented records of federal or state protected species within one mile. The ROW of the equivalent would intersect 2 acres of a Site of Biodiversity Significance ranked below, while Route Segment S204 would avoid this resource.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Route Segment S204 has one waterbody within the ROI and no PWI basins or waterbody crossings. Its equivalent has no waterbodies, PWI basins or waterbody crossings within the ROI. Both S204 and its equivalent have one watercourse within their ROIs. S204 has three watercourse crossings and its equivalent has five watercourse crossings. There are no PWI watercourses within the ROI.
Natural Environment – Wetlands and Calcareous Fens	Route Segment S204 would cross the same acreage of wetlands (10 acres of wetlands not classified as PWI) as its equivalent, while the length of crossing is approximately 90 feet longer when compared to the equivalent. No changes occur between S204 and its equivalent when considering impacts on forested wetlands, PWI wetlands or calcareous fens.

5.3.9.6 Route Segment S205

Route Segment S205 is 7.5 miles long and is an alternative to a part of Routes SSR03 and SSR04. Route Segment S205 was proposed to mitigate impacts to federally protected USFWS lands. Route Segment S205 is shown on Figure 5-22 and Table 5-44 summarizes differences in potential impacts of Route Segment S205 compared to its equivalent.

Table 5-44 Route Segment S205 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment S205 would follow existing infrastructure (transmission lines, roads, railroads) for 46.8 percent of its length compared to its equivalent following existing infrastructure for 11.7 percent of its length. S205 would follow division lines (field, parcel, or section lines) for 83.3 percent of its length compared to the equivalent following division lines for 95.1 percent of its length. S205 parallels less total ROW than its equivalent (83.3 percent and 95.1 percent, respectively).

Resource	Summary
Cost	Route Segment S205 is approximately one mile shorter than its equivalent and costs an estimated $7.3 million (17 percent) less; $36,069,500 compared to $43,418,000 for its equivalent.
Human Settlement – Aesthetics	Route Segment S205 has one residence within 250 feet, two within 500 feet, and one within 1,600 feet. Its equivalent has four residences within 1,600 feet. Neither route would box in residences but may box in larger parcels that residences are within. S205 would follow natural division lines for 83.3 percent of its length compared to the equivalent following for 95.1 percent. S205's route would be partially along a US Highway and have an incremental aesthetic impact to residences along this existing infrastructure. The portion of S205 that does not parallel the Highway has no residences within 1,600 feet. Aesthetic impacts are relatively similar for both routes.
Human Settlement – Displacement	There are no residences or non-residential structures within the ROW.
Human Settlement – Recreation	There are no changes to impacts to recreation.
Land-Based Economies – Agriculture	Route Segment S205 would traverse more agricultural land than its equivalent, and it would parallel less existing infrastructure. Route Segment S205 would also cut through eight agricultural fields without following natural division lines. Additionally, Route Segment S205 would add another center pivot irrigation system to the route width, although the anticipated alignment is north of the center pivot irrigation system so impacts are not anticipated.
Land-Based Economies - Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	One historic resource previously determined not eligible for the NRHP (XX-ROD-00111) is located within the ROI of Route Segment S205 and its equivalent. Further, one historic cemetery (ID 19406/Unknown cemetery) is within the route width of the Route Segment S205 equivalent, but not within the route width of Route Segment S205.
Natural Environment – Public and Designated Lands	Public lands within the ROI of Route Segment S205 and its equivalent include a Big Stone County WPA which is owned by USFWS. The equivalent would have greater impacts on federally protected wetlands and grasslands within the Big Stone County WPA compared to S205 (comment #48 reference (2)). There are no conservation easement lands within the ROI of S205 or its equivalent.
Natural Environment - Vegetation	Route Segment S205 would have 0.5 acres of forested land within its ROW whereas its equivalent would have none.
Natural Environment – Wildlife and Wildlife Habitat	Route Segment S205 would intersect fewer acres of Important Bird Areas than its equivalent (927 acres and 1,046 acres, respectively) for a shorter crossing length (7.5 miles and 8.5 miles, respectively). The equivalent crosses WPAs twice and intersects more acres of WPAs than S205 (105 acres and 51 acres, respectively). The equivalent would intersect 25 acres of GBCAs; S205 avoids GBCAs.

Resource	Summary
Natural Environment – Rare and Unique Natural Resources	Route Segment S205 has one documented record of a state threatened species within one mile. No documented records of federal or state protected species are located within a mile of the equivalent. The ROW of both Route Segment S205 and its equivalent would intersect Sites of Biodiversity Significance, with Route Segment S205 intersecting 1 acre more than the equivalent. The ROW of the equivalent would intersect 1 acre of a native plant community, while Route Segment S205 would avoid it.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Both Route Segment S205 and its equivalent have one waterbody within their ROIs, but its equivalent has one PWI basin whereas S205 does not. S205 does not have any waterbody crossings, while the equivalent has two waterbody and two PWI basin crossings. Route Segment S205 and its equivalent each have one watercourse within its ROI. Route Segment S205 has three watercourse crossings, while its equivalent has six watercourse crossings.
Natural Environment – Wetlands and Calcareous Fens	Route Segment S205 would cross fewer wetlands than its equivalent both in terms of acreage (68 compared to 94 acres, respectively) and length of crossing (approximately 1100 feet shorter). S205 crosses less forested wetland (1 acre) compared to its equivalent (2 acres). No changes occur between the Route Segment and its equivalent when considering impacts on PWI wetlands or calcareous fens.

5.3.9.7 Alignment Alternative SAA01

Alignment Alternative SAA01 is 2.0 miles long and is an alternative to a part of Routes SSR01 and SSR04. Alignment Alternative SAA01 was proposed to mitigate impacts to a residence. Alignment Alternative SAA01 is shown on Figure 5-22 and Table 5-45 summarizes differences in potential impacts of Alignment Alternative SAA01 compared to its equivalent.

Table 5-45 Alignment Alternative SAA01 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Alignment Alternative SAA01 and its equivalent would follow existing infrastructure (transmission lines, roads, railroads) for 100 percent of their lengths. Both SAA01 and its equivalent would follow division lines (field, parcel, or section lines) for 100 percent of their lengths. SAA01 and its equivalent would both parallel total ROW for 100 percent of their lengths.
Cost	Alignment Alternative SAA01 costs an estimated $0.9 million (9 percent) more than its equivalent; $10,897,000 compared to $9,981,500 for its equivalent.
Human Settlement – Aesthetics	No changes in impacts to aesthetics.
Human Settlement – Displacement	There are no residences or non-residential structures within the ROW.
Human Settlement – Recreation	There are no changes to impacts to recreation.
Land-Based Economies – Agriculture	There are no changes to impacts to agriculture.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	No archaeological sites or historic resources are in the ROIs for Alignment Alternative SAA01 or its equivalent.
Natural Environment – Public and Designated Lands	There are no public or conservation easement lands within the ROI of Alignment Alternative SAA01 or its equivalent.
Natural Environment - Vegetation	No changes in impacts to vegetation.
Natural Environment – Wildlife and Wildlife Habitat	No changes to impacts to wildlife or wildlife habitat.
Natural Environment – Rare and Unique Natural Resources	Alignment Alternative SAA01 nor its equivalent have any documented records of federal or state protected species within one mile. No sensitive ecological resources intersect the ROW of Alignment Alternative SAA01 or its equivalent.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Alignment Alternative SAA01 has no differences in waterbodies with its equivalent. Alignment Alternative SAA01 and its equivalent each have one watercourse within the ROI. SAA01 has one watercourse crossing, while its equivalent has three.
Natural Environment – Wetlands and Calcareous Fens	No changes to impacts to wetlands or calcareous fens.

5.3.9.8 Alignment Alternative SAA02

Alignment Alternative SAA02 is 2.2 miles long and is an alternative to a part of Routes SSR02 and SSR03. Alignment Alternative SAA02 was proposed to mitigate impacts to a commercial building and a residence. Alignment Alternative SAA02 is shown on Figure 5-22 and Table 5-46 summarizes differences in potential impacts of Alignment Alternative SAA02 compared to its equivalent.

Table 5-46 Alignment Alternative SAA02 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Alignment Alternative SAA02 and its equivalent would follow existing infrastructure (transmission lines, roads, railroads) for 100 percent of their lengths. Both SAA02 and its equivalent would follow division lines (field, parcel, or section lines) for 100 percent of their lengths. SAA02 and its equivalent would both parallel total ROW for 100 percent of their lengths.
Cost	Alignment Alternative SAA02 costs an estimated $2.8 million (30 percent) more than its equivalent; $12,233,500 compared to $9,418,000 for its equivalent.
Human Settlement – Aesthetics	No changes in impacts to aesthetics.
Human Settlement – Displacement	There are no residences or non-residential structures within the ROW.
Human Settlement – Recreation	There are no changes to impacts to recreation.
Land-Based Economies – Agriculture	There are no changes to impacts to agriculture.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	No archaeological sites or historic resources are in the ROIs for Alignment Alternative SAA02 or its equivalent.
Natural Environment – Public and Designated Lands	There are no public or conservation easement lands within the ROI of Alignment Alternative SAA02 or its equivalent.
Natural Environment - Vegetation	No changes in impacts to vegetation.
Natural Environment – Wildlife and Wildlife Habitat	No changes to impacts to wildlife or wildlife habitat.
Natural Environment – Rare and Unique Natural Resources	Alignment Alternative SAA02 nor its equivalent have any documented records of federal or state protected species within one mile. No sensitive ecological resources intersect the ROW of Alignment Alternative SAA02 or its equivalent.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Alignment Alternative SAA02 has no differences in waterbodies with its equivalent. Alignment Alternative SAA02 and its equivalent each have one watercourse within the ROI. SAA02 has one watercourse crossing, while its equivalent has 3.
Natural Environment – Wetlands and Calcareous Fens	No changes to impacts to wetlands or calcareous fens.

5.3.9.9 Alignment Alternative SAA03

Alignment Alternative SAA03 is 0.5 miles long and is an alternative to a part of Routes SSR01 and SSR04. Alignment Alternative SAA03 was proposed to mitigate impacts to a residence. Alignment Alternative SAA03 is shown on Figure 5-22 and Table 5-47 summarizes differences in potential impacts of Alignment Alternative SAA03 compared to its equivalent.

Table 5-47 Alignment Alternative SAA03 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Alignment Alternative SAA03 and its equivalent would follow existing infrastructure (transmission lines, roads, railroads) for 100 percent of their lengths. Both SAA03 and its equivalent would follow division lines (field, parcel, or section lines) for 100 percent of their lengths. SAA03 and its equivalent would both parallel total ROW for 100 percent of their lengths.
Cost	Alignment Alternative SAA03 costs an estimated $0.8 million (25 percent) more than its equivalent; $4,193,000 compared to $3,350,500 for its equivalent.
Human Settlement – Aesthetics	Alignment Alternative SAA03 would shift from a property used as a residence onto a property used for agriculture, however, the alignment modification is minor and does not materially impact aesthetics.
Human Settlement – Displacement	There are no residences or non-residential structures within the ROW.
Human Settlement – Recreation	There are no changes to impacts to recreation.
Land-Based Economies – Agriculture	There are no changes to impacts to agriculture.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	No archaeological sites or historic resources are in the ROIs for Alignment Alternative SAA03 or its equivalent.
Natural Environment – Public and Designated Lands	There are no public or conservation easement lands within the ROI of Alignment Alternative SAA03 or its equivalent.
Natural Environment - Vegetation	No changes in impacts to vegetation.
Natural Environment – Wildlife and Wildlife Habitat	No changes to impacts to wildlife or wildlife habitat.
Natural Environment – Rare and Unique Natural Resources	Alignment Alternative SAA03 nor its equivalent have any documented records of federal or state protected species within one mile. No sensitive ecological resources intersect the ROW of Alignment Alternative SAA03 or its equivalent.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Alignment Alternative SAA03 has no differences in waterbodies with its equivalent. Alignment Alternative SAA03 has no differences in watercourses with its equivalent.
Natural Environment – Wetlands and Calcareous Fens	Alignment Alternative SAA03 crosses approximately ¼ acre less wetland than its alternative.

6 Central Region – Potential Impacts and Mitigation

This chapter describes potential impacts in the Central Region (Map 4). The Central Region includes the Hancock, Cyrus, and White Bear Lake subregions. There are 13 routing alternatives (nine routes, three route segments and one alignment alternative) in the Central Region as shown on Map 4.

6.1 Environmental Setting

The Central Region, which includes the Hancock, Cyrus, and White Bear Lake Subregions, is bound between the South Region to the southwest and North Region to the northeast (Map 2). The Central Region primarily intersects Pope and Stevens counties, with the southern extent of the Central Region also intersecting Swift County. The municipalities in the vicinity of the Central Region include the cities of Hancock, Cyrus, and Starbuck; several townships also intersect the Central Region. Existing transmission lines and the Canadian Pacific 98 – East Breckenridge Burlington Northern Santa Fe railroad traverse the Hancock Subregion in the southwestern extent of the Central Region. Major highways that traverse the Central Region include State Highway 9 and State Highway 28; county and local roads are also present. The Central Region is dominated by agricultural land (Map 11-2 through Map 11-5). Major waterways crossed by the routing alternatives within Central Region include the Chippewa River and the Little Chippewa River (Map 14-5 through Map 14-8).

The DNR and the USFWS have developed an Ecological Classification System (ECS) for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. Under this classification system, the Central Region is in the Minnesota River Prairie Subsection of the North Central Glaciated Plains Section in the Prairie Parkland Province (Map 2; reference (180)).

The Minnesota River Prairie Subsection is characterized by large till plains that are bisected by the broad valley of the Minnesota River. Topography is steepest along the Minnesota River and the Big Stone Moraine, which has steep kames and broad slopes, while topography outside of the river valley consists of level to gently rolling ground moraine. Glacial drift generally ranges between 100 and 400 feet throughout this subsection. Soils are mostly well to moderately well-drained loams formed in gray calcareous till with some localized inclusions of clay, sand, and gravel soils. Wetlands were common within this subsection prior to pre-European contact, and most have been drained to establish usable cropland (reference (180)).

6.2 Hancock Subregion Routes

The Hancock Subregion includes three routes and two route segments. The three routes are shown on Figure 6-1 and summarized in Table 6-1. The two route segments are discussed in Section 6.2.9.

Figure 6-1 Hancock Subregion Routes

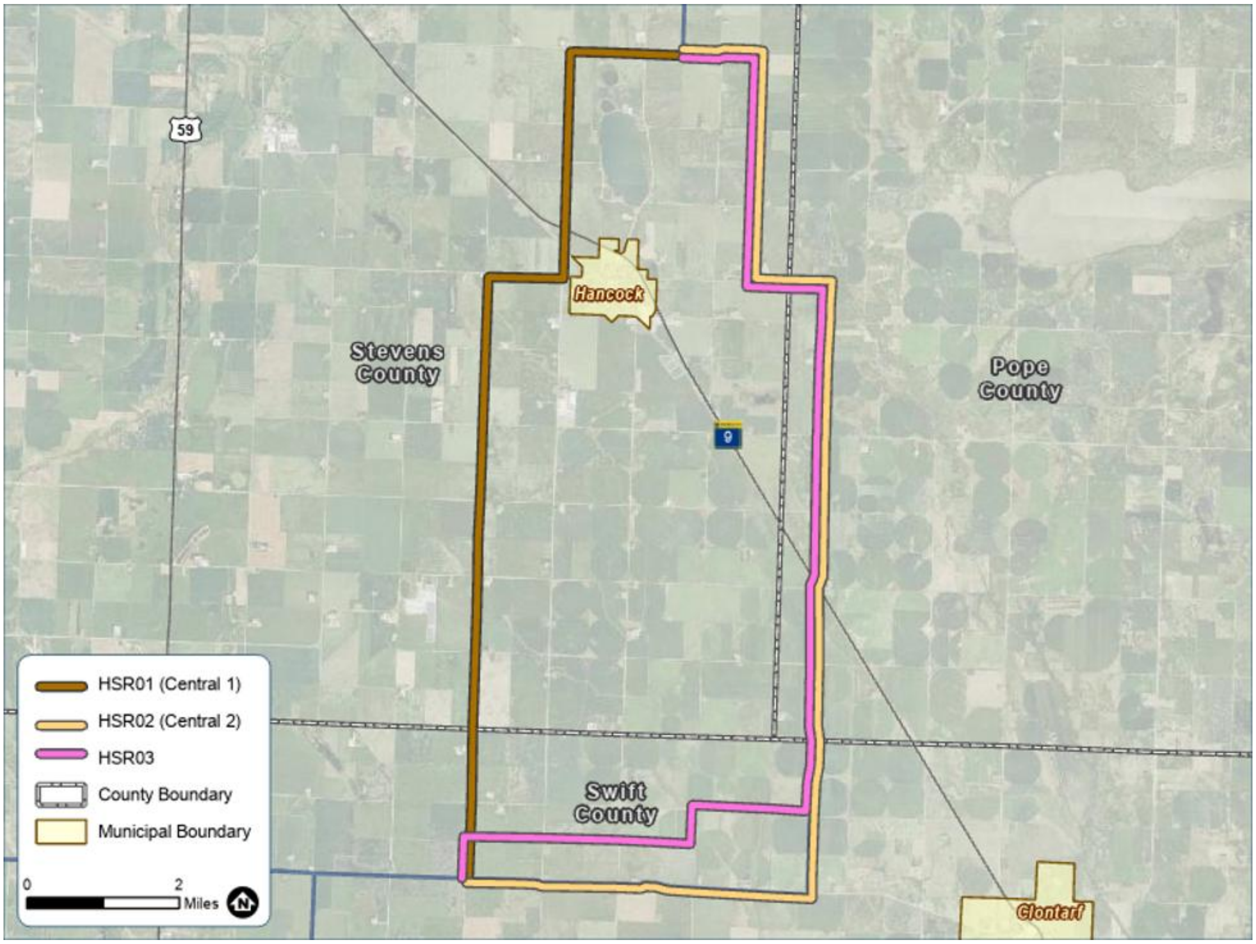


Table 6-1 Hancock Subregion Routes

Routing Alternative	Type	Description
HSR01	Route	Follows the applicants' proposed Central 1.
HSR02	Route	Follows the applicants' proposed Central 2.
HSR03	Route	Follows the applicants' proposed Central 1, then crosses to the applicants' proposed Central 2 using route connector C102.

6.2.1 Use or Paralleling of Existing Rights-of-Way

The use and paralleling of existing ROW is considered by the Commission when determining the most appropriate route for the project. Opportunities for ROW sharing for the project include public roads, existing transmission lines, and railroads.

Paralleling and/or sharing other types of existing ROW would have an incremental impact relative to existing horizontal elements, such as existing transmission lines, highways and county roads, and/or railroads (collectively referred to as "existing infrastructure"). In some cases, portions of a route could parallel ROW with more than one of these existing features at the same time (e.g., be sharing or paralleling transmission line and road ROW). Map 7-5 and Map 7-6 illustrates where ROW paralleling occurs and shows existing infrastructure.

As shown in Figure 6- and Table 6-2, HSR01 through HSR03 are between 13.4 miles (HSR01) and 17.6 miles long (HSR02). HSR01 follows existing ROW for the largest percentage of its length (88.8 percent), and HSR03 follows existing ROW for the smallest percentage of its length (31.5 percent).

Figure 6-2 Hancock Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

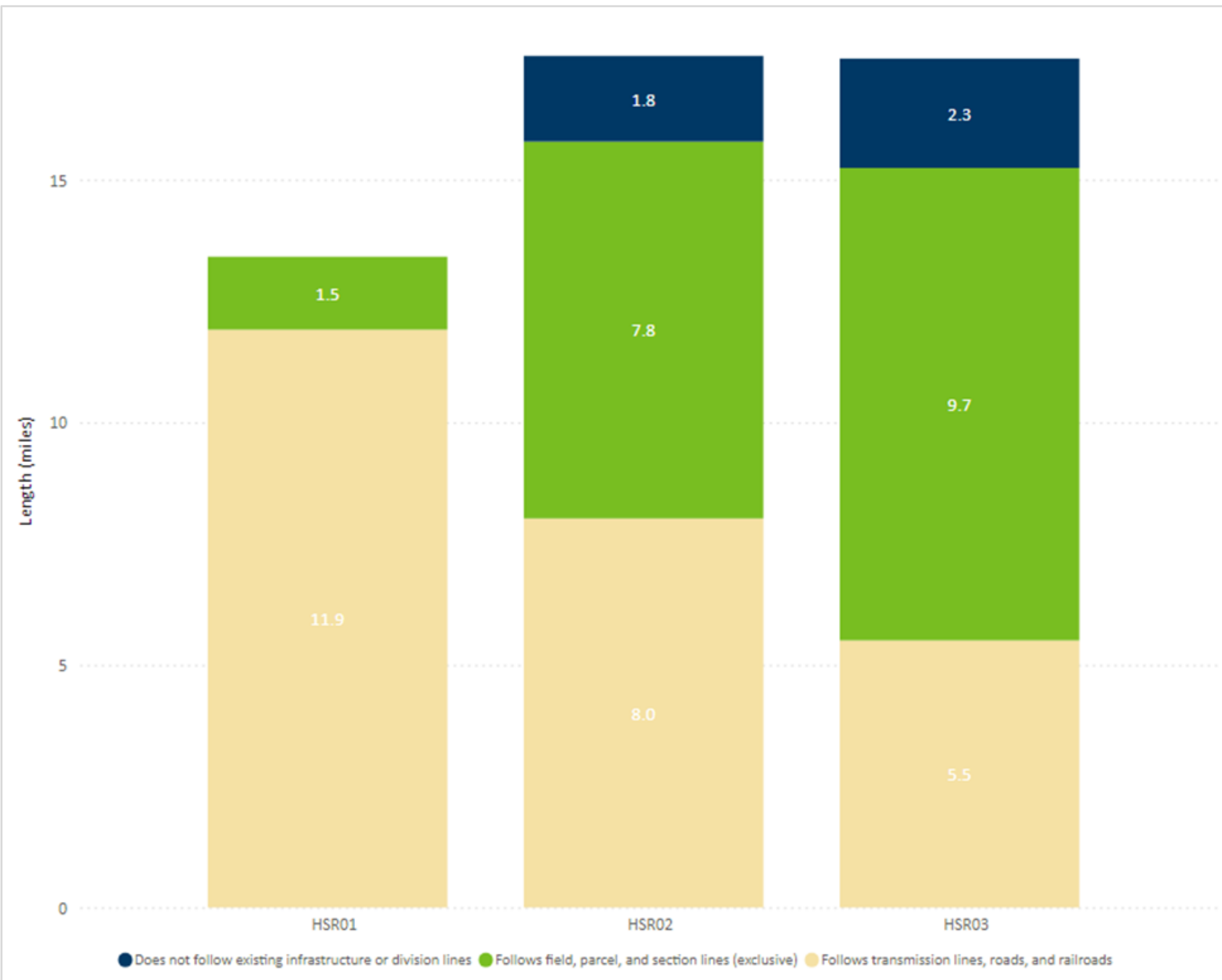


Table 6-2 Hancock Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

		Follows existing transmission lines		Follows existing roads		Follows existing infrastructure (transmission lines, roads, and railroads)		Follows field, parcel, and section lines	
Route	Total Length (mi)	Length (mi)	%	Length (mi)	%	Length (mi)	%	Length (mi)	%
HSR01	13.4	1.5	11.2	11.9	88.8	11.9	88.8	13.4	100.0
HSR02	17.6	0.5	2.7	8.0	45.7	8.0	45.7	15.7	89.5
HSR03	17.5	0.5	2.7	5.5	31.5	5.5	31.5	15.2	86.6

6.2.2 Human Settlement

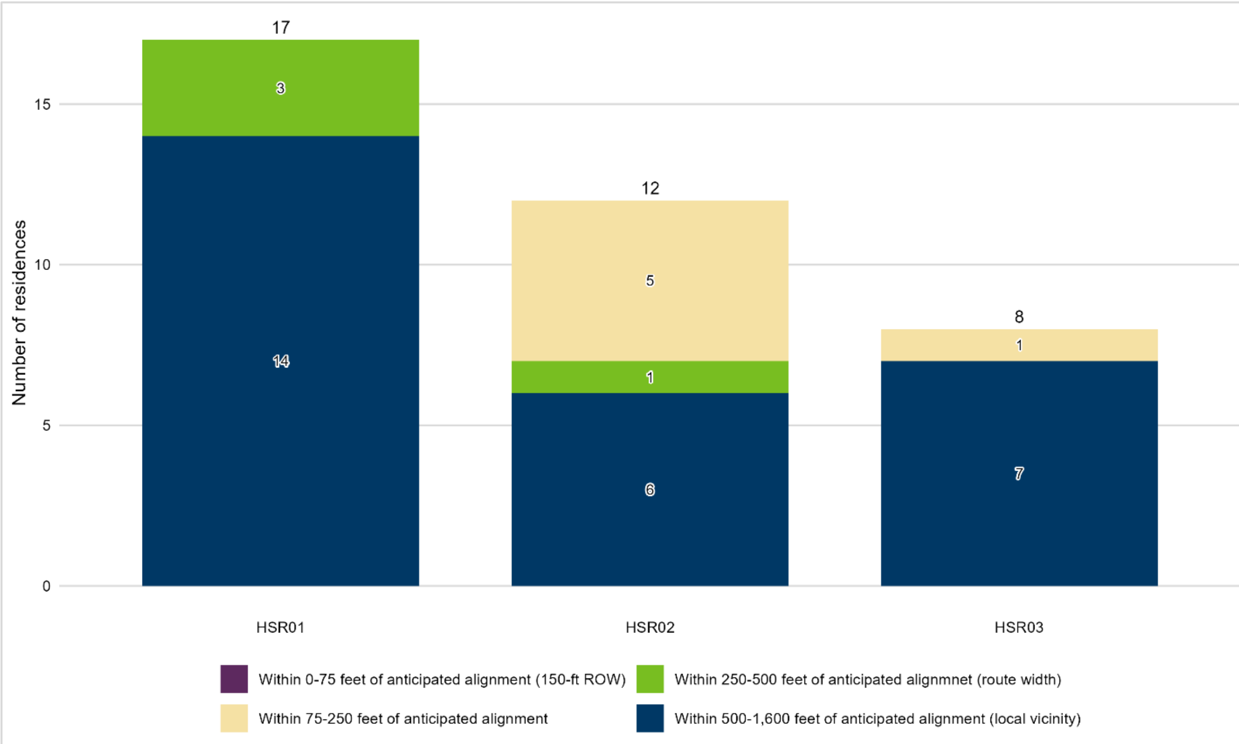
6.2.2.1 Aesthetics

The ROI for aesthetics is the local vicinity. Transmission lines alter a viewshed (Section 4.3.1). Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes. Determining the relative scenic value or visual importance in any given area is subjective and depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question.

Aesthetic impacts can be minimized by selecting routes farther from homes, schools, businesses, and other places where people congregate such as recreational areas. Aesthetic impacts can also be minimized by following existing transmission line ROW where elements of the built environment already define the viewshed and the addition of a transmission line would have an incremental impact. Following other infrastructure, such as roads and railroads, would also be expected to reduce potential impacts but not to the same extent. Additional details regarding potential impacts to aesthetics and potential mitigation measures for the project as a whole are provided in Section 4.3.1.

Appendix F shows human settlement features such as residences and nursing homes in the local vicinity of the routes in the Hancock Subregion. The proximity of residential structures (homes) and non-residential structures to routes at various distances is shown in Figure 6- and Table 6-3 , respectively. HSR03 has the fewest residences (8) and non-residential structures (78) in the local vicinity, whereas HSR01 has the most residences (17) and HSR02 has the most non-residential structures (103) in the local vicinity.

Figure 6-3 Hancock Subregion Routes, Proximity of Residential Structures



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

Table 6-3 Hancock Subregion, Proximity of Non-Residential Structures

Non-Residential Structures	Route		
Distances from Anticipated Alignment	HSR01	HSR02	HSR03
0-75 feet (150-foot-ROW)	0	0	0
75-250 feet	0	2	2
250-500 feet (generally route width)	8	39	14
500-1,600 feet (local vicinity)	85	62	62
Total	93	103	78

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

Recreational resources where people might congregate identified within the ROI include the West Central Trail Blazer and Northern Lights snowmobile trails (Map 10-5 and Map 10-6; Section 6.2.2.8). Recreational resources are defined and discussed for the project as a whole in Section 4.3.9. Aesthetic impacts to snowmobile trails are expected to be minimal due to the limited length of trail within the ROI (approximately 3,500 to 7,000 feet). In addition, all of the snowmobile trail cross routes rather than run in parallel. HSR01 has two snowmobile trail crossings, whereas the other routes have one snowmobile crossing.

There are no major river or waterbody crossings in the Hancock Subregion that would require vegetation clearing for the route's ROW. A railroad goes through this subregion along Old Highway 9 but does not parallel any routes. All routes would cross this railroad once.

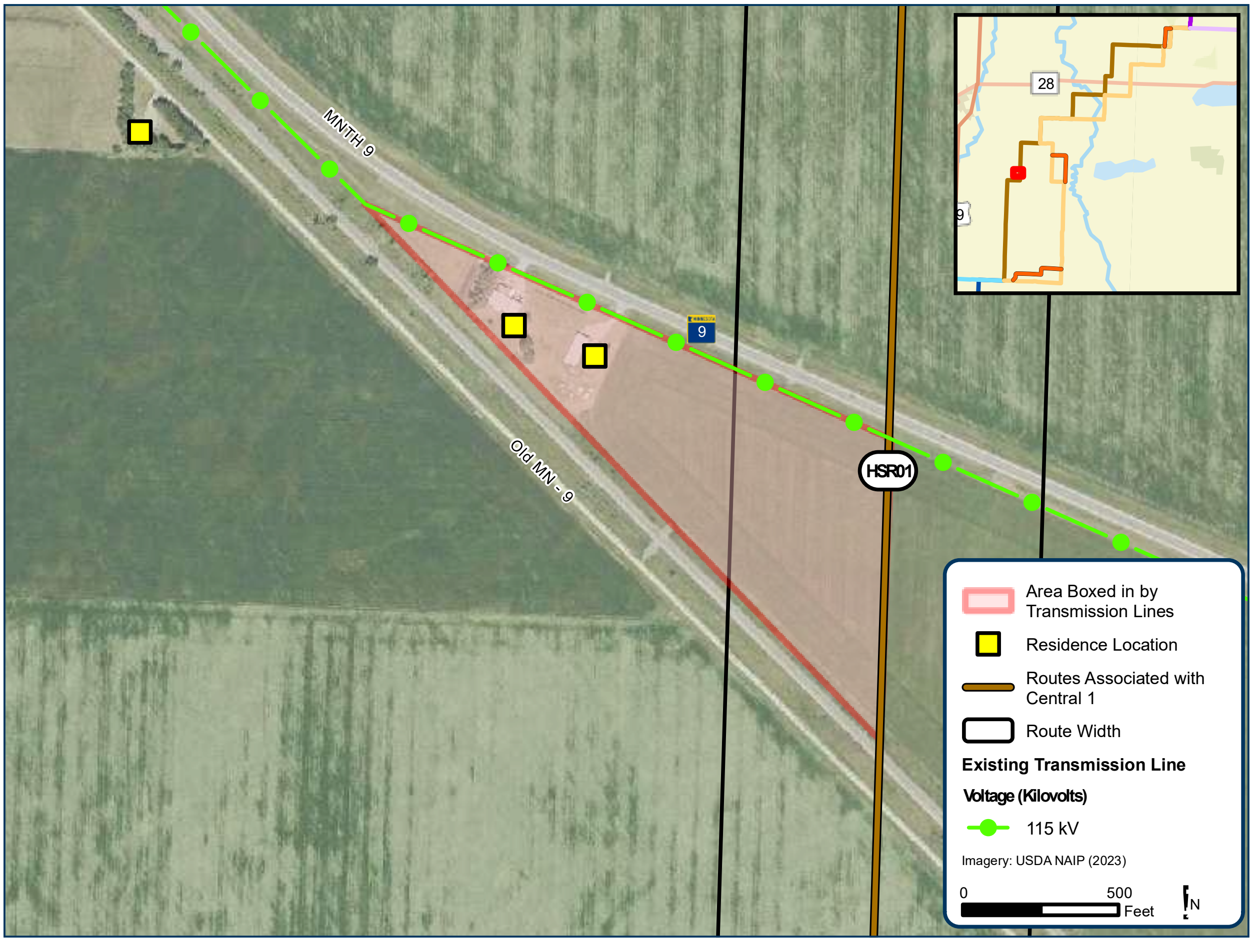
Aesthetic impacts will be greater in areas where no existing linear infrastructure, such as other transmission lines or railroads, is present. As shown in Map 7-5 and Map 7-6, HSR01 parallels existing transmission line along 250th Street as well as HSR02 and HSR03. HSR02 also follows an existing transmission line along 60th Street NW. HSR02 crosses the most transmission lines (6 times), whereas HSR01 crosses the fewest (2 times). Section 6.2.1 has further discussion on the use or paralleling of existing ROW for each route in the Hancock Subregion.

Each route would parallel existing infrastructure or division lines, as shown in Map 7-5, and Map 7-6. These maps illustrate existing infrastructure and division lines in the region, including roads, railroads, transmission lines, and parcel lines. In some cases, portions of a route could parallel ROW with more than one of these existing features at the same time. Table 6-2 quantifies the length and percentage of each type of paralleling for each route in the Hancock Subregion. Figure 6-2 demonstrates the same information in a chart based on length.

All routes are relatively similar in the percentage of paralleling with all types of existing infrastructure; however, HSR01 is approximately 4 miles shorter than the other routes. HSR01 parallels the most with 100 percent (13 miles) of its length. HSR03 parallels the least existing infrastructure with approximately 87 percent (15 miles) of its length. Aesthetics are minimized by paralleling with existing transmission line ROW rather than all types of existing ROW, which includes roads and parcel lines. Where transmission line structures already define the viewshed, more transmission line structures would have an incremental impact. HSR02 follows the most existing transmission lines for approximately 17 percent of its length (3 miles), whereas HSR02 follows the least at approximately 3 percent (0.5 miles). Aesthetic impacts are more moderate for residents in the ROI along routes that parallel with less existing transmission lines.

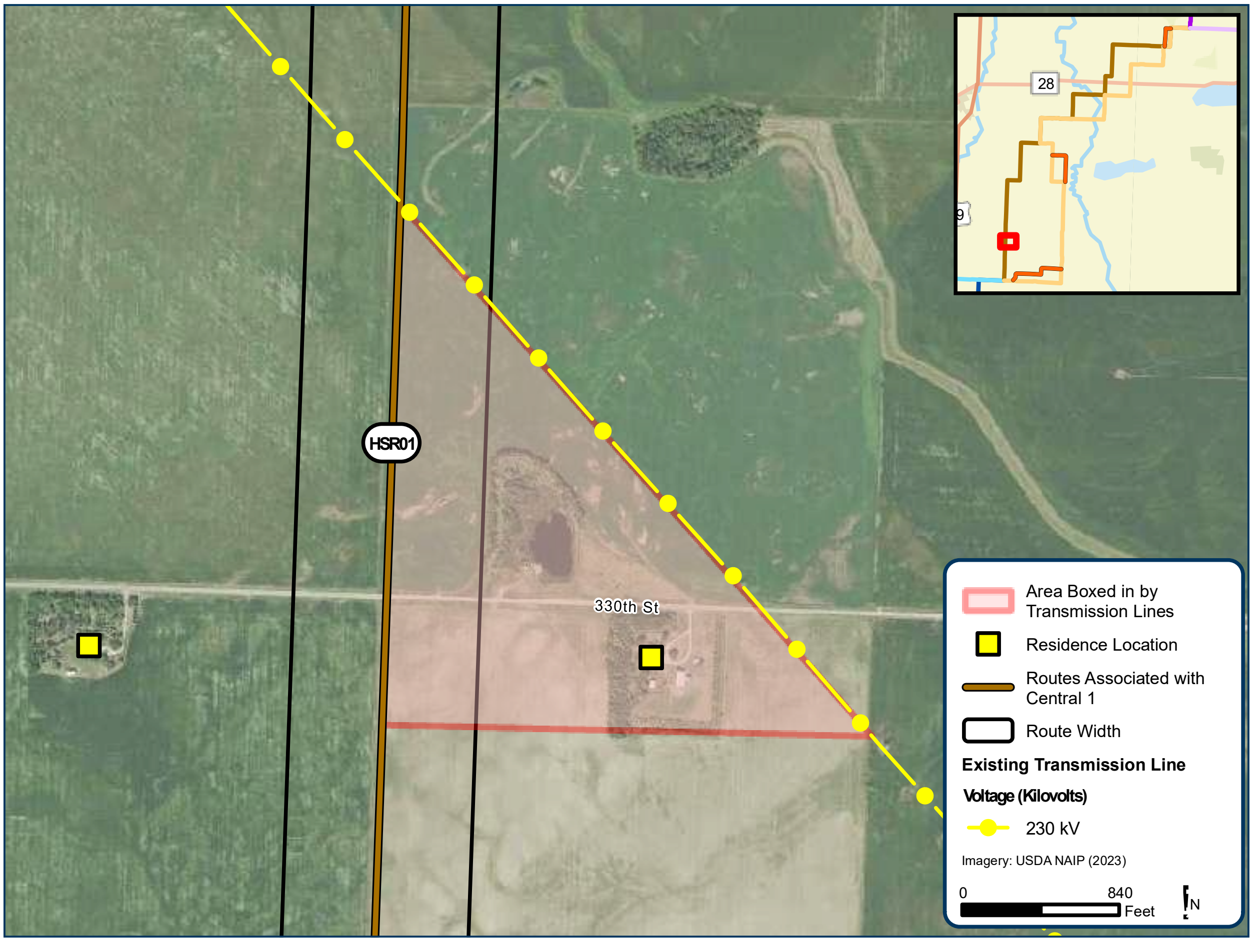
There are three areas in the Hancock Subregion where HSR01, HSR02, or HSR03 would box in parcels on two sides of their property with existing transmission lines and portions of the proposed transmission line. Area 1, as shown in Figure 6-4, is in Stevens County, northwest of Hancock. The existing line is a 115 kV line. If HSR01 were constructed, two residences would be subject to significant aesthetic impacts.

Figure 6-4 Hancock Subregion Area 1 Bordered by Existing Transmission and HSR01



Area 2, as shown in Figure 6-5, is in Stevens County southwest of Hancock. The existing line is a 230 kV line. If HSR01 were constructed, this residence would be subject to significant aesthetic impacts.

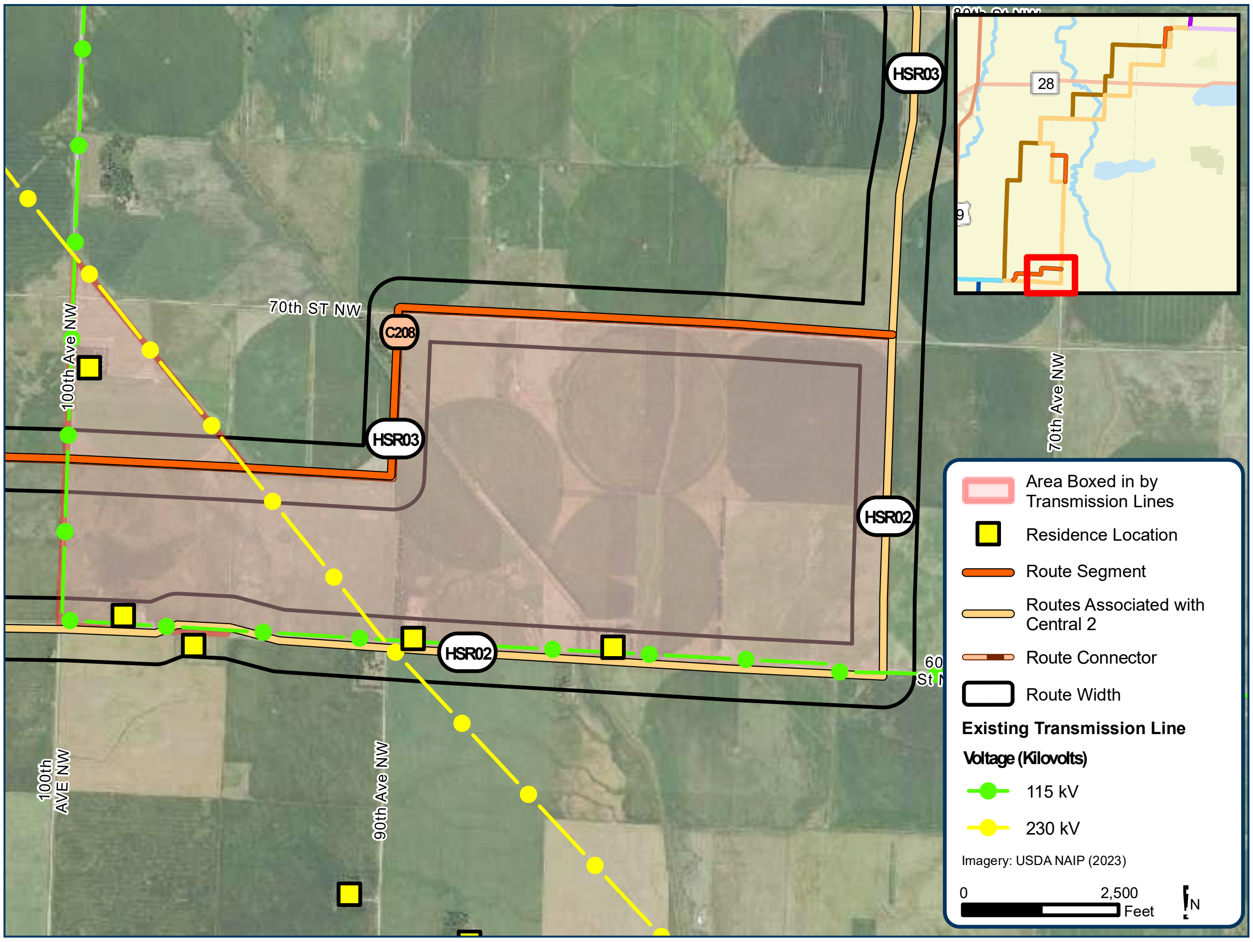
Figure 6-5 Hancock Subregion Area 2 Bordered by Existing Transmission and HSR01



There is one area (Area 3) in the Hancock Subregion where a pinch point would be created between four residences, an existing transmission line, and HSR02 as shown on Figure 6-6. Area 3 is in Swift County, west of Clontarf. One residence in Area 3 would be pinched between two existing transmission lines and HSR02 as shown on Figure 6-6. The existing lines are 115 kV and 230 kV lines.

HSR03 would box in two residences in Area 3 that have two boundaries with existing 115 kV and 230 kV transmission lines as shown in Figure 6-6. These residences would be subject to significant aesthetic impacts.

Figure 6-6   Hancock Subregion Area 3 Bordered by Existing Transmission and HSR02 or HSR03



6.2.2.2 Cultural Values

An assessment of potential impacts to cultural values is discussed for the entire project in Section 4.3.2. The impact assessment was completed for the project as a whole because there is limited variability in cultural values across the routing alternatives. Impacts to cultural values are independent of the route selected.

6.2.2.3 Displacement

There are no residences or non-residential structures within the ROW for the routes within the Hancock Subregion. An assessment of displacement, the general impacts from construction and operation of the project, and ways to avoid, minimize, and mitigate these impacts are in Section 4.3.3.

6.2.2.4 Environmental Justice

No EJ areas were identified in the Hancock Subregion routes. An assessment of potential impacts on environmental justice is discussed for the entire project in Section 4.3.5.

6.2.2.5 Land Use and Zoning

An assessment of potential impacts to land use and zoning is discussed in Section 4.3.6. The impact assessment for land use and zoning was completed for the project as a whole because there is limited variability in zoning impacts among the routing alternatives.

6.2.2.6 Noise

An assessment of potential impacts from noise is discussed for the entire project in Section 4.3.7. The impact assessment for noise was completed for the project as a whole because there is limited variability in the potential for noise across the routing alternatives.

6.2.2.7 Property Values

An assessment of potential impacts to property values is discussed for the entire project in Section 4.3.8. The impact assessment for property values was completed for the project as a whole because there is limited variability in the potential for property value impacts across the routing alternatives and changes to a specific property's value are difficult to predict. Potential impacts would be minimized by minimizing aesthetic impacts; aesthetic impacts are analyzed by subregion in Chapters 5 through 7.

6.2.2.8 Recreation

The ROI for recreation is the route width. Intermittent and localized indirect impacts could occur during construction (for example – increased noise levels); long-term impacts during operation could occur in the form of aesthetic impacts (Section 4.3.1.2). Given that direct long-term effects are predominantly related to aesthetics, the indirect long-term repercussions on recreation are anticipated to be subjective, meaning that responses would vary based on individual perspectives and experiences. Impacts to recreation are assessed through identification of recreational resources within the ROI. The project is not anticipated to directly impede recreational activities within the ROI such as snowmobiling, golfing, canoeing, hunting, or fishing. Additional details regarding potential impacts to recreation and potential mitigation measures for the project are provided in Section 4.3.9.

Routes in the Hancock Subregion do not cross any land-based public trails, state water trails, wild and scenic rivers, or scenic byways.

Multiple snowmobile trails are present in the Hancock Subregion including the Northern Lights Trails and West Central Trail Blazers Trails (Map 10-5 and Map 10-6). HSR01 has the most snowmobile crossings (2) and linear distance of snowmobile trail in the ROI (0.4 miles) while the other routes have one crossing and 0.2 miles of trail within their ROIs.

Public lands, including Waterfowl Production Areas, in the Hancock Subregion are publicly accessible and can be used for recreational purposes. These public lands are also used for wildlife management and are discussed in Section 6.2.6.8.

6.2.2.9 Socioeconomics

An assessment of potential impacts to socioeconomics is discussed for the entire project in Section 4.3.10 because there is limited variability in socioeconomic impacts among the routing alternatives.

6.2.2.10 Transportation and Public Services

An assessment of potential impacts to transportation and public services, including roadways, railroads, emergency services, airports, and utilities, is discussed for the entire project in Section 4.3.11. The impact assessment for transportation and public services was not analyzed at the subregional level because there is limited variability across the routing alternatives.

6.2.3 Human Health and Safety

An assessment of potential impacts to human health and safety is discussed for the entire project in Section 4.4. The impact assessment was completed for the project as a whole because there is limited variability across the routing alternatives and impacts would be minimized by prudent routing and adhering to applicable transmission line standards and codes.

6.2.4 Land-based Economies

Impacts to land-based economies are assessed by considering four elements: agriculture, forestry, mining, and tourism. Impacts and mitigation related to land-based economies are analyzed for the project as a whole in Section 4.5. The primary land-based economic activity in the project area is agriculture. The primary means of mitigating impacts to land-based economies is prudent routing; that is, by choosing routing alternatives that avoid such economies.

6.2.4.1 Agriculture

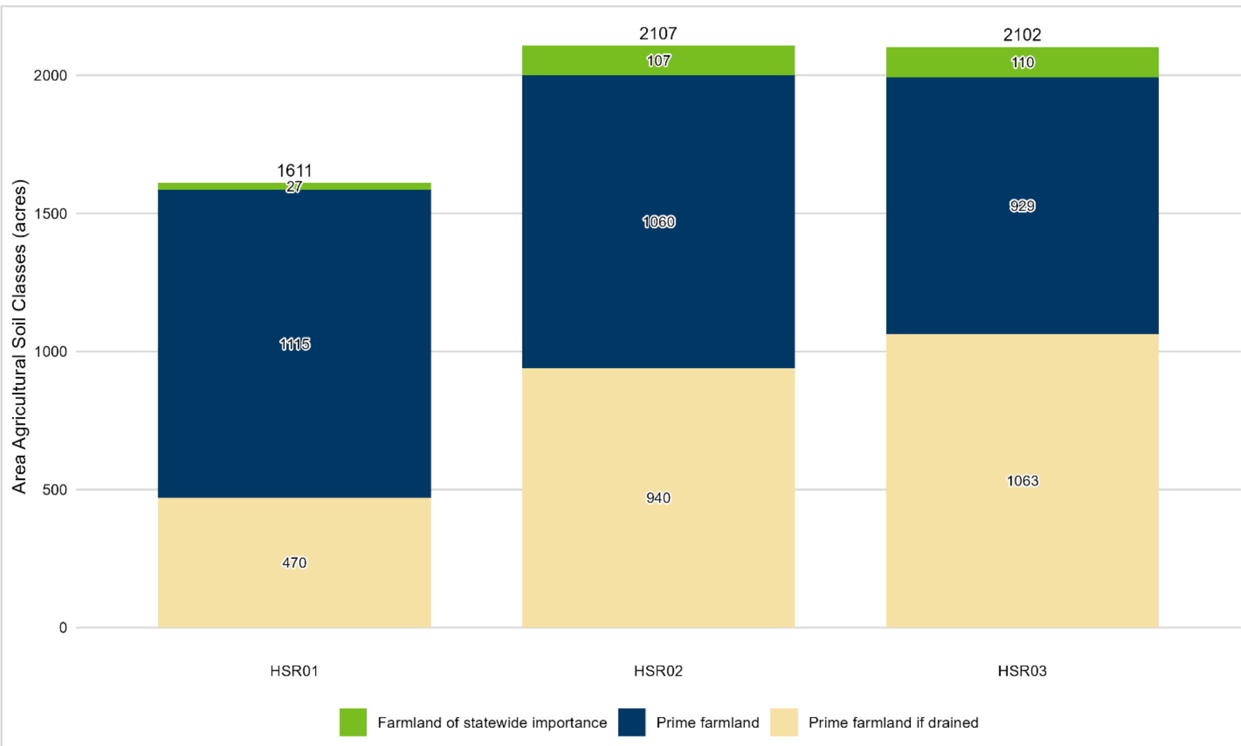
The ROI for the land-based economy of agriculture is the route width. Construction and operation of a transmission line impacts agriculture (Section 4.5.1.2). During construction, impacts would include the limited use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Permanent impacts would also occur when the footprint of the transmission line structures directly impedes agricultural production and/or impedes efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields.

Prudent routing (paralleling existing infrastructure and/or paralleling division lines) could minimize potential impacts. Implementation of the AIMP (Appendix K) would minimize and mitigate impacts to agriculture. Additional details regarding potential impacts to agriculture and potential mitigation measures is provided in Section 4.5.1.

Figure 6-7 summarizes the total acres within the route widths of the Hancock Subregion routes that have designated soil classifications for prime farmland and farmland of statewide importance. Figure 6-8 summarizes the total acres within the route widths of the Hancock Subregion routes that are designated agricultural land use. Most land (80 percent or more) within the ROI of the routing alternatives in the Hancock Subregion is designated as agricultural land use (cultivated crops and hay/pasture; see Section 6.2.6.7). HSR01 has the most prime farmland. HSR03 has the least prime farmland. HSR03 has the most agricultural land. HSR01 has the least agricultural land.

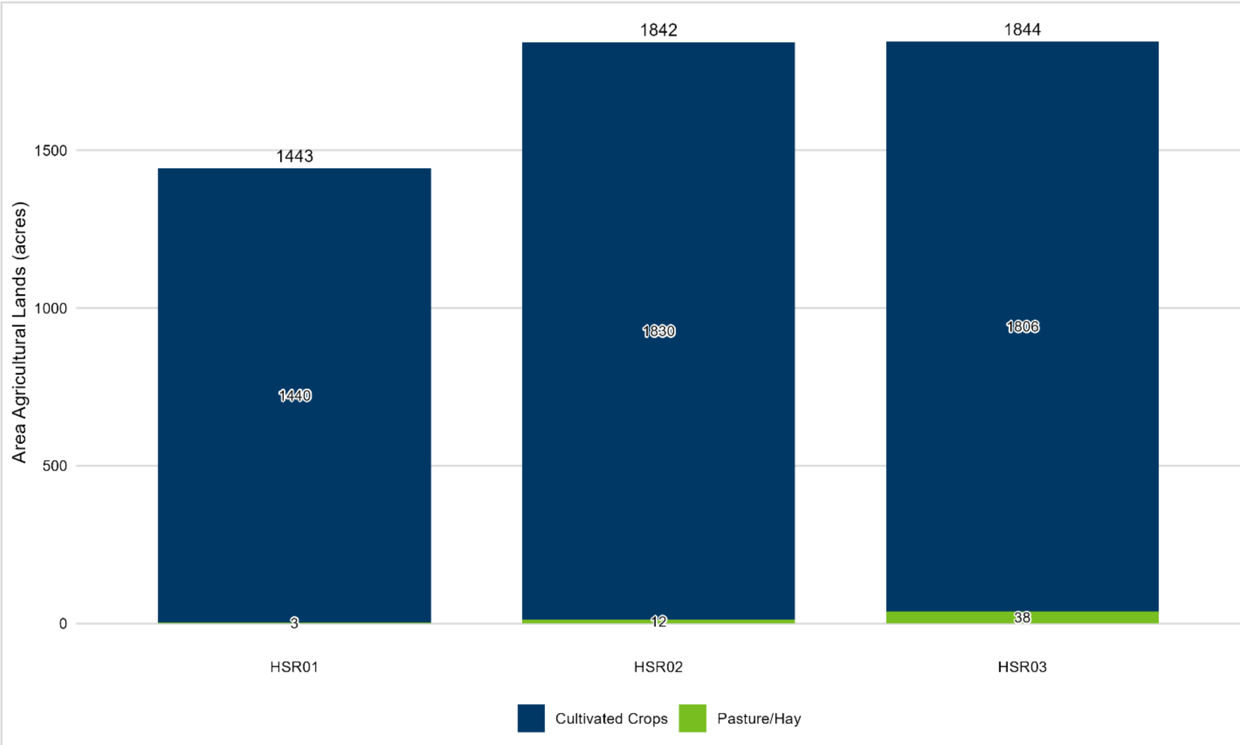
Routing with existing infrastructure or division lines, such as parcel or agricultural fields, would reduce impacts to agriculture. As noted in Table 6-2, HSR01 parallels the most existing infrastructure (89 percent of its total length) while HSR03 parallels the least amount (32 percent). HSR03 also has the greatest distance that does not follow existing infrastructure or division lines at 2.3 miles, while HSR01 completely follows existing infrastructure or division lines (Figure 6-2).

Figure 6-7 Hancock Subregion, Prime Farmland within Route Widths



Source: Prime farmland/farmland of statewide importance, SSURGO (Appendix D)
Not all prime farmland is farmed.

Figure 6-8 Hancock Subregion, Acres of Agricultural Lands within Route Width



Source: Agricultural land, NLCD (Appendix D)

Center pivot irrigation systems present in the Hancock Subregion are shown on Map 13-5 through Map 13-6.

While not crossed by the anticipated alignment, there is one pivot irrigation system within the route width of HSR01. The anticipated alignment avoids impacts to the center pivot irrigation systems because it follows division lines and does not cross the center pivot irrigation system portion of the agricultural field (Map 13-5).

There are 32 pivot irrigation systems within the route width of HSR02, of which five are crossed by the anticipated alignment (Map 13-5 and Map 13-6). There are 33 pivot irrigation systems located within the route width of HSR03, of which seven are crossed by the anticipated alignment (Map 13-5 and Map 13-6). These structures could potentially impede or eliminate usability of the center pivot irrigation systems by necessitating reconfiguration to accommodate structures or by reducing crop revenue due to changes in irrigation practice. Impacts could range from minimal to significant and include restrictions that may limit future irrigation options such as linear irrigation and corner system irrigation.

One private airstrip, Brown's Private Airstrip, is present within one mile of all routes in the Hancock Subregion (Map 7-6). Aerial spraying operations could be impeded or eliminated where transmission lines are close to applicable crops.

The RIM/CREP program provides financial incentives to farmers to remove land from production (Section 4.7.6). Several farmers within the route widths of the routes in the Hancock Subregion participate within the CREP program (Section 6.2.6.6); however, no anticipated alignment in this subregion crosses an easement area. If one of these routes are permitted, it is anticipated that the easements could be avoided if the alignment is adjusted during final design. Additional discussion regarding the potential to avoid the easement areas is provided in Section 6.2.6.6. Impacts can be mitigated by compensating individual landowners through negotiated easement agreements.

6.2.4.2 Forestry

Potential impacts to forestry are discussed for the entire project in Section 4.5.2. Impacts to forestry are anticipated to be negligible to minimal and independent of the route selected.

6.2.4.3 Mining

No active aggregate mines were identified within the route width for the Hancock Subregion. Potential impacts to mining are discussed for the entire project in Section 4.5.3.

6.2.4.4 Tourism

Potential impacts to tourism are discussed for the entire project in Section 4.5.4. Impacts to tourism are anticipated to be negligible to minimal and independent of the route selected.

6.2.5 Archaeological and Historic Resources

The ROI for archaeological sites and historic cemeteries is the route width. The ROI for historic resources is the 1600-foot buffer on either side of the anticipated alignment, which accounts for resources outside of the route width but within visual range of the project.

The analysis of impacts to archaeological and historic resources takes NRHP eligibility into account. Pursuant to state (Minnesota Statutes § 138.661 to 138.669) and federal law (36 CFR 800), only resources that are eligible, listed, or unevaluated for the NRHP have the potential to be adversely affected by the project. For additional information regarding NRHP eligibility, see Section 4.6.1.

Impacts to archaeological and historic resources could result from construction activities such as ROW clearing, placement of structures, the construction of access roads, temporary construction areas, and vehicle and equipment operation (Section 4.6.2). Impacts could also result from the removal of historic buildings or structures, or if the project is near or within view of a resource (typically a historic building, structure, or TCP). Additional details concerning potential impacts and mitigation regarding archaeological and historic resources for the project as a whole are provided in Section 4.6.3.

Documented archaeological and historic resources within the Hancock Subregion are summarized in Table 6-4 and Table 6-5. Table 6-4 summarizes the number of archaeological and historic resources within the ROI (which is the route width for archaeological sites and historic cemeteries, and a 1600-foot buffer on either side of the anticipated alignment for historic architecture). Table 6-5 provides descriptions of the resources located within the ROIs.

Additional cultural resources may be in the ROIs; reconnaissance survey and evaluation would be necessary to determine whether any other significant archaeological and/or historic resources are present and could be impacted by project activities. If a route permit is issued, the applicants would coordinate with landowners to proceed with these surveys in the permitted route and surrounding areas to include access roads and other areas of potential ground disturbance.

Table 6-4 Hancock Subregion, Cultural Resource counts within Route's ROI

Route	Archaeological Sites				Historic Architecture				Historic Cemeteries
	Not Eligible	Unevaluated	Eligible or Listed	Total	Not Eligible	Unevaluated	Eligible or Listed	Total	
HSR01	0	0	0	**0**	2	0	2	**4**	0
HSR02	0	0	0	**0**	1	1	1	**3**	0
HSR03	0	0	0	**0**	1	0	1	**2**	0

Table 6-5 Hancock Subregion, Descriptions of Cultural Resources within Route's ROI

Route	Site / Resource Number	Resource Type	Resource Name/Type	NRHP Status	Description
HSR01	SE-XXX-00001	Historic Architecture	Former Trunk Highway 10	Not eligible	Active U.S. Highway 12; constructed 1921
HSR01	SE-XXX-00002	Historic Architecture	Bypass, Former Trunk Highway 10	Eligible	3.3 mile bypass of former TH 10 (currently TR 7/Old Hwy 9); constructed 1921
HSR02	SW-TAR-00001	Historic Architecture	Tara Township Hall	Unevaluated	Surveyed 1983; constructed 1900
HSR01, HSR02, HSR03	XX-ROD-00053	Historic Architecture	Trunk Highway 9	Not Eligible	Active TH 9; constructed 1921
HSR01, HSR02, HSR03	XX-RRD-GNR012	Historic Architecture	St. Paul and Pacific Railway Company/St. Paul Minneapolis and Manitoba Railway Company/Great Northern Railway Company: Main Line, Minneapolis to Breckenridge	Eligible	Active Railroad Right of Way between Minneapolis Junction and Breckenridge at the North Dakota State Line.

6.2.5.1 Archaeological Resources

There are no documented archaeological resources in the ROI within the Hancock Subregion; therefore, none of the routing alternatives have the potential to impact known archaeological sites. However, a lack of previously documented archaeological sites does not mean that the area is devoid of resources. Rather, it indicates that a professional archaeological survey has not occurred in any of the proposed routes. A Phase I archaeological investigation would be necessary to determine whether significant archaeological sites are present and have the potential to be impacted by Project activities.

6.2.5.2 Historic Resources

Historic architectural resources within the route ROIs in the Hancock Subregion include two NRHP-eligible resources (SE-XXX-00002/Former Trunk Highway 10 Bypass and XX-RRD-GNR012/ St. Paul and Pacific Railway Company/St. Paul Minneapolis and Manitoba Railway Company/Great Northern Railway Company: Main Line, Minneapolis to Breckenridge), one unevaluated resource (SW-TAR-00001/Tara Township Hall), and two ineligible resources, as shown in Table 6-5.

Resource SE-XXX-00002/Former Trunk Highway 10 Bypass is a 3.3-mile segment of roadway bypassing former TH 10 between 450th Avenue north of Hancock to 3rd Street in Hancock. The segment parallels an active railroad corridor (resource XX-RRD-GNR012/ St. Paul and Pacific Railway Company/St. Paul Minneapolis and Manitoba Railway Company/Great Northern Railway Company: Main Line, Minneapolis to Breckenridge). This bypass was determined eligible for the NRHP under Criterion C, for its architectural significance in the category of engineering, with a period of significance from 1921 to 1954. The significant engineering feature of this resource is the 18-foot wide concrete pavement used to construct the bypass, most of which remains intact. This pavement is an early example of concrete use in roadways, and the setting retains integrity of feeling and character within a rural agricultural environment, paralleling the historic railway (reference (228)).

Resource XX-RRD-GNR012/ St. Paul and Pacific Railway Company/St. Paul Minneapolis and Manitoba Railway Company/Great Northern Railway Company: Main Line, Minneapolis to Breckenridge is an active railroad corridor eligible for listing on the NRHP under Criterion A for its association with significant events in the category of transportation with a period of significance from 1867 to 1930. This resource is significant because it provided the only efficient means of transportation to areas of western Minnesota not otherwise assessable by river or regional roadways, thus facilitating the settlement of the region between Minneapolis and Breckenridge. The railroad also played a significant role in expanding Minnesota's flour milling industry by connecting wheat suppliers with the milling center in Minneapolis (reference (229)).

All of the proposed route ROIs contain at least one historic architectural resource that is eligible for the NRHP. HSR03 contains just one eligible resource and no unevaluated resources within the ROI, and therefore would have the least potential to impact significant historic architectural resources. HSR02 crosses one eligible resource and has one unevaluated resource within the ROI while HSR01 crosses two eligible resources. HSR01 and HSR02 therefore have similar potential to impact significant historic architectural resources. However, the two eligible resources include an active railroad (crossed by both routes) and a roadway segment (crossed by HSR01); therefore, while the project may be visible from these resources, the feeling and character of the setting surrounding these resources would not be significantly altered by the project. Conversely, the ROI for HSR02 includes a Town Hall that is unevaluated for the NRHP and whose viewshed is largely rural in character; therefore, HSR02 has the most potential to impact significant historic architectural resources.

6.2.5.3 Historic Cemeteries

There are no historic cemeteries mapped within the Hancock Subregion ROI.

6.2.6 Natural Environment

Electric infrastructure, such as transmission lines, can impact the natural environment. The Commission must consider effects on the natural environment when designating transmission lines routes and making a decision on a route permit. Impacts are dependent upon many factors, such as how the project is designed, constructed, and maintained. Other factors, such as the environmental setting, influence potential impacts.

6.2.6.1 Air Quality

An assessment of potential impacts to air quality is discussed for the entire project in Section 4.7.1. The impact assessment for air quality was not analyzed at the subregional level because impacts are anticipated to largely be independent of the route selected.

6.2.6.2 Climate Change

An assessment of potential impacts from climate change is discussed for the entire project in Section 4.7.2. The impact assessment for climate change was completed for the project as a whole because there is limited variability in the potential for climate change across the routing alternatives.

6.2.6.3 Greenhouse Gases

An assessment of potential impacts from greenhouse gases is discussed for the entire project in Section 4.7.3.2. The impact assessment for greenhouse gases was completed for the project as a whole because there is limited variability in the potential for greenhouse gases across the routing alternatives.

6.2.6.4 Geology and Topography

An assessment of potential impacts to geology and topography is discussed for the entire project in Section 4.7.3. The impact assessment for geology and topography was not analyzed at the regional level because impacts are anticipated to largely be independent of the route selected.

6.2.6.5 Groundwater

An assessment of potential impacts to groundwater is discussed for the entire project in Section 4.7.5. The impact assessment for groundwater was not analyzed at the subregional level because impacts are anticipated to largely be independent of the route selected.

6.2.6.6 Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands often involve unique resources intended for protection and/or preservation and would be subject to short and long-term impacts depending upon their use (Section 4.7.6.2). Public and designated lands within the ROI are first identified and then further reviewed to better understand potential impacts such as vegetation clearing. Occupying public and designated lands would require coordination with the landowner (Section 4.7.6.3).

Public lands and designated lands with existing easements or covenants within the route widths and rights-of-way of routes in the Hancock Subregion are summarized in Table 6-6 and shown in Map 10-5 and Map 10-6, Map 15-5 and Map 15-6, and Map 18-5 and Map 18-6.

There are no state WMAs or national wildlife refuges in the ROI of the Hancock Subregion. Federal public lands in the Hancock Subregion ROI include several WPAs.

A WPA owned and managed by USFWS is within the ROI of HSR02 in the Hancock Subregion. The anticipated alignment of HSR02 would not cross the WPA; the route parallels to an existing road ROW, across the road from the WPA, and vegetation clearing is not anticipated. Construction activities in this area could temporarily impact public enjoyment of the WPA, and the visibility of transmission line structures could create long-term impacts to public enjoyment of the WPA. The applicants requested a narrower route width along HSR02 where it runs by the WPA (Section 3.3.1) in the Hancock Subregion (Map 6-2). The narrower route widths were requested in areas where WPA easements exist to avoid USFWS lands or easements to the greatest extent practicable. If HSR02 were permitted in this area, the narrower route width would ensure placing transmission structures directly into these lands would be avoided. HSR01 and HSR03 will not impact WPAs.

One conservation easement program, CREP, has lands in the Hancock Subregion ROI (Map 15-5 and Map 15-6). The applicants intend to avoid conservation easements to the greatest extent practicable. There are 9 acres of one wetland restoration CREP easement within the ROI of HSR01. The CREP easement is not crossed by the anticipated alignment and associated ROW of HSR01. The route parallels an existing road ROW, across the road from the CREP easement, thus it is anticipated to be avoided during final design. Impacts to the CREP easement are not anticipated. HSR02 and HSR03 avoid CREP easements entirely.

Table 6-6 Hancock Subregion, Public and Designated Lands within Route Width and ROW

Public and Designated Land Type	Unit	Routes		
		HSR01	HSR02	HSR03
Waterfowl Production Areas	Acres in ROW (route width)	0 (0)	<1 (<1)	0 (0)
Conservation Reserve Enhancement Program (CREP)	Acres in ROW (route width)	0 (9)	0 (0)	0 (0)

6.2.6.7 Vegetation

The ROI for vegetation is the ROW. Potential construction and operation-related impacts to vegetation for the project as a whole are discussed in Section 4.7.7.2. Potential long-term impacts on vegetation would occur where structures are located or where conversion of forested vegetation to low-growing vegetation would be required. Impacts would be localized, and unavoidable. Impacts to vegetation are primarily evaluated by examining vegetative landcover types within the ROW of each routing option. Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation, as described in Section 4.7.7.3.

Map 11-5 and Map 11-6 provide an overview of landcover types across the Hancock Subregion, and Table 6-7 summarizes the landcover types within the ROW of each route in the Hancock Subregion. Agricultural vegetation, particularly cultivated cropland, represents the dominant vegetative landcover type within the ROW of all of the routes in the Hancock Subregion. Other sizable land cover types in the route rights-of-way include herbaceous wetland and low intensity development or open space. Sparse amounts of pasture/hay and forested land are present, and no areas of open water are present among the routes.

Forested land is the vegetation that would be impacted the most by ROW clearing. Removal of woody vegetation will result in conversion to low-stature vegetation (shrubs and grasses) throughout the ROW. The ROW would be maintained with low-growing vegetation during operations to minimize potential interference with the transmission line. Conversion of wooded landscapes to open landscapes could indirectly affect native vegetation by potentially increasing the spread of invasive and non-native species, which could permanently alter ecosystem functions. Co-locating the route with existing infrastructure right-of-way, for example, roadways or transmission lines, might limit tree removal. Use or paralleling of existing ROWs is discussed in Section 6.2.1 for the Hancock Subregion.

Land cover in the route ROWs considered forested land include woody wetlands and deciduous forest, which are present in minimal amounts. HSR02 has the most forested land cover, with 0.8 acres of deciduous forest and 0.4 acres of woody wetlands, comprising approximately 0.4% of the total ROW acreage. Conversely, HSR01 has the least forested land cover, with no acres of deciduous forest or woody wetlands.

Although HSR01 would minimize impacts to forested vegetation, given the small amount of forested vegetation in the ROW for all of the routes, impacts are anticipated to be minimal for all routes in the Hancock Subregion. Potential impacts to agricultural vegetation and wetlands are discussed in Section 6.2.4.1 and Section 6.2.6.12, respectively.

Table 6-7 Hancock Subregion, Landcover Types in the ROW

Landcover Data	Unit	HSR01	HSR02	HSR03
Area Within ROW	Acres	244.2	319.4	318.4
Cultivated Crops	Acres (percentages)	158.7 (65.0)	234.8 (73.5)	233.7 (73.4)
Deciduous Forest	Acres (percentages)		0.8 (0.3)	0.8 (0.3)
Developed, Low Intensity	Acres (percentages)	6.9 (2.8)	16.4 (5.1)	3.8 (1.2)
Developed, Open Space	Acres (percentages)	77.9 (31.9)	53.7 (16.8)	58.9 (18.5)
Emergent Herbaceous Wetlands	Acres (percentages)	0.1 (0.0)	13.1 (4.1)	19.7 (6.2)
Pasture/Hay	Acres (percentages)	0.7 (0.3)	0.3 (0.1)	1.4 (0.4)
Woody Wetlands	Acres (percentages)		0.4 (0.1)	

6.2.6.8 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. Potential construction and operation-related impacts to wildlife and wildlife habitat are discussed in Section 4.7.8.2. Potential short-term, localized impacts could occur from displacement, injury, or mortality during construction or maintenance activities. Potential long-term impacts could occur as a result of habitat loss, conversion, or fragmentation. Impacts to wildlife and wildlife habitat are assessed both by considering wildlife inhabiting the ROI as well as assessing the presence of potential habitat for wildlife within the ROI. Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife and wildlife habitat, as described in Section 4.7.8.3.

Map 18-5 and Map 18-6 provides an overview of resources across the Hancock Subregion and Table 6-8 summarizes the wildlife resources within the route width of each route in the Hancock Subregion. Designated wildlife habitat within the Hancock Subregion ROI includes GBCAs and WPAs.

WPAs are within the local vicinities of HSR02 and HSR03 in the Hancock Subregion, but only the route width of HSR02 intersects WPAs (Map 18-5 and Map 18-6). The local vicinities of HSR02 and HSR03 intersect an equivalent acreage of the Hoff WPA and a Pope County WPA in areas where the anticipated alignments parallel an existing road ROW. The local vicinity and route width of HSR02 intersects the Maki WPA, which HSR03 avoids. The anticipated alignment of HSR02 would parallel an existing road ROW, across the road and outside of the Maki WPA. Routes that establish new transmission line corridors near WPAs could increase potential impacts to flying waterfowl. HSR02 intersects WPAs within its route width, and would establish new transmission line corridors closer to WPAs than HSR03, which only intersects WPAs within its local vicinity. Thus, HSR02 would have a greater potential impact to flying waterfowl compared to HSR03. HSR01 avoids WPAs entirely.

A GBCA is within the local vicinities and route widths of HSR02 and HSR03, and the anticipated alignments of both routes would cross this resource (Map 18-5). The local vicinity and route width of HSR03 intersects a greater acreage of the GBCA (1,086 acres and 314 acres, respectively) compared to the local vicinity and route width of HSR02 (726 acres and 204 acres, respectively). Establishment of a new transmission line corridor within a GBCA could increase potential impacts to flying birds. HSR03 would cross the GBCA by paralleling an existing road ROW for only part of the crossing, establishing a new transmission line corridor within the GBCA. HSR02 would cross the GBCA by paralleling an existing road ROW for the entire crossing across from an existing transmission line corridor, minimizing the potential for increased impacts to flying birds. Thus, HSR03 would have a greater potential impact to flying birds compared to HSR02. HSR01 avoids GBCAs entirely.

The routes in the Hancock Subregion would parallel little to no existing transmission line ROW, with HSR01 paralleling the most (only 11 percent of its length) and HSR02 and HSR03 paralleling the least (both only 3 percent of their length). Avian species traversing wildlife areas along new transmission line corridors could potentially experience increased impacts resulting from electrocution or collision with transmission line structures or conductors. As discussed in Section 4.7.8.3, avian impacts can be minimized through use of bird flight diverters.

The routes in the Hancock Subregion would parallel some existing non-transmission line infrastructure rights-of-way such as roads, with HSR01 paralleling the most (89 percent of its length), then HSR02 (46 percent of its length), with HSR03 paralleling the least (31 percent of its length). The greater length of each route that parallels existing infrastructure, the more impacts would minimize potential wildlife and habitat impacts associated with habitat fragmentation and/or edge effects because habitat fragmentation has already occurred in these areas.

Table 6-8 Hancock Subregion, Wildlife Management and Conservation Areas within Route Width

Resource Area	Unit	Routes		
		HSR01	HRS02	HSR03
Waterfowl Production Areas	Acres	0	<1	0
Grassland Bird Conservation Area	Acres	0	204	314

6.2.6.9 Rare and Unique Natural Resources

Rare and unique natural resources encompass protected species and sensitive ecological resources. The ROI for protected species is the project area (one mile), and the ROI for sensitive ecological resources is the route width. Potential construction and operation-related impacts to protected species and sensitive ecological resources are discussed in Section 4.7.9.2. Potential direct or indirect impacts to protected species could occur should they be present within or near the ROW during construction or maintenance activities. While more mobile species would leave the area for nearby

comparable habitats, non-mobile species, such as vascular plants or nesting birds, could be directly impacted. Construction activities also have the potential for direct impacts to sensitive ecological resources if they are present within the area subject to construction disturbance. Long-term impacts would involve permanent clearing of vegetation in areas identified as sensitive ecological resources which could indirectly impact any protected species associated with these habitats.

Impacts to protected species are evaluated by reviewing documented occurrences of these species within the ROI. Potential impacts to sensitive ecological resources, which could provide suitable habitat for protected species, are evaluated by assessing the presence of these resources within the ROI. Several measures that could be implemented to avoid, minimize, or mitigate impacts to protected species and sensitive ecological resources, including those provided in the DNR's Natural Heritage Review response (Appendix N), are described in Section 4.7.9.3.

Sensitive ecological resources within the Hancock Subregion are shown on Map 15-5 and Map 15-6. To secure federally and state protected species from exploitation or destruction, documented locations of these species are not identified on maps.

6.2.6.9.1 Protected Species

According to the NHIS database, one state protected bird species has been documented within one mile of HSR01 and two state protected bird species have been documented within one mile of HSR02 and HSR03; these are summarized in Table 6-9. One of the state-protected bird species, loggerhead shrike, has been documented within the ROW of HSR02 and HSR03. In addition, several state special concern species have been documented within one mile of the routes in the Hancock Subregion; records of state special concern species are summarized in Appendix N.

Formal protected species surveys have not been conducted for the project; as such, it is possible that additional protected species could be present where suitable habitat is available within the ROW or route width of the routes in the Hancock Subregion. As part of project permitting, the applicants could be required to conduct field surveys for the potential presence of protected species; these surveys would occur prior to construction in coordination with the USFWS and/or DNR.

Table 6-9 Hancock Subregion, Natural Heritage Information System Database Records of Protected Species within One Mile

Scientific Name	Common Name	Type	State/Federal Status	Routes		
				HSR01	HSR02	HSR03
Athene cunicularia	Burrowing owl	Bird	Endangered/not listed	X	X	X
Lanius ludovicianus	Loggerhead shrike	Bird	Endangered/not listed		X[1]	X[1]

[1] Species has been documented within the ROW.

6.2.6.9.2 Sensitive Ecological Resources

The route widths and rights-of-way of all routes in the Hancock Subregion would intersect sensitive ecological resources (Table 6-10; Map 15-5 through Map 15-6). The ROW of all routes would intersect a railroad rights-of-way prairie, with the anticipated alignment of each route spanning the railroad rights-of-way prairie. The route widths of HSR02 and HSR03 would intersect a Site of Biodiversity Significance ranked moderate and below, respectively. The ROW of HSR03 would also intersect the edge of the Site of Biodiversity Significance ranked below and would do so while paralleling a road corridor. However, the anticipated alignment crosses in an area that may be too large to span (>1,000 feet), thus potentially requiring the placement of a transmission line structure within this Site of Biodiversity Significance. All other sensitive ecological resources should be spannable by the anticipated alignments for routes in the Hancock Subregion.

Table 6-10 Hancock Subregion, Sensitive Ecological Resources within the ROW and Route Width of Each Route

Resource	Units	HSR01	HSR02	HSR03
Sites of Biodiversity Significance	Moderate rank (acres in ROW (route width))	0 (0)	0 (20)	0 (0)
	Below rank (acres in ROW (route width))	0 (0)	0 (0)	8 (34)
	Total acres in ROW (route width)	0 (0)	0 (20)	8 (34)
Railroad Rights-of-Way prairie	Count in ROW	1	1	1

6.2.6.10 Soils

The ROI for soils is the ROW. Common soil impacts include rutting, compaction, and erosion. Potential impacts would be short-term during construction, localized, and can be minimized. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicants would obtain a NPDES/State Disposal System Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicles trips, and decompacting soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored a suitable location. Disturbed areas would be promptly seeded after construction. Additional details regarding potential impacts to soils and potential mitigation measures are provided in Section 4.7.10.

Map 20-5 and Map 20-6 show the surface soil textures across the subregion. Soil types within the ROW were reviewed to identify soil characteristics that could be more prone to impacts in some areas compared to others (Table 6-11). Less than three acres of the soils within the ROW of the Hancock Subregion routes are susceptible to erosion. Approximately one-third of the soils are classified as prone to soil compaction. Nearly all soils within the ROW of the Hancock Subregion routes have a moderate or severe rutting hazard rating. Generally, all of the routes within the Hancock Subregion have similar soil characteristics. There is no route that is better suited to reduce the potential rutting, compaction, and erosion that could occur during construction.

Table 6-11 Hancock Subregion, NRCS Mapped Soils within ROW

Soil Data	Unit	HSR01	HSR02	HSR03
Area within ROW	Area	244	319	318
Compaction Prone[1]	Acres (percentage)	93 (38)	117 (37)	96 (30)
Susceptible to Erosion Hazard[2]	Acres (percentage)	3 (1)	2 (<1)	2 (<1)
Hydric Soils[3]	Acres (percentage)	72 (30)	155 (48)	174 (55)
Revegetation Concerns[4]	Acres (percentage)	25 (10)	36 (11)	40 (13)
Susceptible to Rutting Hazard[5]	Acres (percentage)	244 (100)	319 (100)	318 (100)

[1] Soils considered to be Compaction Prone soils include those with a rating of "Medium" or higher.
[2] Soils considered susceptible to erosion hazard soils include those with a rating of “Medium”, “Severe”, or “Very Severe”.
[3] Hydric soil include hydric soils (100% hydric) and predominantly hydric soils (67-99% hydric).
[4] Soils considered to have revegetation concerns include soils with a non-irrigated land capability classification of 3 or greater.
[5] Soils considered susceptible to Rutting Hazard include those with a rating of "Moderate" or “Severe”.

6.2.6.11 Surface Water

The ROI for surface water is the route width. Direct impacts caused by structures placed in surface waters would be avoided by spanning the surface waters. Direct impacts to other resources can cause indirect impacts to surface waters. For example, construction activities near surface waters could cause riparian vegetation disturbance and surface erosion, which can lead to runoff impacting surface waters. Impacts to surface waters could be avoided by prudent routing, selecting the routes that cross the fewest watercourses or waterbodies and/or special or impaired waters.

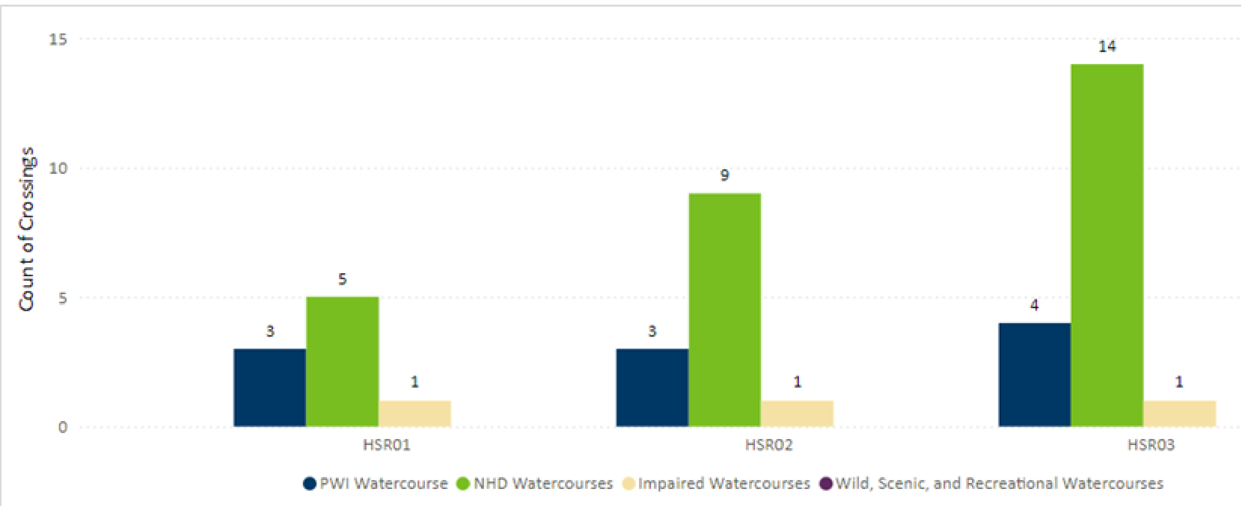
Impacts would be mitigated by using BMPs. Crossing PWI waters would require a DNR license to cross public waters and work near special or impaired waters would require additional BMPs as detailed in the construction stormwater permit. Additional details regarding potential impacts to surface waters and potential mitigation measures, including those provided in the DNR’s Natural Heritage Review response (Appendix N), is provided in Section 4.7.11.

Map 14-5 and Map 14-6 show the waterbodies and watercourses across the region. There are no trout streams, state-designated outstanding resource value waters, or state wild and scenic rivers within the ROI for the Hancock Subregion.

HSR01 has no waterbodies within the ROI and no waterbody crossings. Both HSR02 and HSR03 have one waterbody within their ROI. Of the waterbodies present in the Hancock Subregion none are designated as PWI waterbodies. Both HSR02 and HSR03 have two total waterbody crossings that would be spanned.

The routes have a total of between 5 and 15 watercourse crossings (Figure 6-9). HSR01 crosses the fewest watercourses while HSR03 crosses the most watercourses. HSR01 and HSR02 both have three PWI watercourse crossings, while HSR03 has four PWI watercourse crossings. PWI watercourses crossed in the Hancock Subregion include an Unnamed Stream and Judicial Ditch 9. All of the routes in the Hancock Subregion cross one watercourse classified as impaired. The crossings where there are no existing transmission lines will require more tree clearing than the crossings where there are existing transmission lines.

Figure 6-9 Hancock Subregion, Number of Watercourse Crossings by Type



Impacts to floodplains during construction would include soil disturbance and vegetation removal. Vegetation clearing within a floodplain, especially tree removal, can greatly destabilize the area, make it more prone to ongoing erosion and sediment issues, and further contribute to water quality issues. There are no FEMA-designated floodplain crossings that exceed 1,000 feet in the Hancock Subregion.

6.2.6.12 Wetlands and Calcareous Fens

The ROI for wetlands is the route width, except for forested wetlands where it is the ROW due to permanent conversion within that area. Short-term and long-term potential impacts to wetlands are discussed in Section 4.7.12.2. Impacts to wetlands are evaluated by examining wetland types, sizes, and potential for spanning. Localized direct impacts to wetlands would include vegetation clearing, movement of soils, and construction traffic which could alter or impair wetland function. Forested wetlands would be subject to long-term impacts given their conversion to non-forested wetlands.

Wetland crossings longer than 1,000 feet might require one or more structures to be placed in the wetland, resulting in small, localized permanent wetland impacts.

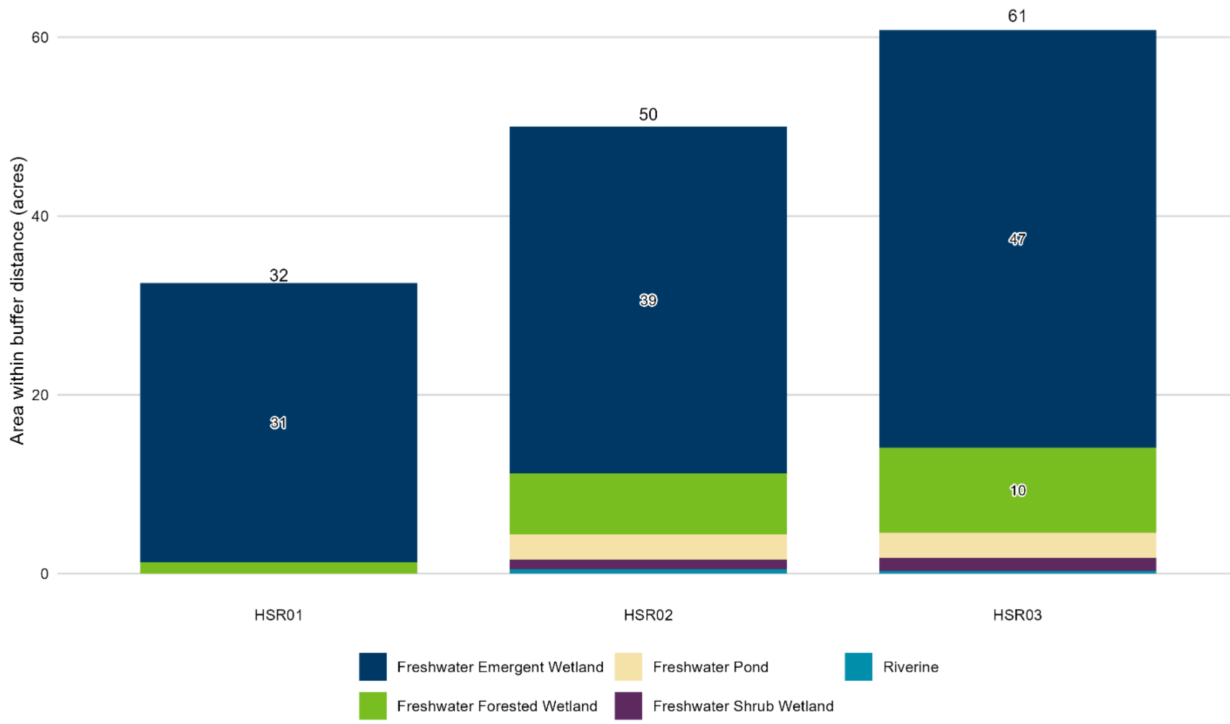
Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width. Wetland impacts would be regulated as described in Section 4.7.12.2. Additional details regarding potential impacts to wetlands, including those provided in the DNR's Natural Heritage Review response, and potential mitigation measures are provided in Section 4.7.12.3.

There are no calcareous fens in or near the ROI for this subregion.

Map 14-5 and Map 14-6 show the mapped wetlands within the ROI of the routes in the Hancock Subregion. Direct wetland impacts would occur within the construction workspace within or adjacent to the ROW. Not all wetland areas within the ROI would be subject to direct impacts as most could be spanned. In most cases, wetlands can be spanned to avoid placing structures within them. However, wetland crossings longer than 1,000 feet might require one or more structures to be placed within the wetland. There are no crossings greater than 1,000 feet under any route in this subregion.

Wetlands in the ROI for the Hancock subregion consist mainly of emergent wetlands, forested wetlands, and a smaller subset of pond, shrub, and riverine wetlands. Figure 6-10 below shows acres of wetland that the ROI crosses. For routes crossing the Hancock Subregion, HSR03's ROI contains the most NWI wetland at approximately 61 acres, has the highest number of individual crossings at 15, and the most overall length at approximately 2,100 feet. In contrast HSR01's ROI contains the fewest areas of NWI wetland at roughly 32 acres, has the fewest number of crossings at 3, and the lowest total length at just under 700 feet. Lower acreage and lower numbers of crossings serve as an indicator of fewer direct or indirect impacts to wetlands.

Figure 6-10 Hancock Subregion, Wetland Area within ROI by Route



No routes in this subregion cross PWI wetlands.

The ROI for each of the routes in the Hancock Subregion cross some amount of forested wetland. Because transmission lines cannot be safely or reliably operated with trees growing within the ROW, existing trees must be removed throughout the ROW, including forested wetlands. Forested wetlands, within any new transmission line ROW, would likely undergo a long-term to potentially permanent change in wetland/vegetation type lasting as long as the transmission line operates in the area. In the Hancock Subregion, HSR03's ROW crosses the most forested wetland, at 2.6 acres, while HSR01 crosses the fewest acres, less than 1. Forested wetlands that are subject to permanent impacts due to their conversion would be limited to the ROW.

6.2.7 Costs that are Dependent on Design and Route

Total project costs range from $465 million to $535 million and vary based on the routes selected. Estimates include permitting, engineering, materials (for example: steel, conductor, and insulators), land rights and ROW, and construction costs. Costs are generally proportional to length with the exception of the additional factors described in Section 4.8. For comparison purposes, the construction costs for the three routes in the Hancock Subregion are included in Table 6-12. Estimated construction costs associated with route segments and alignment alternatives in the Hancock Subregion are discussed in Section 6.2.9.

The route with the lowest estimated cost is HSR01 ($64,144,000); it is over 4 miles shorter than the other two routes. HSR02 has the highest estimated cost ($88,328,000) though it is not the longest.

Table 6-12 Hancock Subregion, Summary of Estimated Cost by Route

Route Alternative	Length (mi)	Estimated Cost
HSR01	13.4	$64,144,000
HSR02	17.6	$86,758,000
HSR03	17.5	$88,328,000

6.2.8 Relative Merits of the Hancock Subregion Routes

The 14 routing factors that the Commission must consider when designating transmission line routes (Minnesota Rules 7850.4100) are summarized at the subregional level. Some elements of these factors have minimal impacts or do not vary significantly by route within the subregion and thus are not further discussed in this Section.

The relative merits analysis uses graphics (Table 6-13) to provide a visual assessment of the relative merits for each route in the Hancock Subregion. The graphic for a specific routing factor or element is not meant to be indicative of the “best” route but is provided as a relative comparison to be evaluated together with all other routing factors. For routing factors where impacts are anticipated to vary, the graphic represents the magnitude of anticipated difference between these anticipated impacts and compares them across the different routes with a given subregion. For routing factors that express the state of Minnesota’s interest in the efficient use of resources (for example, the use and paralleling of existing rights-of-way), the graphic represents the consistency of the routes with these interests and compares them to each other. Table 6-14 summarizes the relative merits analysis of the three routes in the Hancock Subregion for the routing factors that are anticipated to vary amongst the routes.

Table 6-13 Guide to Relative Merits Analysis

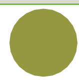
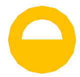
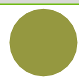
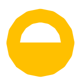
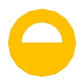
Consistency with Routing Factor or Anticipated Impacts	Symbol
• Route is consistent with the routing factor OR • Impacts are anticipated to be negligible to minimal or the impact is positive	
• Route is consistent with routing factor but less so than the other options OR • Impacts are anticipated to be minimal but the potential for impacts is greater than the other routes or require special permit conditions OR • Impacts are anticipated to be moderate	
• Route is not consistent with routing factor or consistent only in part OR • Impacts might be moderate but the potential for impacts is greater than the other routes or might require special permit conditions OR • Impacts are anticipated to be significant	

Table 6-14 Hancock Subregion, Relative Merits of Subregion Routes

Routing Factor / Resource	HSR01	HSR02	HSR03	Summary
Factor A Human Settlement				
Aesthetics				HSR03 has the fewest residences (8) and HSR01 has the most (17). HSR01 is three to four miles shorter than the other routes. HSR02 crosses the most transmission lines (6 times) whereas HSR01 crosses the least (2 times). HSR01 would box in three residences on two sides of their property. HSR02 would box in one residence on three sides of their property and create a pinch point between four residents and an existing transmission line. HSR03 would box in two residences on three sides of their property.
Displacement				There are no residences or non-residential structures within the ROW of any of the routes.
Recreation				HSR01 has more snowmobile crossings and a greater distance of snowmobile trails than the other routes.
Factor C Land-Based Economies				
Agriculture				HSR02 and HSR03 cross multiple center pivot irrigation systems, but HSR01 does not cross any. HSR01 also entirely parallels existing infrastructure.
Mining				Impacts to mining are anticipated to be negligible among the routes.
Factor D Archaeological and Historic Resources				
Archaeological				Because there are no previously identified archaeological sites in the Hancock Subregion route widths, the project does not have the potential to impact known archaeological resources in this subregion.

Routing Factor / Resource	HSR01	HSR02	HSR03	Summary
Historic				All of the proposed route ROIs contain at least one historic architectural resource that is eligible for the NRHP. Route HSR03 contains just one eligible resource and no unevaluated resources within the ROI. Route HSR02 crosses one eligible resource and has one unevaluated resource within the ROI, while Route HSR01 crosses two eligible resources. Routes HSR01 and HSR02 therefore have similar potential to impact significant historic architectural resources. However, the two eligible resources include an active railroad (crossed by both routes) and a roadway segment (crossed by HSR01); therefore, while the project may be visible from these resources, the feeling and character of the setting surrounding these resources would not be significantly altered by the project. Conversely, the ROI for HSR02 includes a Town Hall that is unevaluated for the NRHP and whose viewshed is largely rural in character; therefore, HSR02 has the most potential to impact significant historic architectural resources.
Factor E Natural Resources				
Public and Designated Lands				Public lands are only within the ROI of HSR02 and include one WPA. HSR02 would not cross the WPA, and vegetation clearing within the WPA would not occur. HSR02 could impact public enjoyment of the WPA within its ROI. HSR01 and HSR03 would not impact public lands. The ROI of HSR01 includes one CREP easement. HSR01 would not cross the CREP easement, and impacts could be avoided during final design.
Soils				Nearly all the soils in the region have a moderate or severe rutting hazard rating. Impacts could be minimized with BMPs or mitigated if long-term re-vegetation impacts extend beyond construction. Impacts to soils would be independent of the route selected.
Surface Water				The total count of watercourse crossings by the anticipated alignments of the routes varies between 5 and 15. HSR01 crosses the fewest watercourses (5 crossings) while HSR03 crosses the most watercourses (14 crossings). HSR01 and HSR02 have three PWI watercourse crossings and HSR03 has four PWI watercourse crossings. All of the routes have one impaired watercourse crossing. No in-water work would occur.
Wetlands				All routes have some acres of forested wetlands. In the Hancock Subregion, HSR03's ROW crosses the most forested wetland, at 2.6 acres, while HSR01 crosses the fewest acres, less than 1. No routes in this subregion cross PWI wetlands. No route would require crossings greater than 1,000 feet.

Routing Factor / Resource	HSR01	HSR02	HSR03	Summary
Vegetation	●	●	●	HSR02 has the most forested land cover, with 1.2 acres or 0.4% of the total ROW acreage. HSR01 has the least forested land cover, with no acres. All routes are considered to have a minimal amount of forested vegetation.
Wildlife and Wildlife Habitat	●	◓	◓	The route width of HSR02 and HSR03 intersect wildlife resources, while the route width of HSR01 would avoid wildlife resources. The route width of HSR02 and HSR03 would cross a GBCA. HSR03 would establish a new transmission line corridor in the GBCA and could result in more avian impacts in the GBCA relative to HSR02, which would cross the GBCA parallel to an existing transmission line. HSR02 could result in more avian impacts near WPAs relative to HSR03, as HSR02 would establish new transmission line corridors closer to WPAs than HSR03. All routes follow little to no existing transmission line corridors. The majority of HSR02 and HSR03 would not follow existing non-transmission line infrastructure, which could result in more habitat fragmentation in these routes relative to HSR01, which follows existing non-transmission line infrastructure for most of its length.
Factor F Rare and Unique Natural Resources				
Rare and Unique Natural Resources	◓	◓	◓	The anticipated alignment of each route would span a railroad rights-of-way prairie. The ROW of HSR03 would intersect the edge of the Site of Biodiversity Significance ranked below and would do so while paralleling a road corridor; the rights-of-way of the other two routes would not intersect Sites of Biodiversity Significance. One state protected bird species has been documented within one mile of HSR01. Two state protected bird species have been documented within one mile of HSR02 and HSR03; one of the species has been documented within the ROW of both routes.
Factor H Paralleling Division Lines				
Paralleling existing survey lines, natural division lines, and agricultural field boundaries	●	●	●	HSR01 follows existing division lines for the largest percentage of all the routes lengths (100 percent). HSR03 follows the smallest percentage of division lines for its total length (86.6 percent).

Routing Factor / Resource	HSR01	HSR02	HSR03	Summary
Factor J Paralleling Existing Infrastructure Minnesota Statute § 216E.03 - Subdivision 7 (8) (roads/railroads) and (15e)(transmission lines)				
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.				HSR01 follows the largest percentage of existing infrastructure for the length of its route (88.8 percent). HSR03 follows the smallest percentage of existing infrastructure for the length of its route (31.5 percent).
Factor L Costs				
Costs Dependent on Design and Route				The route with the lowest estimated cost is HSR01 ($64,144,000). HSR02 has the highest estimated cost ($88,328,000). HSR02 and HSR03 have an estimated cost more than 10% higher than the average estimated cost of the applicants' proposed routes.

6.2.9 Route Segments for the Hancock Subregion

Route segments were included in the scoping decision for the Hancock Subregion but are not part of Routes HSR01 through HSR03. Rather, they are refinements to Routes HSR01 through HSR03. No alignment alternatives are included in the Hancock Subregion. Figure 6-11 provides the locations of the route segments in the Hancock Subregion. Table 6-15 summarizes the two route segments in the Hancock Subregion and indicates which route each would refine or replace a portion of. These replacements are compared to the same portion of the original route that they diverge from, known as route segment equivalents. For purposes of analysis, route segments are considered in standalone comparisons to their route equivalents.

Figure 6-11 Hancock Subregion Route Segments

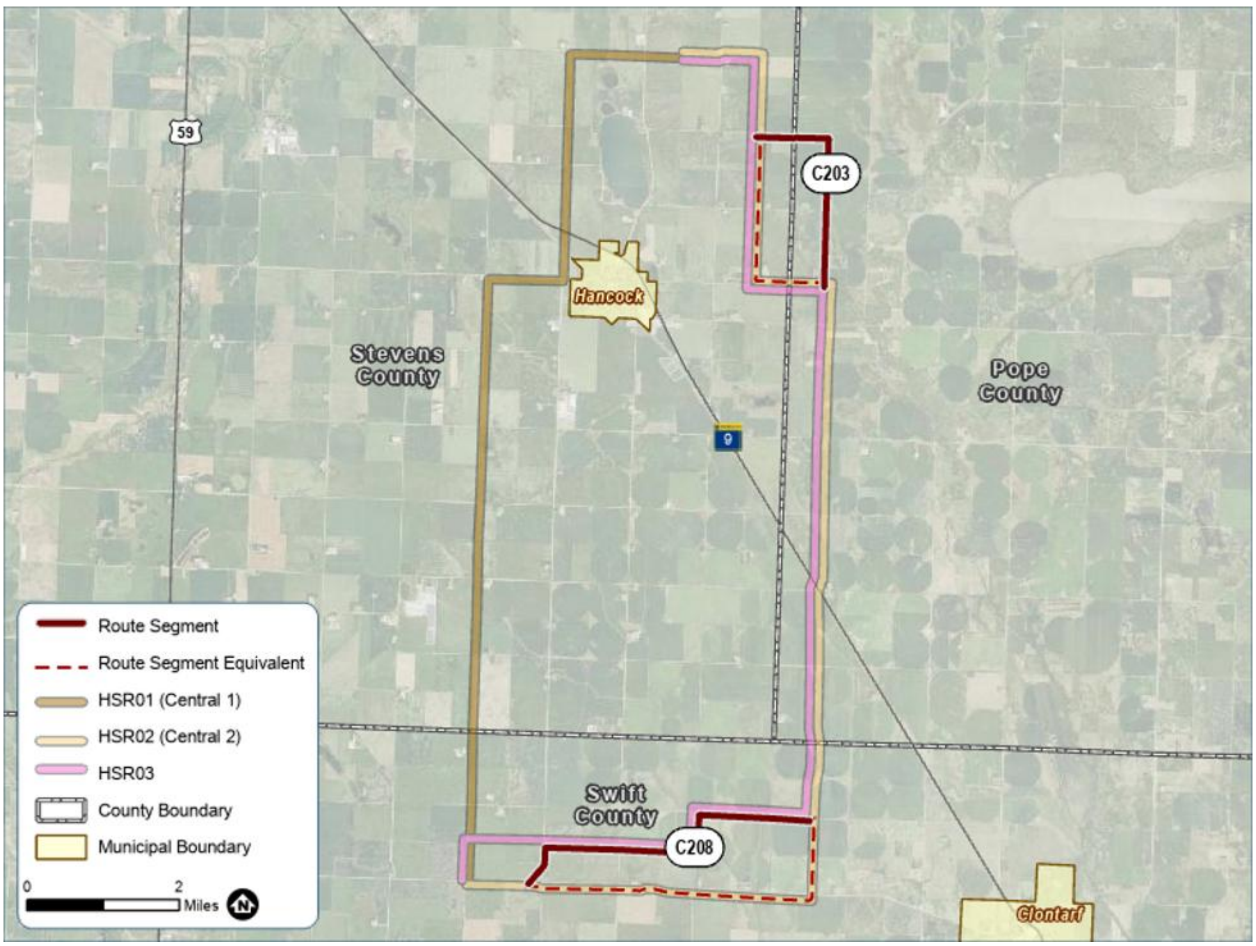


Table 6-15 Hancock Subregion Route Segments

Routing Alternative	Type	Description
C203	Route Segment	Proposed during scoping to mitigate impacts to farmland and to reduce costs by decreasing the number of 90-degree turns in the line. It can be used to modify routes HSR02 or HSR03.
C208	Route Segment	Proposed during scoping to mitigates impacts to residences. It can be used to modify routes HSR02.

6.2.9.1 Route Segment C203

Route Segment C203 is 3.0 miles long and is an alternative to a part of Routes HSR02 and HSR03. Route Segment C203 was proposed to mitigate impacts to farming operations and reduce costs by decreasing the number of 90-degree turns in the line. Route Segment C203 is shown on Figure 6-11 and Table 6-16 summarizes differences in potential impacts of Route Segment C203 compared to its equivalent.

Table 6-16 Route Segment C203 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment C203 would follow existing infrastructure (transmission lines, roads, railroads) for 16.6 percent of its length compared to its equivalent following existing infrastructure for 33.54 percent of its length. Both C203 and its equivalent would follow division lines (field, parcel, or section lines) for 100 percent of their lengths. Both C203 and its equivalent parallel total ROW for 100 percent of their lengths.
Cost	The cost estimates for Route Segment C203 and its equivalent are nearly identical; $15,133,000 compared to $15,119,500 for its equivalent.
Human Settlement – Aesthetics	Route Segment C203 has one residence within 250 feet and one residence within 1,600 feet. C203's equivalent has one residence within 250 feet and three residences within 1,600 feet. Both C203 and its equivalent would border two boundaries of a residence's property. Both C203 and its equivalent would follow natural division lines for 100 percent of their lengths – the equivalent follows about 15 percent more roadway than C203. One of the affected residents suggested this alternative to mitigate impacts to the front of their home as C203 generally affects the viewshed from farther away or from the side of a home. Other than the residences along Township Road 18, homes would be partially screened from the transmission line with vegetation on the west side. Due to less nearby residences and a public commenter's preference, C203 has slightly less aesthetic impacts than its equivalent.
Human Settlement – Displacement	There are no residential or non-residential structures within the ROW of the route segment or the equivalent.
Human Settlement – Recreation	There are no changes to impacts to recreation.

Resource	Summary
Land-Based Economies – Agriculture	Route Segment C203 has 12 center pivot irrigation systems in the route width, of which 5 would be crossed by the anticipated alignment. The equivalent has 6 center pivot irrigation systems in the route width, of which none would be crossed by the anticipated alignment.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	No archaeological or historic resources have been documented within the ROI for Route Segment C203 or its equivalent.
Natural Environment – Public and Designated Lands	Public lands within the ROI of Route Segment C203 include a Pope County WPA which is owned by USFWS. There are no public lands within the ROI of the equivalent. C203 would cross the WPA for a total length of 1,318 feet. C203 would impact federally protected wetlands in the Pope County WPA; its equivalent would not impact these federally protected lands (reference (178)). There are no conservation easement lands within the ROI of C203 or its equivalent.
Natural Environment - Vegetation	Both Route Segment C203 and its equivalent would impact no forested land within their ROWs.
Natural Environment – Wildlife and Wildlife Habitat	Route Segment C203 would cross 31 acres of a WPA and 67 acres of a GBCA. The equivalent does not cross areas preserved or managed for wildlife, and only intersects a small acreage (4 acres) of a WPA within its local vicinity. C203 is within ¼ mile of nesting trumpeter swan and ½ mile of nesting bald eagles on wetlands in or adjacent to WPAs (reference (178)).
Natural Environment – Rare and Unique Natural Resources	Both Route Segment C203 and its equivalent have one record of a state endangered species within one mile; no records of federal or state protected species have been documented within the ROW of Route Segment C203 or its equivalent. No sensitive ecological resources intersect the ROW of Route Segment C203 or its equivalent.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Route Segment C203 has no waterbodies within the ROI, while its equivalent has one. Its equivalent also has one waterbody crossing, whereas C203 has none. C203 and its equivalent each have one watercourse within the ROI. C203 has one watercourse crossing, while its equivalent has two. These would not require in-water work.
Natural Environment – Wetlands and Calcareous Fens	Route Segment C203 would cross more wetland acreage but includes less in total length of crossing (approximately 400 feet less). No changes occur between C203 and its equivalent when considering impacts on forested wetland acres in the ROW.

6.2.9.2 Route Segment C208

Route Segment C208 is 4.6 miles long and is an alternative to a part of Route HSR02. Route Segment C208 was proposed to mitigate impacts to residences. Route Segment C208 is shown on Figure 6-11 and Table 6-17 summarizes differences in potential impacts of Route Segment C208 compared to its equivalent.

Table 6-17 Route Segment C208 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment C208 would follow existing infrastructure (transmission lines, roads, railroads) for 38.3 percent of its length compared to its equivalent following existing infrastructure for 78.3 percent of its length. C208 would follow division lines (field, parcel, or section lines) for 93.2 percent of its length compared to the equivalent following division lines for 100 percent of its length. C208 parallels less total ROW than its equivalent (93.2 percent and 100 percent, respectively).
Cost	Route Segment C208 costs an estimated $3.4 million (15 percent) more than its equivalent; $26,622,500 compared to $23,257,000 for its equivalent.
Human Settlement – Aesthetics	Route Segment C208 would box in one residential parcel that has two boundaries with existing transmission lines as shown in Figure 6-5. This residence would be subject to significant aesthetic impacts. Route Segment C208's equivalent would create pinch points between four residences and an existing transmission line as shown on Figure 5-14. One of these residences would be pinched between two existing transmission lines and Route Segment C208's equivalent. These four residences would be subject to significant aesthetic impacts. The nearest residences to C208 are over 1,600 feet away of the proposed alignment whereas C208's equivalent has 5 residences and 25 non-residences within 1,600 feet. Four of those residents on the equivalent are within 250 feet. Due to more residents that would be pinched with the route and existing transmission lines as well as more residences and non-residences at closer distances, aesthetic impacts are higher for C208's equivalent.
Human Settlement – Displacement	There are no residential or non-residential structures within the ROW of the route segment or the equivalent.
Human Settlement – Recreation	There are no changes to impacts to recreation.
Land-Based Economies - Agriculture	There are no changes to impacts to agriculture.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	One unevaluated historic resource (SW-TAR-00001/Tara Township Hall) is located within the ROI for the Route Segment C208 equivalent, while no archaeological sites or historic resources have been documented within the ROI for Route Segment C208. Therefore, the Route Segment C208 equivalent has more potential to impact significant cultural resources.

Natural Environment – Public and Designated Lands	Public lands within the ROI of Route Segment C208 and its equivalent include a Swift County WPA which is owned by USFWS. C208 and its equivalent do not cross the Swift County WPA; impacts to this resource would not substantially differ between C208 and its equivalent. There are no conservation easement lands within the ROI of Route Segment C208 or its equivalent.
Natural Environment - Vegetation	Route Segment C208 would have no forested land within its ROW whereas its equivalent would have 0.4 acres, increasing vegetation impacts.
Natural Environment – Wildlife and Wildlife Habitat	Route Segment C208 and its equivalent intersect an equal acreage of WPAs (2 acres), while C208 intersects more acres of GBCAs than its equivalent (313 acres and 203 acres, respectively). Both C208 and its equivalent cross GBCAs; the equivalent parallels an existing road ROW across from an existing transmission line for the entire crossing whereas C208 parallels an existing road ROW for only part of the crossing.
Natural Environment – Rare and Unique Natural Resources	Neither Route Segment C208 nor its equivalent have any documented records of federal or state protected species within one mile. The ROW of Route Segment C208 would intersect 8 acres of a Site of Biodiversity Significance ranked below, while its equivalent would avoid this resource.
Natural Environment - Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Route Segment C208 has no waterbodies within the ROI, while its equivalent has one. Neither C208 nor its equivalent have any waterbody crossings. C208 and its equivalent each have two watercourses, two PWI watercourses, and one impaired stream within the ROI. C208 has six watercourse crossings, two PWI watercourse crossings, and one impaired watercourse crossing. Its equivalent has three watercourse crossings, one PWI watercourse crossing, and one impaired stream crossing. These would not require in water work.
Natural Environment – Wetlands and Calcareous Fens	Route Segment C208 would cross more wetlands than its equivalent in terms of acreage and in total length of crossing (approximately 1200 feet more). C208 also crosses more forested wetland acres in the ROW (.3 of an acre versus none).

6.3 Cyrus Subregion Routes

The Cyrus Subregion includes two routes and one alignment alternative. The two routes are shown on Figure 6-12 and summarized in Table 6-18. The one alignment alternative is discussed in Section 6.3.9.

Figure 6-12 Cyrus Subregion Routes

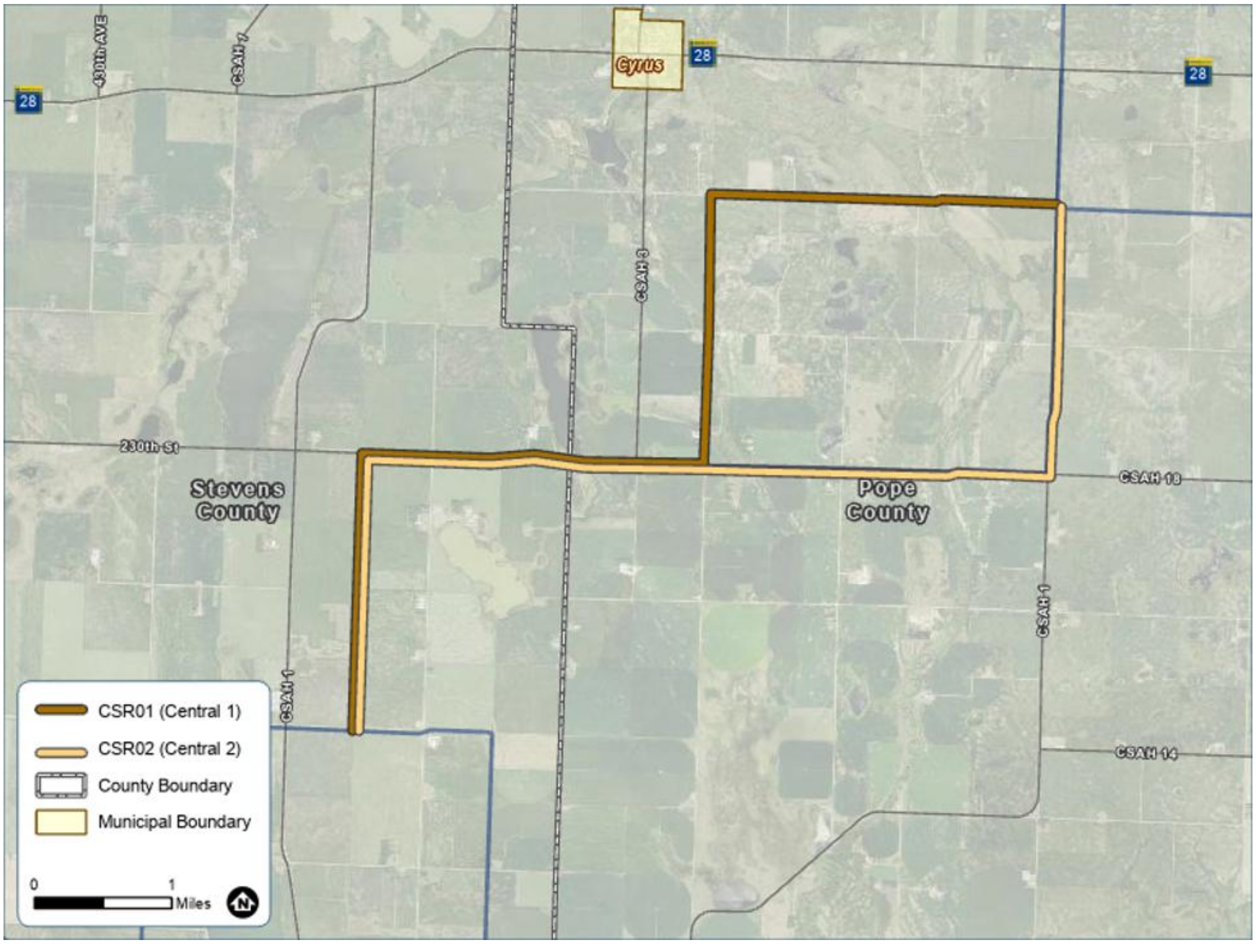


Table 6-18 Cyrus Subregion Routes

Routing Alternative	Type	Description
CSR01	Route	Follows the applicants' proposed Central 1.
CSR02	Route	Follows the applicants' proposed Central 2.

6.3.1 Use or Paralleling of Existing Rights-of-Way

The use and paralleling of existing ROW is considered by the Commission when determining the most appropriate route for the project. Opportunities for ROW sharing for the project include public roads, existing transmission lines, and railroads.

Paralleling and/or sharing other types of existing ROW would have an incremental impact relative to existing horizontal elements, such as existing transmission lines, highways and county roads, and/or railroads (collectively referred to as "existing infrastructure"). In some cases, portions of a route could parallel ROW with more than one of these existing features at the same time (e.g., be sharing or paralleling transmission line and be paralleling road ROW). Map 7-6 through Map 7-7 illustrates where ROW paralleling occurs and shows existing infrastructure.

As shown in Figure 6- and Table 6-19, CSR01 is 9 miles, and CSR02 is 8.9 miles long. CSR02 follows more existing infrastructure (77.5 percent) than CSR01 (66.6 percent).

Figure 6-13 Cyrus Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

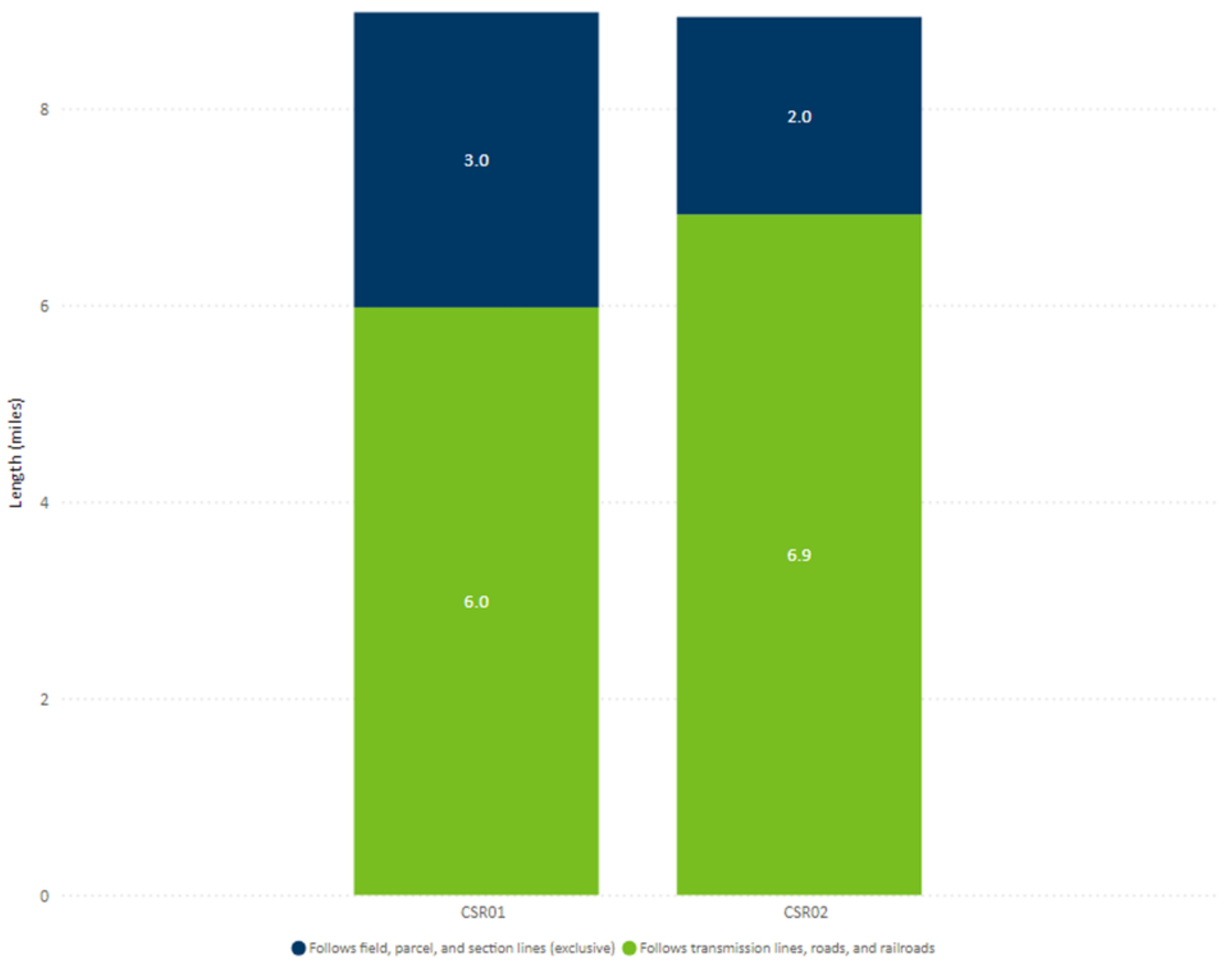


Table 6-19 Cyrus Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

		Follows existing transmission lines		Follows existing roads		Follows existing infrastructure (transmission lines, roads, and railroads)		Follows field, parcel, and section lines	
Route Alternative	Total Length (mi)	Length (mi)	%	Length (mi)	%	Length (mi)	%	Length (mi)	%
CSR01	9.0	0.0	0.0	6.0	66.6	6.0	66.6	8.4	93.2
CSR02	8.9	0.0	0.0	6.9	77.5	6.9	77.5	8.3	93.1

6.3.2 Human Settlement

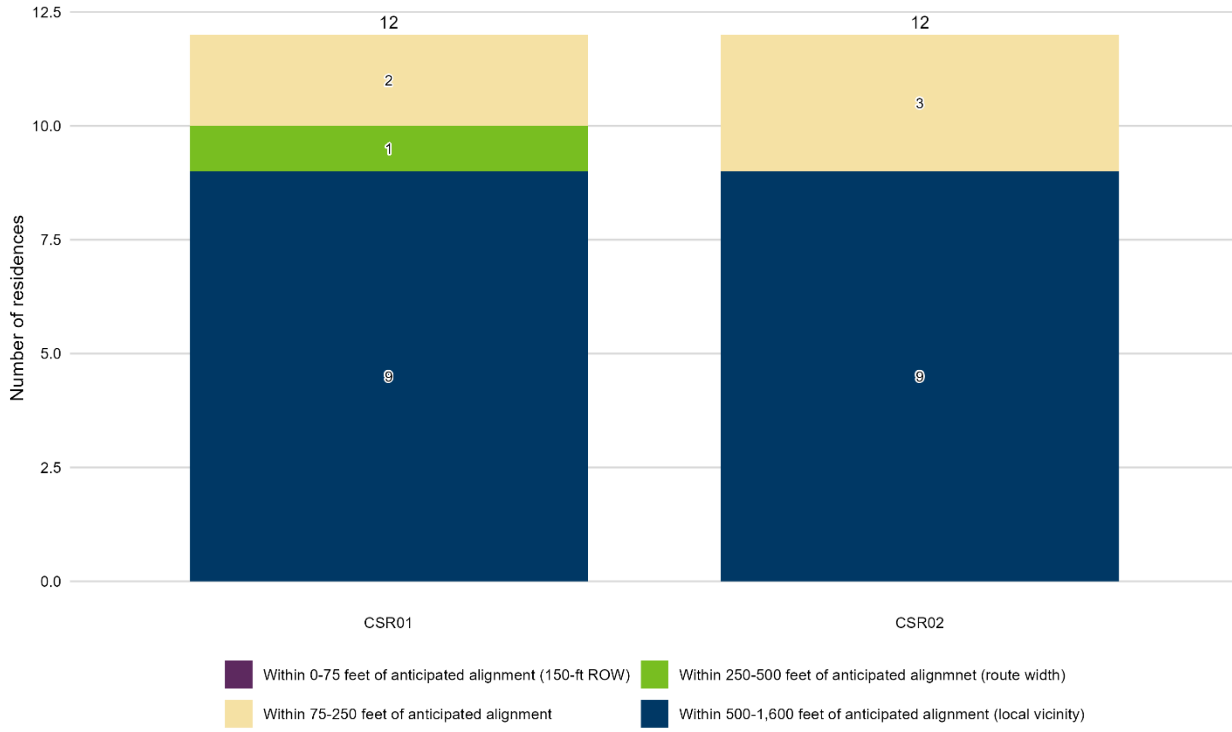
6.3.2.1 Aesthetics

The ROI for aesthetics is the local vicinity. Transmission lines alter a viewshed (Section 4.3.1). Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes. Determining the relative scenic value or visual importance in any given area is subjective and depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question.

Aesthetic impacts can be minimized by selecting routes farther from homes, schools, businesses, and other places where people congregate such as recreational areas. Aesthetic impacts can also be minimized by following existing transmission line ROW where elements of the built environment already define the viewshed and the addition of a transmission line would have an incremental impact. Following other infrastructure, such as roads and railroads, would also be expected to reduce potential impacts but not to the same extent. Additional details regarding potential impacts to aesthetics and potential mitigation measures for the project as a whole are provided in Section 4.3.1.

Appendix F shows human settlement features such as residences and nursing homes in the local vicinity of the routes in the Cyrus Subregion. The proximity of residential structures (homes) and non-residential structures to routes at various distances is shown in Figure 6- and Table 6-20 , respectively. Both of the potential routes, CSR01 and CSR02, have 12 residences within the local vicinity. CSR01 has the least non-residential structures (94) and CSR02 has the most (107) within the local vicinity.

Figure 6-14 Cyrus Subregion, Proximity of Residential Structures



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

Table 6-20 Cyrus Subregion, Proximity of Non-Residential Structures

Non-Residential Structures	Route	
Distances from Anticipated Alignment	CSR01	CSR02
0-75 feet (150-foot-ROW)	0	0
75-250 feet	5	10
250-500 feet (generally route width)	23	14
500-1,600 feet (local vicinity)	56	83
Total	84	107

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

Recreational resources where people might congregate identified within the ROI include Noordmans WMA (Map 18-7; Section 4.7.8.1). Recreational resources are defined and discussed for the project as a whole in Section 4.3.9. There are no major waterbody crossings, however, the Chippewa and Little Chippewa Rivers are crossed by CSR02 once each. CSR01 crosses the Chippewa River once. In these areas, existing forested vegetation would require clearing to accommodate a 150 foot wide ROW (Map F-43 and Map F-45). Vegetation clearing would be minimal by the Little Chippewa crossing and could be further minimized by adjusting the alignment within the route width. CSR02's anticipated alignment near the Chippewa River would cause moderate aesthetic impacts by widening existing County Road 18 ROW. CSR01's crossing of the Chippewa River would require minimal vegetation clearing.

Aesthetic impacts will be greater in areas where no existing linear infrastructure, such as other transmission lines or railroads, are present. There are no existing transmission lines or railroads in the Cyrus Subregion. Section 6.3.1 has further discussion on the use or paralleling of existing ROW for each route in the Cyrus Subregion.

Each route would parallel existing infrastructure or division lines as shown in Map 7-6 and Map 7-7. These maps illustrate existing infrastructure and division lines in the region, including roads, railroads, transmission lines, and parcel lines. In some cases, portions of a route could parallel ROW with more than one of these existing features at the same time. Table 6-19 quantifies the length and percentage of each type of paralleling for each route in the Cyrus Subregion. Figure 6-13 demonstrates the same information in a chart based on length.

Each route is approximately the same total length with 100 percent of their lengths parallelling with all types of existing infrastructure. Aesthetics are minimized by paralleling with existing transmission line ROW rather than all types of existing ROW, which includes roads and parcel lines. There are no existing transmission lines to parallel in the Cyrus Subregion. Aesthetic impacts are minimal along all routes as they completely parallel with existing infrastructure.

There are no areas or residences in the Cyrus Subregion that would be boxed in by existing transmission lines and a portion of a proposed line. There are also no areas or residences that would be in a pinch point between existing transmission lines and a portion of a proposed line.

6.3.2.2 Cultural Values

An assessment of potential impacts to cultural values is discussed for the entire project in Section 4.3.2. The impact assessment was completed for the project as a whole because there is limited variability in cultural values across the routing alternatives. Impacts to cultural values are independent of the route selected.

6.3.2.3 Displacement

There are no residences or non-residential structures within the ROW for the routes within the Cyrus Subregion. An overview regarding displacement, the general impacts from construction and operation of the project, and ways to avoid, minimize, and mitigate these impacts are in Section 4.3.3.

6.3.2.4 Environmental Justice

No EJ areas were identified in the Cyrus Subregion routes. An impact assessment on environmental justice is discussed for the entire project in Section 4.3.5.

6.3.2.5 Land Use and Zoning

An assessment of potential impacts to land use and zoning is discussed in Section 4.3.6. The impact assessment for land use and zoning was completed for the project as a whole because there is limited variability in zoning impacts among the routing alternatives.

6.3.2.6 Noise

An assessment of potential impacts from noise is discussed for the entire project in Section 4.3.7. The impact assessment for noise was completed for the project as a whole because there is limited variability in the potential for noise across the routing alternatives.

6.3.2.7 Property Values

An assessment of potential impacts to property values is discussed for the entire project in Section 4.3.8. The impact assessment for property values was completed for the project as a whole because there is limited variability in the potential for property value impacts across the routing alternatives and changes to a specific property's value are difficult to predict. Potential impacts would be minimized by minimizing aesthetic impacts; aesthetic impacts are analyzed by subregion in Chapters 5 through 7.

6.3.2.8 Recreation

The ROI for recreation is the route width. Intermittent and localized indirect impacts could occur during construction (for example – increased noise levels); long-term impacts during operation could occur in the form of aesthetic impacts (Section 4.3.1.2). Given that direct long-term effects are predominantly related to aesthetics, the indirect long-term repercussions on recreation are anticipated to be subjective, meaning that responses would vary based on individual perspectives and experiences. Impacts to recreation are assessed through identification of recreational resources within the ROI. The project is not anticipated to directly impede recreational activities within the ROI such as snowmobiling, golfing, canoeing, hunting, or fishing. Additional details regarding potential impacts to recreation and potential mitigation measures for the project are provided in Section 4.3.9.

Routes in the Cyrus Subregion do not cross any land-based public trails, state water trails, wild and scenic rivers, scenic byways, or snowmobile trails.

Public lands, including Waterfowl Production Areas and Wildlife Management Areas, in the Cyrus Subregion are publicly accessible and can be used for recreational purposes. These public lands are also used for wildlife management and are discussed in Section 6.3.6.8.

6.3.2.9 Socioeconomics

An assessment of potential impacts to socioeconomics is discussed for the entire project in Section 4.3.10 because there is limited variability in socioeconomic impacts among the routing alternatives.

6.3.2.10 Transportation and Public Services

An assessment of potential impacts to transportation and public services, including roadways, railroads, emergency services, airports, and utilities, is discussed for the entire project in Section 4.3.11. The impact assessment for transportation and public services was not analyzed at the subregional level because there is limited variability across the routing alternatives.

6.3.3 Human Health and Safety

An assessment of potential impacts to human health and safety is discussed for the entire project in Section 4.4. The impact assessment was completed for the project as a whole because there is limited variability across the routing alternatives and impacts would be minimized by prudent routing and adhering to applicable transmission line standards and codes.

6.3.4 Land-based Economies

Impacts to land-based economies are assessed by considering four elements: agriculture, forestry, mining, and tourism. Impacts and mitigation related to land-based economies are analyzed for the project as a whole in Section 4.5. The primary land-based economic activity in the project area is agriculture. The primary means of mitigating impacts to land-based economies is prudent routing; that is, by choosing routing alternatives that avoid such economies.

6.3.4.1 Agriculture

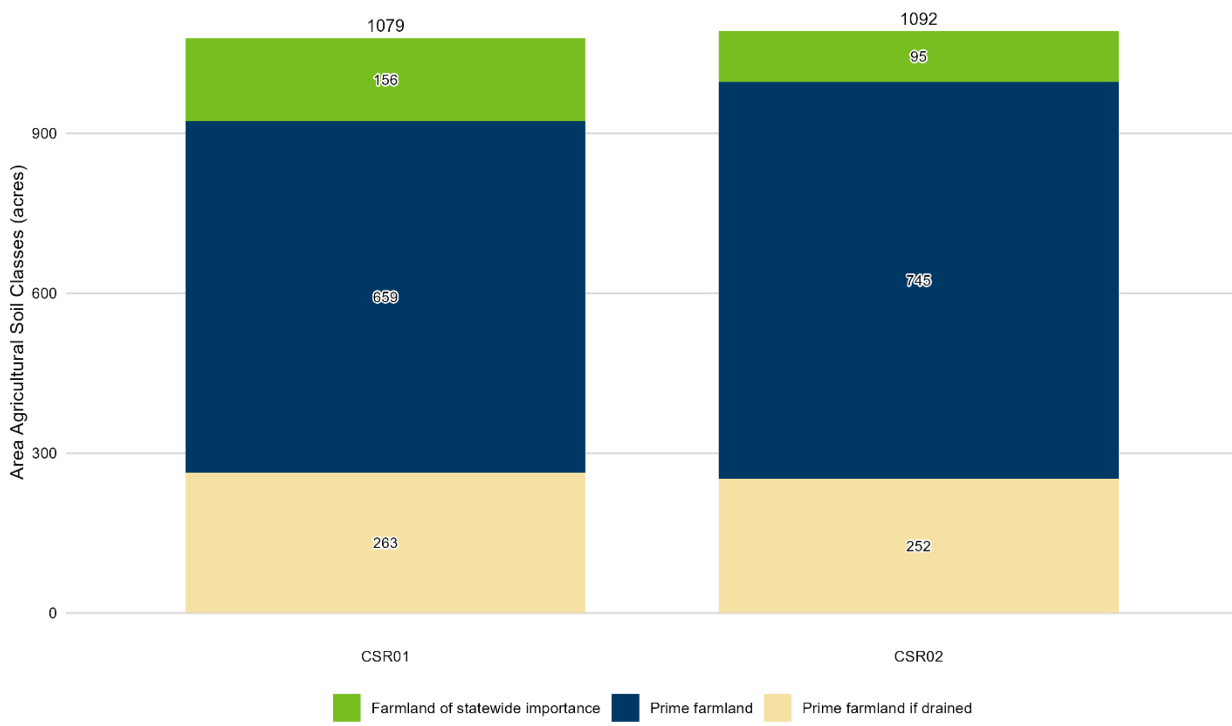
The ROI for agriculture is the route width. Construction and operation of a transmission line impacts agriculture (Section 4.5.1.2). During construction, impacts would include the limited use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Permanent impacts would also occur when the footprint of the transmission line structures directly impedes agricultural production and/or impedes efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields.

Prudent routing (paralleling existing infrastructure and/or paralleling division lines) could minimize potential impacts. Implementation of the AIMP (Appendix K) would minimize and mitigate impacts to agriculture. Additional details regarding potential impacts to agriculture and potential mitigation measures is provided in Section 4.5.1.

Figure 6-15 summarizes the total acres within the route widths of the Cyrus Subregion routes that have designated soil classifications for prime farmland and farmland of statewide importance. Figure 6-16 summarizes the total acres within the route widths of the Cyrus Subregion routes that are designated agricultural land use. Most land (80 percent or more) within the ROI of the routing alternatives in the Cyrus Subregion is designated as agricultural land use (cultivated crops and hay/pasture; see Section 6.3.6.7). CSR02 has more prime farmland than CSR01. However, CSR01 has more agricultural land than CSR02.

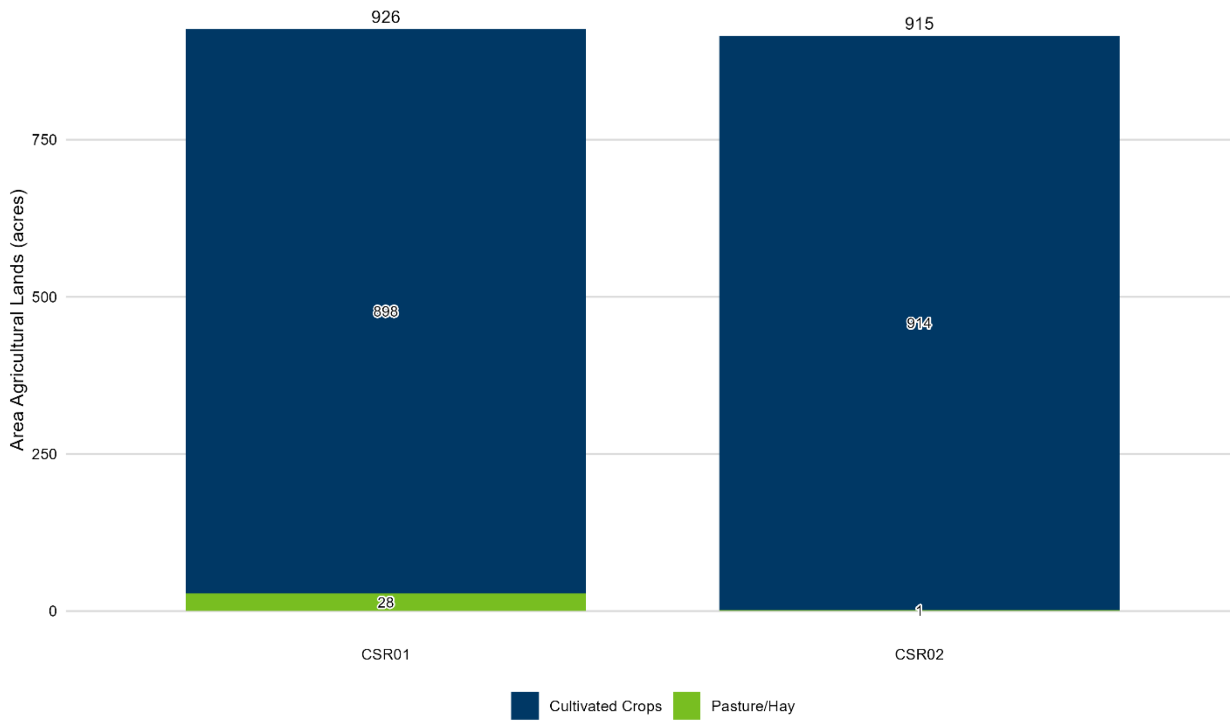
Routing with existing infrastructure or division lines, such as parcel or agricultural fields, would reduce impacts to agriculture. As noted in Table 6-19, CSR02 parallels more existing infrastructure (78 percent of its total length) than CSR01 (67 percent). Both routes completely follow existing infrastructure or division lines (Figure 6-13).

Figure 6-15 Cyrus Subregion, Prime Farmland within Route Widths



Source: Prime farmland/farmland of statewide importance, SSURGO (Appendix D)
Not all prime farmland is farmed.

Figure 6-16 Cyrus Subregion, Acres of Agricultural Lands within Route Width



Source: Agricultural land, NLCD (Appendix D)

Center pivot irrigation systems present in the Cyrus Subregion are shown on Map 13-6 and Map 13-7.

While not crossed by its anticipated alignment, there are seven pivot irrigation systems within the route width of CSR01. The anticipated alignment avoids impacts to all of the center pivot irrigation systems because it parallels 230th Street and 390th Avenue or does not cross the center pivot irrigation system portion of the agricultural field (Map 13-6-Map 13-7).

While not crossed by its anticipated alignment, there are also seven pivot irrigation systems within the route width of SSR02. The anticipated alignment avoids impacts to all of the center pivot irrigation systems because it parallels 230th Street and County Road 18 and does not cross the center pivot irrigation system portion of the agricultural field (Map 13-6-Map 13-7).

One private airstrip, Brown's Private Airstrip, is present within one mile of both CSR01 and CSR02 (Map 7-6). Aerial spraying operations could be impeded or eliminated where transmission lines are close to applicable crops.

The RIM/CREP program provides financial incentives to farmers to remove land from production (Section 4.7.6). Farmers within the route widths of the routes in the Cyrus Subregion participate within the CREP program (Section 6.3.6.6); however, no anticipated alignment in this subregion crosses an easement area. It is anticipated the easement could be avoided during final design. Additional discussion regarding the potential to avoid the easement areas is provided in Section 6.3.6.6. Impacts can be mitigated by compensating individual landowners through negotiated easement agreements.

6.3.4.2 Forestry

Potential impacts to forestry are discussed for the entire project in Section 4.5.2. Impacts to forestry are anticipated to be negligible to minimal and independent of the route selected.

6.3.4.3 Mining

No active aggregate mines were identified within the route width for the Cyrus Subregion. Potential impacts to mining are discussed for the entire project in Section 4.5.3.

6.3.4.4 Tourism

Potential impacts to tourism are discussed for the entire project in Section 4.5.4. Impacts to tourism are anticipated to be negligible to minimal and independent of the route selected.

6.3.5 Archaeological and Historic Resources

The ROI for archaeological sites and historic cemeteries is the route width. The ROI for historic resources is the 1600-foot buffer on either side of the anticipated alignment, which accounts for resources outside of the route width but within visual range of the project.

The analysis of impacts to archaeological and historic resources takes NRHP eligibility into account. Pursuant to state (Minnesota Statutes § 138.661 to 138.669) and federal law (36 CFR 800), only resources that are eligible, listed, or unevaluated for the NRHP have the potential to be adversely affected by the project. For additional information regarding NRHP eligibility, see Section 4.6.1.

Impacts to archaeological and historic resources could result from construction activities such as ROW clearing, placement of structures, the construction of access roads, temporary construction areas, and vehicle and equipment operation (Section 4.6.2). Impacts could also result from the removal of historic buildings or structures, or if the project is near or within view of a resource (typically a historic building, structure, or TCP). Additional details concerning potential impacts and mitigation regarding archaeological and historic resources for the project as a whole are provided in Section 4.6.3.

Documented archaeological and historic resources within the Cyrus Subregion are summarized in Table 6-21 and Table 6-22. Table 6-21 summarizes the number of archaeological and historic resources within the ROI (which is the route width for archaeological sites and historic cemeteries, and a 1600-foot buffer on either side of the anticipated alignment for historic architecture). Table 6-22 provides descriptions of the resources located within the ROIs.

Additional cultural resources may be in the ROIs; reconnaissance survey and evaluation would be necessary to determine whether any other significant archaeological and/or historic resources are present and could be impacted by project activities. If a route permit is issued, the applicants would coordinate with landowners to proceed with these surveys in the permitted route and surrounding areas to include access roads and other areas of potential ground disturbance.

Table 6-21 Cyrus Subregion, Cultural Resource counts within Route's ROI

Route	Archaeological Sites				Historic Architecture				Historic Cemeteries
	Not Eligible	Unevaluated	Eligible or Listed	Total	Not Eligible	Unevaluated	Eligible or Listed	Total	
CSR01	0	0	0	**0**	1	0	0	**1**	0
CSR02	0	1	0	**1**	1	0	0	**1**	0

Table 6-22 Cyrus Subregion, Descriptions of Cultural Resources within Route's ROI

Route	Site/Resource Number	Resource Type	Resource Name/Type	NRHP Status	Description
CSR02	21PO0070	Archaeological Site	Hovendick Site	Unevaluated	Multi-component (precontact and post contact artifact scatter)
CSR02	PO-NPR-00006	Historic Architecture	Bridge No. 61506	Not Eligible	Bridge crossing Twp 69 over the Chippewa River
CSR01	PO-NPR-00009	Historic Architecture	Culvert No. 97586	Not Eligible	Culvert crossing Twp 70 over the Chippewa River

6.3.5.1 Archaeological Resources

One documented archaeological site, unevaluated for listing on the NRHP, is present within the route width for CSR02 (Table 6-22). Site 21PO0070/Hovendick Site consists of an artifact scatter, identified during a pedestrian survey conducted by Archaeo-Physics, LLC in 2018, which includes precontact, contact, and post-contact components. The site is reportedly along the Wadsworth Trail (reference (230)), which was established in 1864 as a supply transportation route for Euroamerican settlers (reference (231)). Recovered artifacts include lithic flakes, faunal bone fragments, worked bottle glass, ceramic whiteware, glass fragments and possibly a coal clinker (slag) (reference (230)).

The CSR01 route width does not intersect any documented archaeological sites and therefore would not impact known archaeological resources. One unevaluated archaeological site (21PO0070) intersects the route width of CSR02; therefore, CSR02 has the potential to impact this resource.

6.3.5.2 Historic Resources

Historic architectural resources within the Cyrus Subregion ROIs include two ineligible resources Table 6-22. These consist of a bridge and a culvert crossing the Chippewa River.

Because both structures were determined not eligible for listing on the NRHP, they are not considered significant historic properties. Therefore, impacts to significant historic architectural resources are not anticipated in the Cyrus Subregion. However, a lack of previously documented historic resources does not mean that the area is devoid of these resources. Rather, it indicates that a professional survey has not occurred for any of the proposed routes. A Phase I historic architectural investigation would be necessary to determine whether significant historic resources are present and have the potential to be impacted by project activities.

6.3.5.3 Historic Cemeteries

There are no documented historic cemeteries within the Cyrus Subregion ROIs.

6.3.6 Natural Environment

Electric infrastructure, such as transmission lines, can impact the natural environment. The Commission must consider effects on the natural environment when designating transmission lines routes and making a decision on a route permit. Impacts are dependent upon many factors, such as how the project is designed, constructed, and maintained. Other factors, such as the environmental setting, influence potential impacts.

6.3.6.1 Air Quality

An assessment of potential impacts to air quality is discussed for the entire project in Section 4.7.1. The impact assessment for air quality was not analyzed at the subregional level because impacts are anticipated to largely be independent of the route selected.

6.3.6.2 Climate Change

An assessment of potential impacts from climate change is discussed for the entire project in Section 4.7.2. The impact assessment for climate change was completed for the project as a whole because there is limited variability in the potential for climate change across the routing alternatives.

6.3.6.3 Greenhouse Gases

An assessment of potential impacts from greenhouse gases is discussed for the entire project in Section 4.7.3. The impact assessment for greenhouse gases was completed for the project as a whole because there is limited variability in the potential for greenhouse gases across the routing alternatives.

6.3.6.4 Geology and Topography

An assessment of potential impacts to geology and topography is discussed for the entire project in Section 4.7.4. The impact assessment for geology and topography was not analyzed at the regional level because impacts are anticipated to largely be independent of the route selected.

6.3.6.5 Groundwater

An assessment of potential impacts to groundwater is discussed for the entire project in Section 4.7.5. The impact assessment for groundwater was not analyzed at the subregional level because impacts are anticipated to largely be independent of the route selected.

6.3.6.6 Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands often involve unique resources intended for protection and/or preservation and would be subject to short and long-term impacts depending upon their use (Section 4.7.6.2). Public and designated lands within the ROI are first identified and then further reviewed to better understand potential impacts such as vegetation clearing. Occupying public and designated lands would require coordination with the landowner (Section 4.7.6.3).

Public lands and designated lands with existing easements or covenants within the route widths and rights-of-way of routes in the Cyrus Subregion are summarized in Table 6-23 and shown in Map 10-6 and Map 10-7, Map 15-6 and Map 15-7, and Map 18-6 and Map 18-7.

There are no national wildlife refuges in the ROI of the Cyrus Subregion. State public lands in the Cyrus Subregion ROI include the Noordmans WMA. Federal public lands in the Cyrus Subregion ROI include the Klevenberg WPA.

The Noordmans WMA, which is owned and managed by the DNR, is within the ROI of CSR01. The Noordmans WMA contains prairie and grasslands, ecosystems that are typically managed with prescribed burns. Though this WMA is within the ROI of CSR01, the anticipated alignment would not cross it. The route parallels an existing road ROW, across the road from the Noordmans WMA. Impacts to the state’s ability to manage the Noordmans WMA are not anticipated, but controlled burn locations in the WMA would need to be coordinated with wind direction to ensure that smoke buildup is not blown across the road towards the transmission line. Construction activities in this area could temporarily impact public enjoyment of this WMA, and the visibility of transmission line structures could create long-term impacts to public enjoyment of the Noordmans WMA. CSR02 will not impact WMAs.

The Klevenberg WPA, which is owned and managed by USFWS, is within the ROI of CSR01. The anticipated alignment of CSR01 would cross the Klevenberg WPA access road for a length of approximately 65 feet; as such, a small amount of vegetation clearing is anticipated. Construction activities in this area could temporarily impact public enjoyment of this WPA, and the visibility of transmission line structures could create long-term impacts to public enjoyment of the Klevenberg WPA. CSR02 will not impact WPAs.

One conservation easement program, CREP, has lands in the Cyrus Subregion ROI (Map 15-6 and Map 15-7). The applicants intend to avoid conservation easements to the greatest extent practicable.

There are 6 acres of one riparian CREP easement within the ROI of CSR01, but it is not crossed by the anticipated alignment and associated ROW. The route parallels an existing road ROW, across the road from the CREP easement, thus it is anticipated to be avoided during final design. Impacts to the CREP easement are not anticipated. CSR02 avoids CREP easements entirely.

Table 6-23 Cyrus Subregion, Public and Designated Lands within Route Width and ROW

Public and Designated Land Type	Unit	Routes	
		CSR01	CSR02
Waterfowl Production Areas	Acres in ROW (route width)	<1 (<1)	0 (0)
Wildlife Management Areas	Acres in ROW (route width)	<1 (14)	0 (0)
Conservation Reserve Enhancement Program (CREP)	Acres in ROW (route width)	0 (6)	0 (0)

6.3.6.7 Vegetation

The ROI for vegetation is the ROW. Potential construction and operation-related impacts to vegetation for the project as a whole are discussed in Section 4.7.7. Potential long-term impacts on vegetation would occur where structures are located or where conversion of forested vegetation to low-growing vegetation would be required. Impacts would be localized, and unavoidable. Impacts to vegetation are primarily evaluated by examining vegetative landcover types within the ROW of each routing option. Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation, as described in Section 4.7.7.

Map 11-6 and Map 11-7 provide an overview of landcover an overview of landcover types across the Cyrus Subregion, and Table 6-24 summarizes the landcover types within the ROW of each route in the Cyrus Subregion. Agricultural vegetation, particularly cultivated cropland, represents the dominant vegetative landcover type within the ROW of both in the Cyrus Subregion. Other sizable land cover types in the route ROIs include herbaceous wetland and low intensity development or open space. No areas of open water or pasture/hay are present among the routes.

Forested land is the vegetation that would be impacted the most by ROW clearing. Removal of woody vegetation will result in conversion to low-stature vegetation (shrubs and grasses) throughout the ROW area. The ROW would be maintained with low-growing vegetation during operations to minimize potential interference with the transmission line. Conversion of wooded landscapes to open landscapes could indirectly affect native vegetation by potentially increasing the spread of invasive and non-native species, which could permanently alter ecosystem functions. Co-locating the route with existing infrastructure right-of-way, for example, roadways or transmission lines, might limit tree removal. Use or paralleling of existing ROWs is discussed in Section 6.3.1 for the Cyrus Subregion.

Land cover in the route ROWs considered forested land include woody wetlands, with only 0.1 acres present in CSR02. CSR01 does not have forested land cover in its ROI. Although CSR01 would minimize impacts to forested vegetation, given the small amount of forested vegetation in the ROW for all of the routes, impacts are anticipated to be minimal for all routes in the Cyrus Subregion. Potential impacts to agricultural vegetation and wetlands are discussed in Section 6.3.4.1 and Section 6.3.6.12 respectively.

Table 6-24 Cyrus Subregion, Landcover Types in the ROW

Landcover Data	Unit	CSR01	CSR02
Area Within ROW	Acres	163.6	162.7
Cultivated Crops	Acres (percentages)	98.8 (60.4)	102.9 (63.2)
Developed, Low Intensity	Acres (percentages)	16.4 (10.0)	33.2 (20.4)
Developed, Medium Intensity	Acres (percentages)		0.1 (<0.1)
Developed, Open Space	Acres (percentages)	46.1 (28.2)	21.4 (13.2)
Emergent Herbaceous Wetlands	Acres (percentages)	2.3 (1.4)	5.1 (3.1)
Pasture/Hay	Acres (percentages)	<0.1 (<0.1)	
Woody Wetlands	Acres (percentages)		0.1 (0.1)

6.3.6.8 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. Potential construction and operation-related impacts to wildlife and wildlife habitat are discussed in Section 4.7.8. Potential short-term, localized impacts could occur from displacement, injury, or mortality during construction or maintenance activities. Potential long-term

impacts could occur as a result of habitat loss, conversion, or fragmentation. Impacts to wildlife and wildlife habitat are assessed both by considering wildlife inhabiting the ROI as well as assessing the presence of potential habitat for wildlife within the ROI. Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife and wildlife habitat, as described in Section 4.7.8.

Map 18-6 and Map 18-7 provides an overview of resources across the Cyrus Subregion and Table 6-25 summarizes the wildlife resources within the route width of each route in the Cyrus Subregion. Designated wildlife habitat within the Cyrus Subregion ROI includes shallow wildlife lakes, GBCAs, WPAs, and WMAs. “Low” rank Wildlife Action Network corridors are present in the Cyrus Subregion ROI.

A DNR-identified priority shallow wildlife lake is within the local vicinity and route width of both routes in the Cyrus Subregion (Map 14-6). The route widths of CSR01 and CSR02 intersect an equivalent acreage (3 acres) of the same unnamed priority shallow wildlife lake. CSR01 and CSR02 would not cross the priority shallow wildlife lake as both routes would parallel an existing road ROW across the road from the lake. Both routes would establish a new transmission line corridor near the shallow wildlife lake that could increase potential impacts to flying birds. CSR01 and CSR02 intersect an equivalent acreage of the lake, and would have an equivalent potential impact to flying birds.

A WPA is within the local vicinity and route width of CSR01, and the anticipated alignment of CSR01 would cross this resource (Map 18-7). The route width of CSR01 intersects less than one acre of the Klevenberg WPA. CSR01 would cross the Klevenberg WPA, paralleling an existing road ROW, for a length of approximately 33 feet. The section of the Klevenberg WPA CSR01 would cross contains an unpaved access road; impacts to habitat quality or resident wildlife from construction activities within CSR01’s ROW are not anticipated. CSR01 would establish a new transmission line corridor near the Klevenberg WPA that could increase potential impacts to waterfowl flying through the area. CSR02 avoids WPAs entirely.

A WMA is within the local vicinity and route width of CSR01, however, the anticipated alignment of CSR01 would not cross this resource (Map 18-7). The route width of CSR01 intersects approximately 14 acres of the Noordmans WMA. The Noordmans WMA contains diverse habitat that can support a variety of bird species including meadowlarks, bobolinks, belted kingfishers, swamp sparrows, herons, and rails (reference (232). CSR01 would parallel an existing road ROW, across the road from the Noordmans WMA. CSR01 would establish a new transmission line corridor near the Noordmans WMA that could increase potential impacts to birds flying through the area. CSR02 avoids WMAs entirely.

A GBCA is within the local vicinity and route width of CSR01, and the anticipated alignment of CSR01 would cross this resource (Map 18-7). CSR01 would cross the GBCA paralleling an existing road ROW for most of the crossing. CSR01 would establish a new transmission line corridor through the GBCA that could increase potential impacts to birds flying through the area. CSR02 avoids GBCAs entirely.

A Low rank Wildlife Action Network corridor is within the route width and local vicinity of both CSR01 and CSR02 (Map 17-7). The route widths of CSR01 and CSR02 intersect an equivalent acreage (5 acres) of the corridor. The anticipated alignments of both routes would cross the corridor; CSR02 would cross the corridor for 48 feet and CSR01 would cross the corridor for 23 feet. The area of the corridor CSR01 and CSR02 would cross contains an agricultural field, so vegetation clearing for the ROW would not result in habitat fragmentation in this area.

The routes in the Cyrus Subregion would parallel no existing transmission line ROW. Avian species traversing wildlife areas along new transmission line corridors could potentially experience increased impacts resulting from electrocution or collision with transmission line structures or conductors. As discussed in Section 4.7.8.3, avian impacts can be minimized through use of bird flight diverters.

The routes in the Cyrus Subregion would parallel a considerable amount of existing non-transmission line infrastructure rights-of-way such as roads, with CSR01 paralleling the most (78 percent of its length) and CSR02 paralleling the least (67 percent of its length). The greater length of each route that parallels existing infrastructure, the more impacts would minimize potential wildlife and habitat impacts associated with habitat fragmentation and/or edge effects because habitat fragmentation has already occurred in these areas.

Table 6-25 Cyrus Subregion, Wildlife Management and Conservation Areas within Route Width

Resource Area	Unit	Routes	
		CSR01	CSR02
Priority Shallow Wildlife Lakes	Count	1	1
Waterfowl Production Area	Acres	<1	0
Wildlife Management Area	Acres	14	0
Grassland Bird Conservation Areas	Acres	329	0
Wildlife Action Network corridors	Low Rank (Acres)	5	5

6.3.6.9 Rare and Unique Natural Resources

Rare and unique natural resources encompass protected species and sensitive ecological resources. The ROI for protected species is the project area (one mile), and the ROI for sensitive ecological resources is the route width. Potential construction and operation-related impacts to protected species and sensitive ecological resources are discussed in Section 4.7.9.2. Potential direct or indirect impacts to protected species could occur should they be present within or near the ROW during construction or maintenance activities. While more mobile species would leave the area for nearby comparable habitats, non-mobile species, such as vascular plants or nesting birds, could be directly impacted. Construction activities also have the potential for direct impacts to sensitive ecological resources if they are present within the area subject to construction disturbance. Long-term impacts would involve permanent clearing of vegetation in areas identified as sensitive ecological resources which could indirectly impact any protected species associated with these habitats.

Impacts to protected species are evaluated by reviewing documented occurrences of these species within the ROI. Potential impacts to sensitive ecological resources, which could provide suitable habitat for protected species, are evaluated by assessing the presence of these resources within the

ROI. Several measures that could be implemented to avoid, minimize, or mitigate impacts to protected species and sensitive ecological resources, including those provided in the DNR's Natural Heritage Review response (Appendix N), are described in Section 4.7.9.3.

Sensitive ecological resources within the Cyrus Subregion are shown on Map 15-6 and Map 15-7. To secure federally and state protected species from exploitation or destruction, documented locations of these species are not identified on maps.

6.3.6.9.1 Protected Species

According to the NHIS database, two state protected bird species have been documented within one mile of CSR01 and CSR02, one of which, loggerhead shrike, has been documented within the ROW of both routes; these are summarized in Table 6-26. In addition, several state special concern species have been documented within one mile of the routes in the Cyrus Subregion; records of state special concern species are summarized in Appendix N.

Formal protected species surveys have not been conducted for the project; as such, it is possible that additional protected species could be present where suitable habitat is available within the ROW or route width of the routes in the Cyrus Subregion. As part of project permitting, the applicants could be required to conduct field surveys for the potential presence of protected species; these surveys would occur prior to construction in coordination with the USFWS and/or DNR.

Table 6-26 Cyrus Subregion, Natural Heritage Information System Database Records of Protected Species within One Mile

Scientific Name	Common Name	Type	State/Federal Status	Routes	
				CSR01	CSR02
Athene cunicularia	Burrowing owl	Bird	Endangered/not listed	X	X
Lanius ludovicianus	Loggerhead shrike	Bird	Endangered/not listed	X[1]	X[1]

[1] Species has been documented within the ROW.

6.3.6.9.2 Sensitive Ecological Resources

The route widths and rights-of-way of both routes in the Cyrus Subregion would intersect sensitive ecological resources (Table 6-27; Map 15-6 and Map 15-7). The ROW and route width of CSR01 would intersect a Prairie Conservation Plan prairie core area, while the ROW and route width of CSR02 would intersect a Prairie Conservation Plan prairie core area, a native plant community, and Sites of Biodiversity Significance ranked moderate and below. Given the extensive mapping of Prairie Conservation Plan prairie core areas in the Cyrus Subregion, both routes would require the placement of multiple structures within these areas. All other sensitive ecological resources should be spannable by the anticipated alignments for both routes in the Cyrus Subregion.

Table 6-27 Cyrus Subregion, Sensitive Ecological Resources within the ROW and Route Width of Each Route

Resource	Units	CSR01	CSR02
Native Plant Community	Conservation Status S2 (acres in ROW (route width))	0 (0)	<1 (3)
Sites of Biodiversity Significance	Moderate rank (acres in ROW (route width))	0 (0)	<1 (7)
	Below rank (acres in ROW (route width))	0 (0)	2 (14)
	Total acres in ROW (route width)	0 (0)	2 (21)
Prairie Conservation Plan	Prairie Core Area (acres in ROW (route width))	<1 (5)	<1 (3)

6.3.6.10 Soils

The ROI for soils is the ROW. Common soil impacts include rutting, compaction, and erosion. Potential impacts would be short-term during construction, localized, and can be minimized. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicants would obtain a NPDES/State Disposal System Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicles trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored a suitable location. Disturbed areas would be promptly seeded after construction. Additional details regarding potential impacts to soils and potential mitigation measures is provided in Section 4.7.10.

Map 20-6 and Map 20-7 show the surface soil textures across the subregion. Soil types within the ROW were reviewed to identify soil characteristics that could be more prone to impacts in some areas compared to others (Table 6-28). Less than one-third of soils within the ROW of the Cyrus Subregion are soils prone to compaction, soils susceptible to erosion, or hydric soils. Nearly all soils within the ROW of the routes have a moderate or severe rutting hazard rating. Generally, all of the routes within the Cyrus Subregion have similar soil characteristics. There is no route that is better suited to reduce the potential rutting, compaction, and erosion that could occur during construction.

Table 6-28 Cyrus Subregion, NRCS Mapped Soils within ROW

Soil Data	Unit	CSR01	CSR02
Area within ROW	Total Acreage	164	163
Compaction Prone[1]	Acres (Percentage)	49 (30)	51 (31)
Susceptible to Erosion Hazard[2]	Acres (Percentage)	9 (6)	5 (3)
Hydric Soils[3]	Acres (Percentage)	40 (24)	32 (20)
Revegetation Concerns[4]	Acres (Percentage)	43 (26)	28 (17)
Susceptible to Rutting Hazard[5]	Acres (Percentage)	164 (100)	163 (100)

[1] Soils considered to be Compaction Prone soils include those with a rating of "Medium" or higher.
[2] Soils considered susceptible to erosion hazard soils include those with a rating of "Medium", "Severe", or "Very Severe".
[3] Hydric soil include hydric soils (100% hydric) and predominantly hydric soils (67-99% hydric).
[4] Soils considered to have revegetation concerns include soils with a non-irrigated land capability classification of 3 or greater.
[5] Soils considered susceptible to Rutting Hazard include those with a rating of "Moderate" or "Severe".

6.3.6.11 Surface Water

The ROI for surface water is the route width. Direct impacts caused by structures placed in surface waters would be avoided by spanning the surface waters. Direct impacts to other resources can cause indirect impacts to surface waters. For example, construction activities near surface waters could cause riparian vegetation disturbance and surface erosion, which can lead to runoff impacting surface waters. Impacts to surface waters could be avoided by prudent routing, selecting the routes that cross the fewest watercourses or waterbodies and/or special or impaired waters.

Impacts would be mitigated by using BMPs. Crossing PWI waters would require a DNR license to cross public waters and work near special or impaired waters would require additional BMPs as detailed in the construction stormwater permit. Additional details regarding potential impacts to surface waters and potential mitigation measures, including those provided in the DNR's Natural Heritage Review response (Appendix N), is provided in Section 4.7.11.

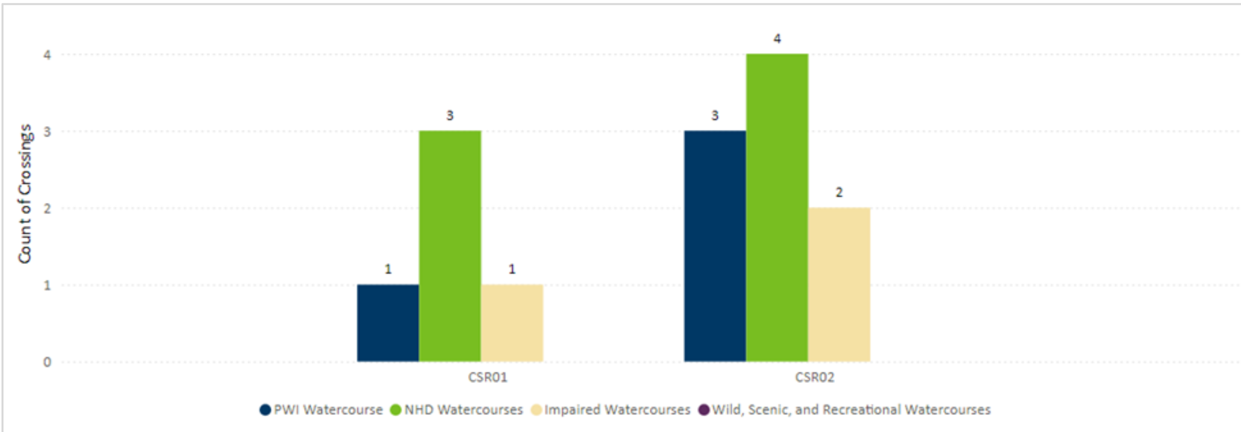
Map 14-6 and Map 14-7 show the waterbodies and watercourses across the region. There are no trout streams, state-designated outstanding resource value waters, or state wild and scenic rivers within the ROI of the Cyrus Subregion.

There is one waterbody within the ROI of both CSR01 and CSR02; and they are designated as a PWI basin. Neither of the routes have any waterbody crossings.

There is a total count of three watercourse crossings in CSR01 and four in CSR02 in the Cyrus Subregion (Figure 6-17). CSR01 has one PWI watercourse crossing and CSR02 has two PWI watercourse crossings. PWI watercourses crossed in the Cyrus Subregion include the Chippewa River and the Little Chippewa

River. The crossings where there are no existing transmission lines will require more tree clearing than the crossings where there are existing transmission lines.

Figure 6-17 Cyrus Subregion, Number of Watercourse Crossings by Type



Impacts to floodplains during construction would include soil disturbance and vegetation removal. Vegetation clearing within a floodplain, especially tree removal, can greatly destabilize the area, make it more prone to ongoing erosion and sediment issues, and further contribute to water quality issues. The project might require that transmission line structures be placed within FEMA-designated floodplain. In the Cyrus Subregion, each routing alternative has one crossing of a floodplain that exceeds 1,000 feet. Routes that could not span the floodplain due to a crossing that exceeds 1,000 feet would have higher potential to impact the floodplain's function and management capabilities.

6.3.6.12 Wetlands and Calcareous Fens

The ROI for wetlands is the route width, except for forested wetlands where it is the ROW due to permanent conversion within that area. Short-term and long-term potential impacts to wetlands are discussed in Section 4.7.12.2. Impacts to wetlands are evaluated by examining wetland types, sizes, and potential for spanning. Localized direct impacts to wetlands would include vegetation clearing, movement of soils, and construction traffic which could alter or impair wetland function. Forested wetlands would be subject to long-term impacts given their conversion to non-forested wetlands. Wetland crossings longer than 1,000 feet might require one or more structures to be placed in the wetland, resulting in small, localized permanent wetland impacts.

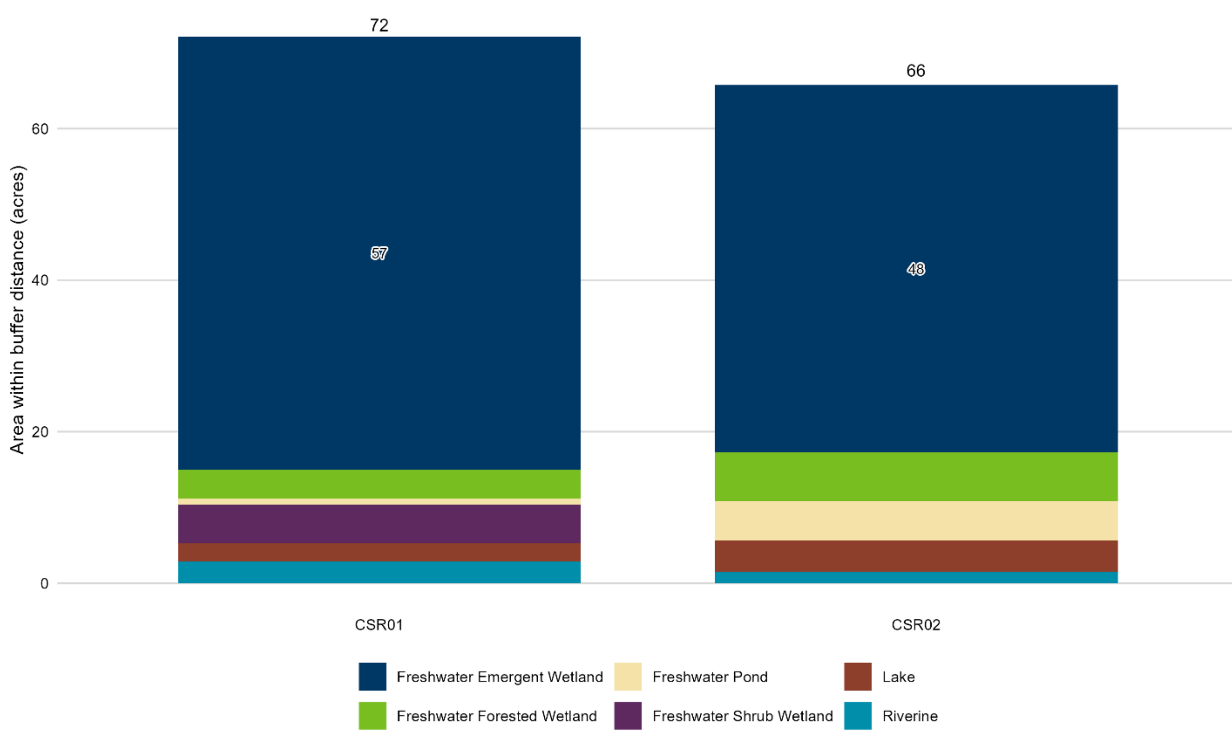
Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width. Wetland impacts would be regulated as described in Section 4.7.12.2. Additional details regarding potential impacts to wetlands, including those provided in the DNR's Natural Heritage Review response, and potential mitigation measures are provided in Section 4.7.12.3.

There are no calcareous fens in or near the ROI for this subregion.

Map 14-6 and Map 14-7 show the mapped wetlands within the ROI of the potential routes in the Cyrus subregion. Direct wetland impacts would occur within the construction workspace within or adjacent to the ROW. Not all wetland areas within the ROI would be subject to direct impacts as most could be spanned. In most cases, wetlands can be spanned to avoid placing structures within them. However, wetland crossings longer than 1,000 feet might require one or more structures to be placed within the wetland. There are no crossings greater than 1,000 feet for any route in this subregion.

Wetlands in the ROI for the Cyrus subregion consist mainly of emergent wetlands and a smaller subset of forested, shrub, pond, and riverine wetlands. Figure 6-18 shows acres of wetland that the ROI crosses. Within the Cyrus Subregion, CSR01's ROI contains the most NWI wetland at 72 acres, crosses the highest number of individual wetlands (12), and has the most overall length at approximately 1,843 feet. CSR02 crosses the fewest acres of wetland at roughly 66 acres, has the fewest number of crossings (11), and the lowest total length at approximately 1,795 feet. Lower acreage and lower numbers of crossings serve as an indicator of fewer direct or indirect impacts to wetlands.

Figure 6-18 Cyrus Subregion, Wetland Area within ROI by Route



No routes in this subregion cross PWI wetlands.

The ROI for each of the routes in the Cyrus Subregion cross a mixture of wetlands including forested wetlands. Because transmission lines cannot be safely or reliably operated with trees growing within the

ROW, existing trees must be removed throughout the ROW, including forested wetlands. Forested wetlands, within any new transmission line ROW, would likely undergo a long-term to potentially permanent change in wetland/vegetation type lasting as long as the transmission line operates in the area. In the Cyrus Subregion, CSR02's ROW crosses the most forested wetland, at 0.7 of an acre, while CSR01 crosses the fewest acres, at 0.4 of an acre. Forested wetlands that are subject to permanent impacts due to their conversion would be limited to the ROW.

6.3.7 Costs that are Dependent on Design and Route

Total project costs range from $465 million to $535 million and vary based on the routes selected. Estimates include permitting, engineering, materials (for example: steel, conductor, and insulators), land rights and ROW, and construction costs. Costs are generally proportional to length with the exception of the additional factors described in Section 4.8. For comparison purposes, the construction costs for the two routes in the Cyrus Subregion are included in Table 6-29. Estimated construction costs associated with route segments and alignment alternatives in the Cyrus Subregion are discussed in Section 6.3.9.

The route with the lowest estimated cost is CSR02 ($43,794,500); it is also the shortest route.

Table 6-29 Cyrus Subregion, Summary of Estimated Cost by Route

Route Alternative	Length (mi)	Estimated Cost
CSR01	9.0	$44,288,000
CSR02	8.9	$43,794,500

6.3.8 Relative Merits of the Cyrus Subregion Routes

The 14 routing factors that the Commission must consider when designating transmission line routes (Minnesota Rules 7850.4100) are summarized at the subregional level. Some elements of these factors have minimal impacts or do not vary significantly by route within the subregion and thus are not further discussed in this Section.

The relative merits analysis uses graphics (Table 6-30) to provide a visual assessment of the relative merits for each route in the Cyrus Subregion. The graphic for a specific routing factor or element is not meant to be indicative of the "best" route but is provided as a relative comparison to be evaluated together with all other routing factors. For routing factors where impacts are anticipated to vary, the graphic represents the magnitude of anticipated difference between these anticipated impacts and compares them across the different routes with a given subregion. For routing factors that express the state of Minnesota's interest in the efficient use of resources (for example, the use and paralleling of existing rights-of-way), the graphic represents the consistency of the routes with these interests and compares them to each other. Table 6-31 summarizes the relative merits analysis of the two routes in the Cyrus Subregion for the routing factors that are anticipated to vary amongst the routes.

Table 6-30 Guide to Relative Merits Analysis

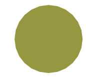
Consistency with Routing Factor or Anticipated Impacts	Symbol
• Route is consistent with the routing factor OR • Impacts are anticipated to be negligible to minimal or the impact is positive	
• Route is consistent with routing factor but less so than the other options OR • Impacts are anticipated to be minimal but the potential for impacts is greater than the other routes or require special permit conditions OR • Impacts are anticipated to be moderate	
• Route is not consistent with routing factor or consistent only in part OR • Impacts might be moderate but the potential for impacts is greater than the other routes or might require special permit conditions OR • Impacts are anticipated to be significant	

Table 6-31 Cyrus Subregion, Relative Merits of Subregion Routes

Routing Factor / Resource	CSR01	CSR02	Summary
Factor A Human Settlement			
Aesthetics	●	◒	Both routes affect 12 residences, most of which are over 500 feet away from the alignments. Existing infrastructure is followed for 100% of both routes. CSR02 near the Chippewa River crossing would cause moderate impacts from vegetation clearing whereas CSR01's crossing impacts would be minimal. CSR02 would also need to cross the Little Chippewa River with minimal impact to vegetation clearing whereas CSR01 would not.
Displacement	●	●	There are no residences or non-residential structures within the ROW of any of the routes.
Recreation	●	●	Impacts to recreation are anticipated to be negligible among the routes.
Factor C Land-Based Economies			
Agriculture	●	●	Impacts to agriculture are anticipated to be minimal among the routes.
Mining	●	●	Impacts to mining are anticipated to be negligible among the routes.
Factor D Archaeological and Historic Resources			
Archaeological	●	◒	The CSR01 route width does not intersect any documented archaeological sites and therefore would not impact known archaeological resources. One unevaluated archaeological site intersects the route width of Route CSR02.
Historic	●	●	No NRHP-listed, eligible or unevaluated historic architecture resources have been recorded within the Cyrus Subregion ROIs. Both routes are therefore expected to have minimal impact on significant historic resources.

Routing Factor / Resource	CSR01	CSR02	Summary
Factor E Natural Resources			
Public and Designated Lands			Public lands are only within the ROI of CSR01 and include one WMA and one WPA. CSR01 would not cross the WMA, and vegetation clearing within the WMA would not occur. CSR01 would not impact the state's ability to conduct controlled burns in the WMA, but CSR01 could be an additional factor to consider when coordinating controlled burns. CSR01 would cross the WPA, and a small amount of vegetation clearing within the ROW would occur (<1 acre). CSR01 could impact public enjoyment of the WMA and WPA within its ROI. CSR02 would not impact public lands. The ROI of CSR01 includes one CREP easement, but CSR01 would not cross it and impacts could be avoided during final design.
Soils			Nearly all the soils in the region have a moderate or severe rutting hazard rating. Impacts could be minimized with BMPs or mitigated if long-term re-vegetation impacts extend beyond construction. Impacts to soils would be independent of the route selected.
Surface Water			CSR01 crosses the fewest watercourses (3 crossings) while CSR02 crosses the most (4 crossings). CSR01 has one PWI watercourse crossing and CSR02 has three PWI watercourse crossings. CSR01 has one impaired watercourse crossing and CSR02 has two impaired watercourse crossings. No in-water work would occur.
Wetlands			All routes have some acres of forested wetlands. In the Cyrus Subregion, CSR02's ROW crosses the most forested wetland, at 0.7 of an acre, while CSR01 crosses the fewest acres, at 0.4 of an acre. No routes in this subregion cross PWI wetlands. No route would require crossings greater than 1,000 feet.
Vegetation			Land cover in the route ROWs considered forested land include 0.1 acres in CSR02 and zero acres in CSR01.

Routing Factor / Resource	CSR01	CSR02	Summary
Wildlife and Wildlife Habitat			CSR02's route width would generally intersect fewer acres of wildlife resources compared to CSR01. The route width of CSR01 and CSR02 would intersect an equivalent amount of the same priority shallow wildlife lake; the routes would establish new transmission line corridors near the lake with equivalent avian impacts. The route width of CSR01 intersects WMAs and WPAs; CSR02 avoids WMAs and WPAs. CSR01 would cross a GBCA, establishing a new transmission line corridor that could result in avian impacts; CSR02 avoids GBCAs. CSR01 and CSR02 cross an equivalent acreage of a Wildlife Action Network corridor in an agricultural field; habitat fragmentation is not expected. CSR01 and CSR02 follow no existing transmission line corridors. CSR01 and CSR02 would follow existing non-transmission line infrastructure for the majority of their length, minimizing habitat fragmentation for both routes.
Factor F Rare and Unique Natural Resources			
Rare and Unique Natural Resources			The ROW of CSR01 would intersect less than an acre of a Prairie Conservation Plan prairie core area, while the ROW of CSR02 would intersect a less than an acre of a Prairie Conservation Plan prairie core area, less than an acre of a native plant community, and approximately two acres of Sites of Biodiversity Significance ranked moderate and below. Two state protected bird species have been documented within one mile of CSR01 and CSR02, one of which has been documented within the ROW of both routes
Factor H Paralleling Division Lines			
Paralleling existing survey lines, natural division lines, and agricultural field boundaries			CSR01 follows existing division lines for 93.2 percent of its length, while CSR02 follows division lines for 93.1 percent of its length.
Factor J Paralleling Existing Infrastructure **Minnesota Statute § 216E.03 - Subdivision 7 (8) (roads/railroads) and (15e)(transmission lines)**			
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.			CSR01 follows more existing infrastructure for larger percentage of its length (66.6 percent), while CSR02 follows existing infrastructure for 77.5 percent of its length.
Factor L Costs			
Costs Dependent on Design and Route			The route with the lowest estimated cost is CSR02 ($43,794,500). There is only a 1% difference between CSR01 and CSR02.

6.3.9 Alignment Alternatives for the Cyrus Subregion

An alignment alternative (CAA01) was included in the scoping decision for the Cyrus Subregion but is not part of Routes CSR01 or CSR02. Rather, it is considered a refinement to a portion of Route CSR02. No route segments are included in the Cyrus Subregion. Figure 6-19 provides the location of Alignment Alternative CAA01. Table 6-32 summarizes the alignment alternative in the Cyrus Subregion and indicates which route it would refine or replace a portion of. For purposes of analysis, an alignment alternative is considered in standalone comparison to its route equivalent.

Figure 6-19 Cyrus Subregion Alignment Alternative

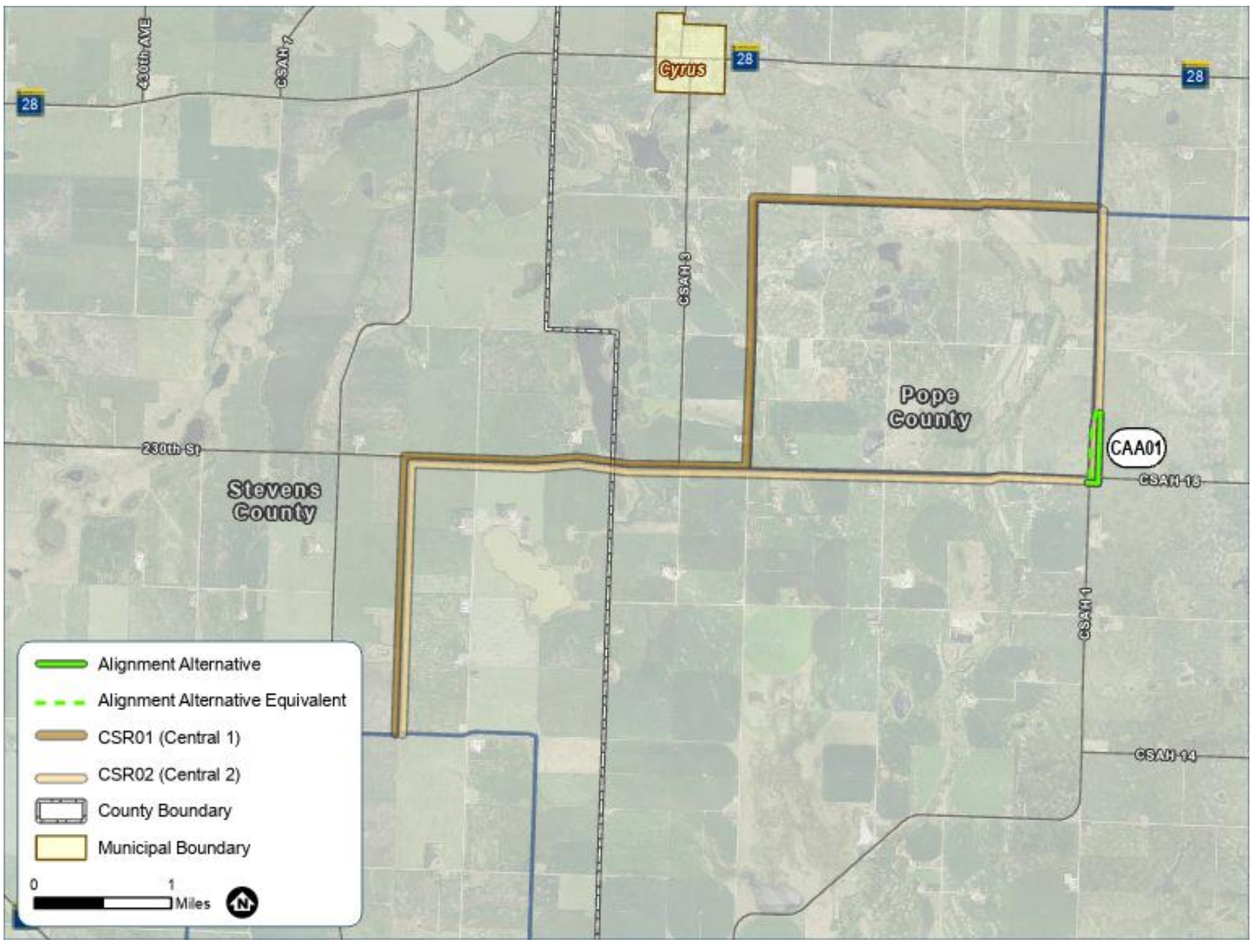


Table 6-32 Cyrus Subregion Alignment Alternative

Routing Alternative	Type	Description
CAA01	Alignment Alternative	Proposed during scoping to mitigate potential impacts to a residence. It can be used to modify route CSR02.

6.3.9.1 Alignment Alternative CAA01

Alignment Alternative CAA01 is 0.5 miles long and is an alternative to a part of Route CSR02. Alignment Alternative CAA01 was proposed to mitigate impacts to a residence. Alignment Alternative CAA01 is shown on Figure 6-19 and Table 6-33 summarizes differences in potential impacts of Alignment Alternative CAA01 compared to its equivalent.

Table 6-33 Alignment Alternative CAA01 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Alignment Alternative CAA01 and its equivalent would follow existing infrastructure (transmission lines, roads, railroads) for 100 percent of their lengths. Both CAA01 and its equivalent would follow division lines (field, parcel, or section lines) for 100 percent of their lengths. Both CAA01 and its equivalent parallel total ROW for 100 percent of their lengths.
Cost	Alignment Alternative CAA01 costs an estimated $0.8 million (20 percent) less than its equivalent; $3,269,500 compared to $4,105,500 for its equivalent. The reduced cost is due to the fewer number of angle structures.
Human Settlement – Aesthetics	No changes in impacts to aesthetics; visibility to residences remains relatively unchanged.
Human Settlement – Displacement	There are no residential or non-residential structures within the ROW of the alignment alternative or the equivalent.
Human Settlement – Recreation	There are no changes to impacts to recreation.
Land-Based Economies – Agriculture	There are no changes to impacts to agriculture.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	There are no documented archaeological or historic resources within Alignment Alternative CAA01 or its equivalent.
Natural Environment – Public and Designated Lands	There are no conservation easement or public lands within the ROI of Alignment Alternative CAA01 or its equivalent.
Natural Environment - Vegetation	No changes in impacts to vegetation.
Natural Environment – Wildlife and Wildlife Habitat	There are no changes to impacts on wildlife or wildlife habitat between Alignment Alternative CAA01 and its equivalent.
Natural Environment – Rare and Unique Natural Resources	Neither Alignment Alternative CAA01 nor its equivalent have any documented records of federal or state protected species within one mile. No sensitive ecological resources intersect the ROW of Alignment Alternative CAA01 or its equivalent.
Natural Environment – Soils	There are no changes to impacts on soil resources.

Resource	Summary
Natural Environment – Surface Water	There are no waterbodies or waterbody crossings within the CAA01 or its equivalents ROI. There are no watercourses or watercourse crossings within CAA01 or its equivalents ROI.
Natural Environment – Wetlands and Calcareous Fens	No changes to impacts on wetlands, PWI wetlands, or calcareous fens between the alignment alternative and its equivalent.

6.4 White Bear Lake Subregion Routes

The White Bear Lake Subregion includes four routes and one route segment. The four routes are shown in Figure 6-20 and summarized in Table 6-34. The one route segment is discussed in Section 6.4.9.

Figure 6-20 White Bear Lake Subregion Routes

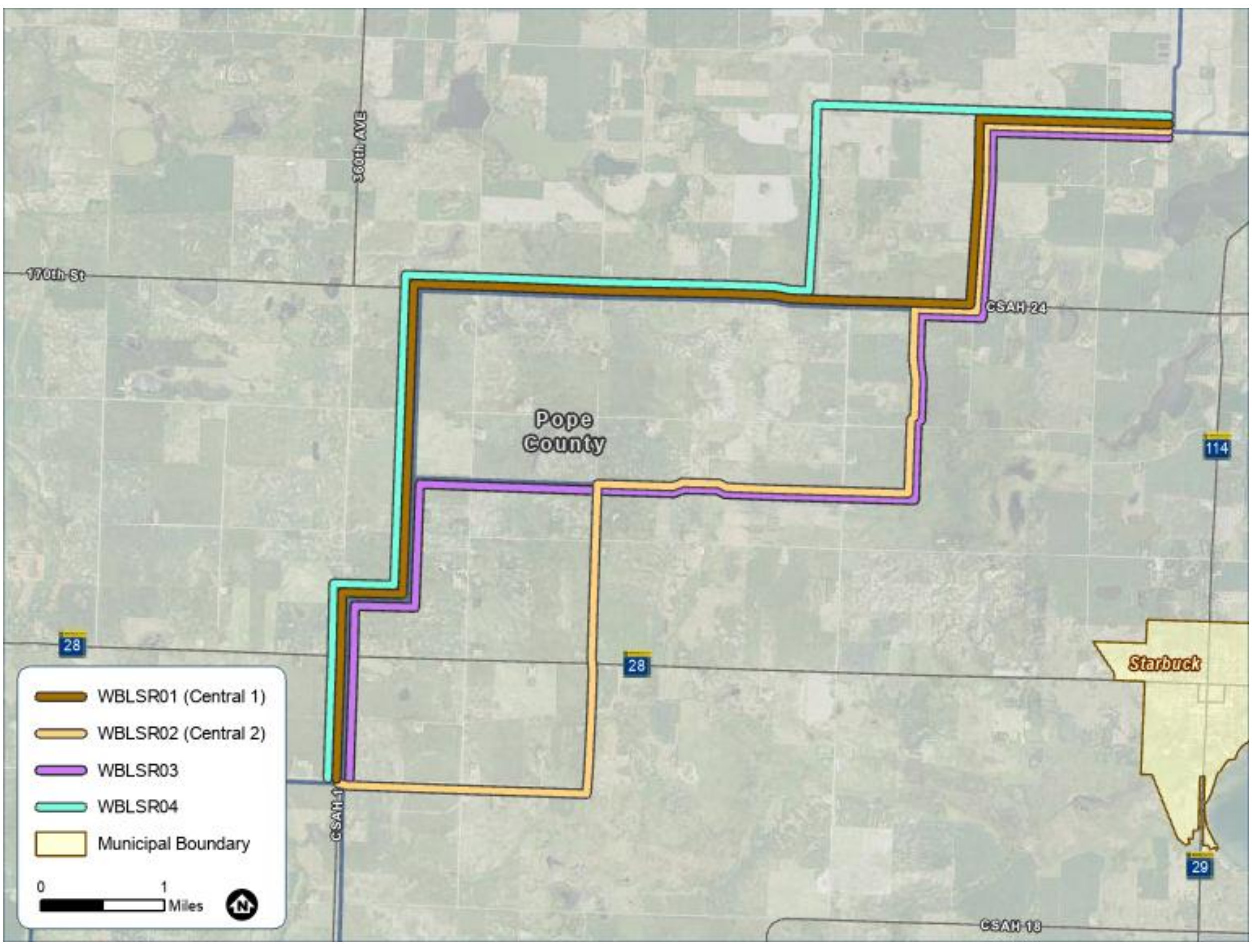


Table 6-34 White Bear Lake Subregion Routes

Routing Alternative	Subregion	Type	Description
WBLSR01	White Bear Lake	Route	Follows the applicants' proposed Central 1.
WBLSR02	White Bear Lake	Route	Follows the applicants' proposed Central 2.
WBLSR03	White Bear Lake	Route	Follows the applicants' proposed Central 1, then crosses to the applicants' proposed Central 2 using route connector C11.
WBLSR04	White Bear Lake	Route	Follows the applicants' proposed Central 1, then follows route connector C101 to connect back to the applicants' proposed Central 1 and 2.

6.4.1 Use or Paralleling of Existing Rights-of-Way

The use and paralleling of existing ROW is considered by the Commission when determining the most appropriate route for the project. Opportunities for ROW sharing for the project include public roads, existing transmission lines, and railroads.

Paralleling and/or sharing other types of existing ROW would have an incremental impact relative to existing horizontal elements, such as existing transmission lines, highways and county roads, and/or railroads (collectively referred to as "existing infrastructure"). In some cases, portions of a route could parallel ROW with more than one of these existing features at the same time (e.g., be sharing or paralleling transmission line and road ROW). Map 7-7 and Map 7-8 illustrates where ROW paralleling occurs and shows existing infrastructure.

As shown in Figure 6- and Table 6-35, WBLSR01 and WBLSR03 are both 12 miles long, and WBLSR02 and WBLSR04 are both 12.1 miles long. WBLSR01, WBLSR02, and WBLSR04 all follow existing ROW for more than 50 percent of their lengths. WBLSR01 follows existing ROW for the largest percentage of its length (62.4 percent), and WBLSR03 follows existing ROW for the smallest percentage of its length (29.1 percent).

Figure 6-21 White Bear Lake Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

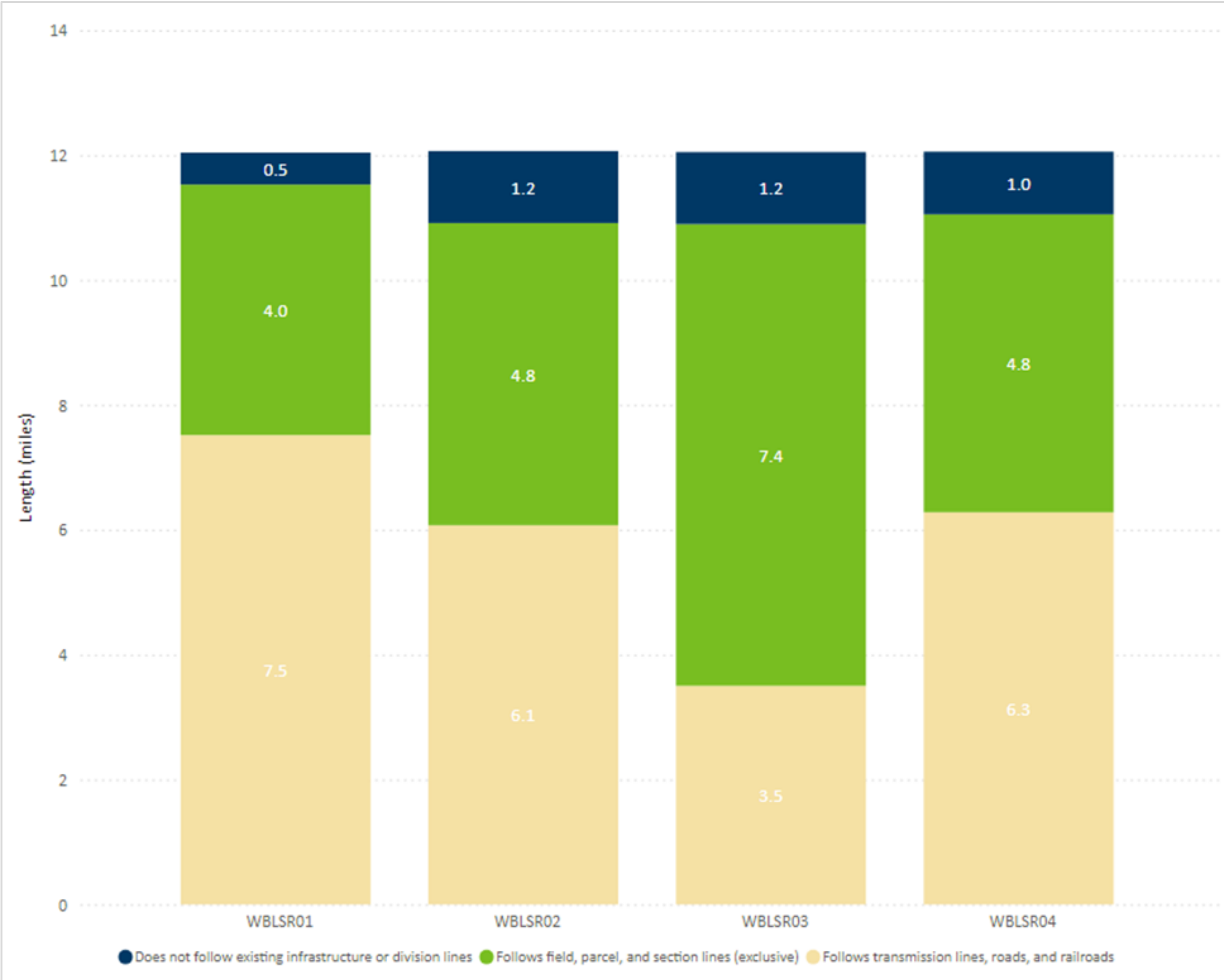


Table 6-35 White Bear Lake Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

		Follows existing transmission lines		Follows existing roads		Follows existing infrastructure (transmission lines, roads, and railroads)		Follows field, parcel, and section lines	
	Total Length (mi)	Length (mi)	%	Length (mi)	%	Length (mi)	%	Length (mi)	%
WBLSR01	12.0	0.0	0.0	7.5	62.4	7.5	62.4	11.5	95.8
WBLSR02	12.1	0.0	0.0	6.1	50.3	6.1	50.3	10.9	90.4
WBLSR03	12.0	0.0	0.0	3.5	29.1	3.5	29.1	10.9	90.4
WBLSR04	12.1	0.0	0.0	6.3	52.1	6.3	52.1	11.1	91.7

6.4.2 Human Settlement

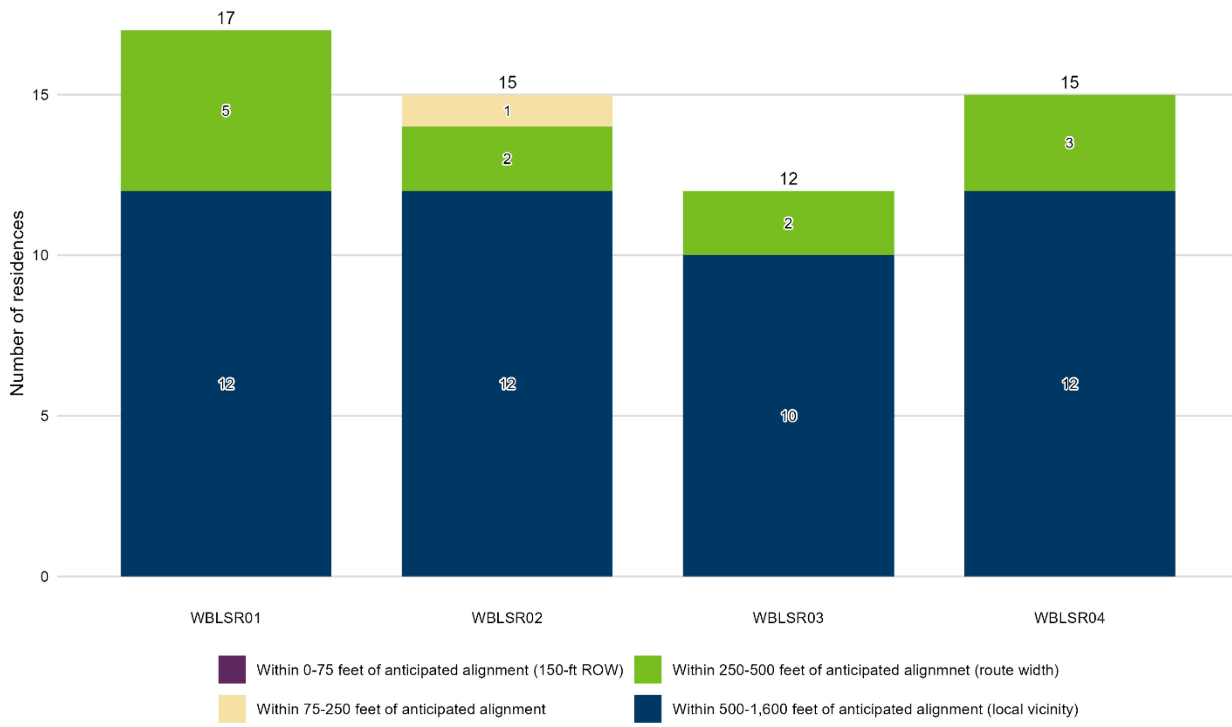
6.4.2.1 Aesthetics

The ROI for aesthetics is the local vicinity. Transmission lines alter a viewshed (Section 4.3.1). Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes. Determining the relative scenic value or visual importance in any given area is subjective and depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question.

Aesthetic impacts can be minimized by selecting routes farther from homes, schools, businesses, and other places where people congregate such as recreational areas. Aesthetic impacts can also be minimized by following existing transmission line ROW where elements of the built environment already define the viewshed and the addition of a transmission line would have an incremental impact. Following other infrastructure, such as roads and railroads, would also be expected to reduce potential impacts but not to the same extent. Additional details regarding potential impacts to aesthetics and potential mitigation measures for the project as a whole are provided in Section 4.3.1.

Appendix F shows human settlement features such as residences and nursing homes in the local vicinity of the routes in the White Bear Lake Subregion. The proximity of residential structures (homes) and non-residential structures to routes at various distances is shown in Figure 6- and Table 6-36, respectively. WBLSR03 has the fewest residences (12) in the ROI, however, a comparable number of residences are present in many routes as shown in Figure 6-. WBLSR03 also has the least non-residential structures (73). WBLSR01 has the most residences (17) and non-residential structures (105) within the local vicinity.

Figure 6-22 White Bear Lake Subregion, Proximity of Residential Structures



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

Table 6-36 White Bear Lake Subregion, Proximity of Non-Residential Structures

Non-Residential Structures	Routes			
Distances from Anticipated Alignment	WBLSR01	WBLSR02	WBLSR03	WBLSR04
0-75 feet (150-foot-ROW)	0	0	0	0
75-250 feet	4	2	1	3
250-500 feet (generally route width)	16	26	11	6
500-1,600 feet (local vicinity)	85	73	61	82
Total	105	101	73	91

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

Recreational resources where people might congregate identified within the ROI include West Central Trail Blazer snowmobile trails (Map 10-7; Section 4.7.8.1) and the New Prairie and White Bear WMAs (Map 18-7; Section 4.7.8.1). Recreational resources are defined and discussed for the project as a whole in Section 4.3.9. The snowmobile trail crosses WBLSR02 and WBLSR03 running west and east from the city of Cyrus up to State Highway 28. No length of this trail runs in parallel with the routes. Aesthetic impacts to snowmobile trails in are expected to be minimal due to the limited length of trail within the

ROI (approximately 3,200 feet for all routes). All routes, WBLSR01 through WBLSR04, have one snowmobile trail crossing.

The only major waterbody that would be crossed in the White Bear Lake Subregion is the Little Chippewa River, which intersects all routing options. WBLSR02 and WBLSR03 cross the Little Chippewa at a point where there is little existing vegetation. Where WBLSR01 and WBLSR04 cross the Little Chippewa, there is also little existing vegetation. Thus, minimal vegetation clearing would be required to cross the river in any of these locations, causing minimal aesthetic impacts.

Aesthetic impacts will be greater in areas where no existing linear infrastructure, such as other transmission lines or railroads, are present. There are no existing transmission lines or railroads in the White Bear Lake Subregion. Section 6.4.1 has further discussion on the use or paralleling of existing ROW for each route in the White Bear Lake Subregion.

Each route would parallel existing infrastructure or division lines as shown in Map 7-7 and Map 7-8. These maps illustrate existing infrastructure and division lines in the region, including roads, railroads, transmission lines, and parcel lines. In some cases, portions of a route could parallel ROW with more than one of these existing features at the same time. Table 6-35 quantifies the length and percentage of each type of paralleling for each route in the White Bear Lake Subregion. Figure 6-21 demonstrates the same information in a chart based on length.

All routes are relatively similar in the percentage of parallelling with all types of existing infrastructure and all routes have similar total lengths (12 miles). WBLSR01 parallels the most with approximately 96 percent (11.5 miles) of its length. WBLSR02 and WBLSR03 parallel the least existing infrastructure with approximately 90 percent (11 miles) of their lengths each. Aesthetics are minimized by paralleling with existing transmission line ROW rather than all types of existing ROW, which includes roads and parcel lines. There are no existing transmission lines to parallel in the White Bear Lake Subregion. Aesthetic impacts are minimal along all routes as they completely parallel with existing infrastructure.

There are no areas or residences in the White Bear Lake Subregion that would be boxed in by existing transmission lines and a portion of a proposed line. There are also no areas or residences that would be in a pinch point between existing transmission lines and a portion of a proposed line.

6.4.2.2 Cultural Values

An assessment of potential impacts to cultural values is discussed for the entire project in Section 4.3.2. The impact assessment was completed for the project as a whole because there is limited variability in cultural values across the routing alternatives. Impacts to cultural values are independent of the route selected.

6.4.2.3 Displacement

There are no residences or non-residential structures within the ROW for the routes within the White Bear Lake Subregion. An overview regarding displacement, the general impacts from construction and operation of the project, and ways to avoid, minimize, and mitigate these impacts are in Section 4.3.3.

6.4.2.4 Environmental Justice

No EJ areas were identified in the White Bear Lake Subregion routes. An impact assessment on environmental justice is discussed for the entire project in Section 4.3.5.

6.4.2.5 Land Use and Zoning

An assessment of potential impacts to land use and zoning is discussed in Section 4.3.6. The impact assessment for land use and zoning was completed for the project as a whole because there is limited variability in zoning impacts among the routing alternatives.

6.4.2.6 Noise

An assessment of potential impacts from noise is discussed for the entire project in Section 4.3.7. The impact assessment for noise was completed for the project as a whole because there is limited variability in the potential for noise across the routing alternatives.

6.4.2.7 Property Values

An assessment of potential impacts to property values is discussed for the entire project in Section 4.3.8. The impact assessment for property values was completed for the project as a whole because there is limited variability in the potential for property value impacts across the routing alternatives and changes to a specific property's value are difficult to predict. Potential impacts would be minimized by minimizing aesthetic impacts; aesthetic impacts are analyzed by subregion in Chapters 5 through 7.

6.4.2.8 Recreation

The ROI for recreation is the route width. Intermittent and localized indirect impacts could occur during construction (for example – increased noise levels); long-term impacts during operation could occur in the form of aesthetic impacts (Section 4.3.1.2). Given that direct long-term effects are predominantly related to aesthetics, the indirect long-term repercussions on recreation are anticipated to be subjective, meaning that responses would vary based on individual perspectives and experiences. Impacts to recreation are assessed through identification of recreational resources within the ROI. The project is not anticipated to directly impede recreational activities within the ROI such as snowmobiling, golfing, canoeing, hunting, or fishing. Additional details regarding potential impacts to recreation and potential mitigation measures for the project is provided in Section 4.3.9.

Routes in the White Bear Lake Subregion do not cross any land-based public trails, state water trails, wild and scenic rivers, or scenic byways.

Snowmobile trails referred to as the West Central Trail Blazer Trails are present in the White Bear Lake Subregion (Map 10-7-Map 10-8). All routes have one snowmobile crossing and 0.2 miles of linear distance within their ROIs.

Public lands, including Wildlife Management Areas and Waterfowl Production Areas, in the White Bear Lake Subregion are publicly accessible and can be used for recreational purposes. These public lands are also used for wildlife management and are discussed in Section 6.4.6.8.

6.4.2.9 Socioeconomics

An assessment of potential impacts to socioeconomics is discussed for the entire project in Section 4.3.10 because there is limited variability in socioeconomic impacts among the routing alternatives.

6.4.2.10 Transportation and Public Services

An assessment of potential impacts to transportation and public services, including roadways, railroads, emergency services, airports, and utilities, is discussed for the entire project in Section 4.3.11. The impact assessment for transportation and public services was not analyzed at the subregional level because there is limited variability across the routing alternatives.

6.4.3 Human Health and Safety

An assessment of potential impacts to human health and safety is discussed for the entire project in Section 4.4. The impact assessment was completed for the project as a whole because there is limited variability across the routing alternatives and impacts would be minimized by prudent routing and adhering to applicable transmission line standards and codes.

6.4.4 Land-based Economies

Impacts to land-based economies are assessed by considering four elements: agriculture, forestry, mining, and tourism. Impacts and mitigation related to land-based economies are analyzed for the project as a whole in Section 4.5. The primary land-based economic activity in the project area is agriculture. The primary means of mitigating impacts to land-based economies is prudent routing; that is, by choosing routing alternatives that avoid such economies.

6.4.4.1 Agriculture

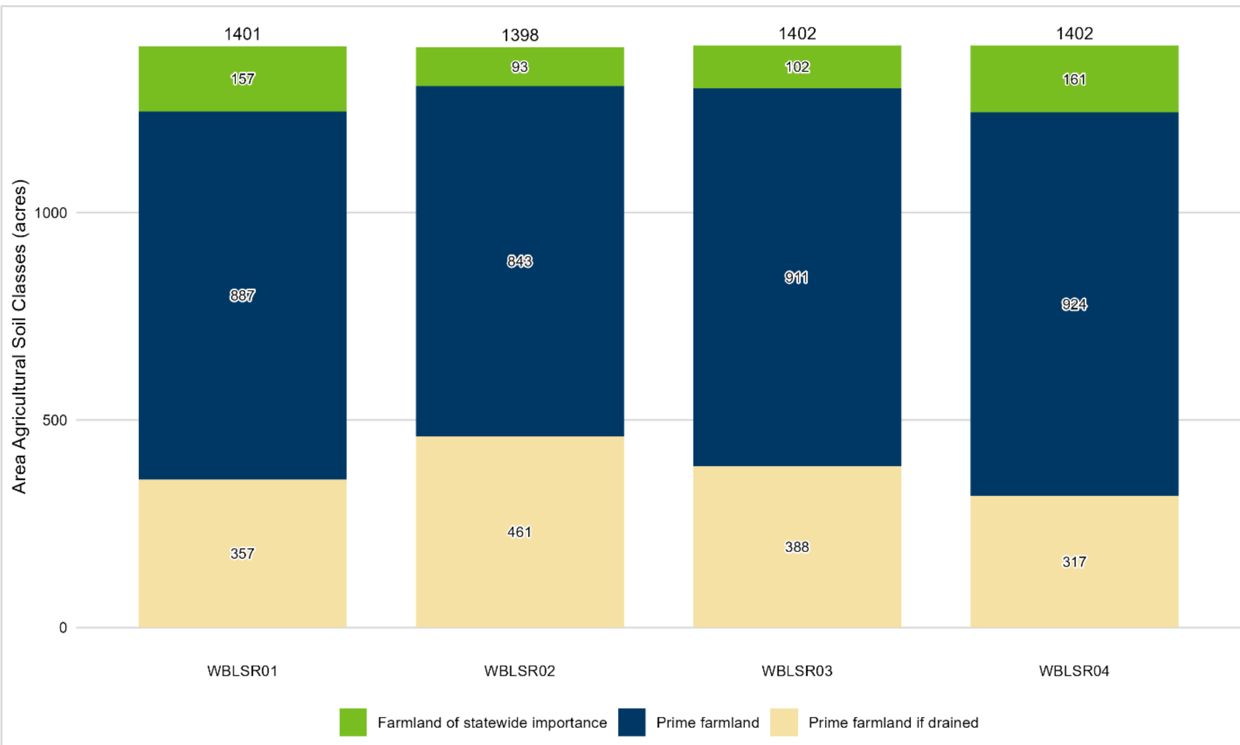
The ROI for agriculture is the route width. Construction and operation of a transmission line impacts agriculture (Section 4.5.1.2). During construction, impacts would include the limited use of fields or certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Permanent impacts would also occur when the footprint of the transmission line structures directly impedes agricultural production and/or impedes efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields.

Prudent routing (paralleling existing infrastructure and/or paralleling division lines) could minimize potential impacts. Implementation of the AIMP (Appendix K) would minimize and mitigate impacts to agriculture. Additional details regarding potential impacts to agriculture and potential mitigation measures is provided in Section 4.5.1.

Figure 6-23 summarizes the total acres within the route widths of the White Bear Lake Subregion routes that have designated soil classifications for prime farmland and farmland of statewide importance. Figure 6-24 summarizes the total acres within the route widths of the White Bear Lake Subregion routes that are designated agricultural land use. Most land (80 percent or more) within the ROI of the routing alternatives in the White Bear Lake Subregion is designated as agricultural land use (cultivated crops and hay/pasture; see Section 6.4.2.5). WBLSR04 has the most prime farmland. WBLSR02 has the least prime farmland. WBLSR03 has the most agricultural land. WBLSR01 has the least agricultural land.

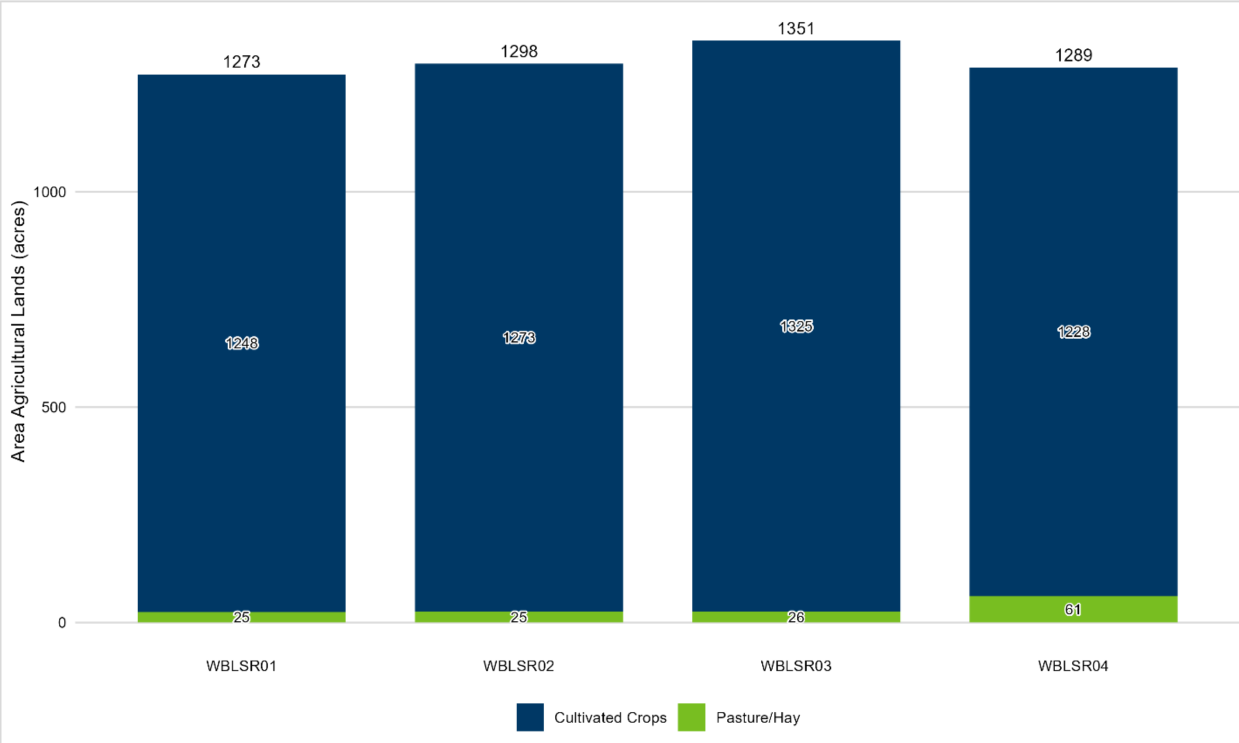
Routing with existing infrastructure or division lines, such as parcel or agricultural fields, would reduce impacts to agriculture. As noted in Table 6-35, WBLSR01 parallels the most existing infrastructure (62 percent of its total length) while WBLSR03 parallels the least amount (29 percent). WBLSR02 and WBLSR03 have the greatest distance that does not follow existing infrastructure or division lines at 1.2 miles, while WBLSB01 has 0.5 miles that does not follow existing infrastructure or division lines (Figure 6-21).

Figure 6-23 White Bear Lake Subregion, Prime Farmland within Route Widths



Source: Prime farmland/farmland of statewide importance, SSURGO (Appendix D)
Not all prime farmland is farmed.

Figure 6-24 White Bear Lake Subregion, Acres of Agricultural Lands within Route Width



Source: Agricultural land, NLCD (Appendix D)

Center pivot irrigation systems present in the White Bear Lake Subregion are shown on Map 13-7.

While not crossed by its anticipated alignment, there is one pivot irrigation system within the route width of WBLSR02. The anticipated alignment avoids impacts to the center pivot irrigation systems because it parallels 340th Avenue and does not cross into the agricultural field (Map 13-7). No other center pivot irrigation systems are present within the White Bear Lake Subregion.

The RIM/CREP program provides financial incentives to farmers to remove land from production (Section 4.7.6). Farmers within the route widths of the routes in the White Bear Lake Subregion participate within the CREP and RIM programs (Section 6.4.6.6); however, no anticipated alignment in this subregion crosses an easement area. If one of these routes are permitted, it is anticipated the easement could be avoided during final design. Additional discussion regarding the potential to avoid the easement areas is provided in Section 6.4.6.6. Impacts can be mitigated by compensating individual landowners through negotiated easement agreements.

6.4.4.2 Forestry

Potential impacts to forestry are discussed for the entire project in Section 4.5.2. Impacts to forestry are anticipated to be negligible to minimal and independent of the route selected.

6.4.4.3 Mining

No active aggregate mines were identified within the route width for the White Bear Lake Subregion. Potential impacts to mining are discussed for the entire project in Section 4.5.3.

6.4.4.4 Tourism

Potential impacts to tourism are discussed for the entire project in Section 4.5.4. Impacts to tourism are anticipated to be negligible to minimal and independent of the route selected.

6.4.5 Archaeological and Historic Resources

The ROI for archaeological sites and historic cemeteries is the route width. The ROI for historic resources is the 1600-foot buffer on either side of the anticipated alignment, which accounts for resources outside of the route width but within visual range of the project.

The analysis of impacts to archaeological and historic resources takes NRHP eligibility into account. Pursuant to state (Minnesota Statutes § 138.661 to 138.669) and federal law (36 CFR 800), only resources that are eligible, listed, or unevaluated for the NRHP have the potential to be adversely affected by the project. For additional information regarding NRHP eligibility, see Section 4.6.1.

Impacts to archaeological and historic resources could result from construction activities such as ROW clearing, placement of structures, the construction of access roads, temporary construction areas, and vehicle and equipment operation (Section 4.6.2). Impacts could also result from the removal of historic buildings or structures, or if the project is near or within view of a resource (typically a historic building, structure, or TCP). Additional details concerning potential impacts and mitigation regarding archaeological and historic resources for the project as a whole are provided in Section 4.6.3.

Documented archaeological and historic resources within the White Bear Lake Subregion are summarized Table 6-37 and Table 6-38. Table 6-37 summarizes the number of archaeological and historic resources within the ROI (which is the route width for archaeological sites and historic cemeteries, and a 1600-foot buffer on either side of the anticipated alignment for historic architecture). Table 6-38 provides descriptions of the resources located within the ROIs.

Additional cultural resources may be in the ROIs; reconnaissance survey and evaluation would be necessary to determine whether any other significant archaeological and/or historic resources are present and could be impacted by project activities. If a route permit is issued, the applicants would coordinate with landowners to proceed with these surveys in the permitted route and surrounding areas to include access roads and other areas of potential ground disturbances.

Table 6-37 White Bear Lake Subregion, Cultural Resource counts within Route's ROI

Route	Archaeological Sites				Historic Architecture				Historic Cemeteries
	Not Eligible	Unevaluated	Eligible or Listed	Total	Not Eligible	Unevaluated	Eligible or Listed	Total	
WBLSR01	0	0	0	**0**	1	0	0	**1**	0
WBLSR02	0	0	0	**0**	1	0	0	**1**	0
WBLSR03	0	0	0	**0**	1	0	0	**1**	0
WBLSR04	0	0	0	**0**	1	0	0	**1**	0

Table 6-38 White Bear Lake Subregion, Descriptions of Cultural Resources within Route's ROI

Route	Site/Resource Number	Resource Type	Resource Name/Type	NRHP Status	Description
WBLSR01, WBLSR02, WBLSR03, WBLSR04	XX-ROD-00171	Historic Architecture	Trunk Highway 28	Not Eligible	Active Trunk Highway 28

6.4.5.1 Archaeological Resources

There are no documented archaeological resources in the ROI within the White Bear Lake Subregion; therefore, none of the routes have the potential to impact known archaeological sites. However, a lack of previously documented archaeological sites does not mean that the area is devoid of resources. Rather, it indicates that a professional archaeological survey has not occurred in any of the proposed routes. A Phase I archaeological investigation would be necessary to determine whether significant archaeological sites are present and have the potential to be impacted by project activities.

6.4.5.2 Historic Resources

One historic resource intersects the ROI for each of the routes within the White Bear Lake Subregion, consisting of XX-ROD-00171/Trunk Highway 28, which has been determined not eligible for the NRHP.

Because this resource was determined not eligible for listing on the NRHP, it is not considered a significant historic property. Therefore, impacts to significant historic architectural resources are not anticipated in the White Bear Lake Subregion. However, a lack of previously documented historic resources does not mean that the area is devoid of these resources. Rather, it indicates that a professional survey has not occurred for any of the proposed routes. A Phase I historic architectural investigation would be necessary to determine whether significant historic resources are present and have the potential to be impacted by project activities.

6.4.5.3 Historic Cemeteries

There are no documented historic cemeteries within the White Bear Lake Subregion ROIs.

6.4.6 Natural Environment

Electric infrastructure, such as transmission lines, can impact the natural environment. The Commission must consider effects on the natural environment when designating transmission lines routes and making a decision on a route permit. Impacts are dependent upon many factors, such as how the project is designed, constructed, and maintained. Other factors, such as the environmental setting, influence potential impacts.

6.4.6.1 Air Quality

An assessment of potential impacts to air quality is discussed for the entire project in Section 4.7.1. The impact assessment for air quality was not analyzed at the subregional level because impacts are anticipated to largely be independent of the route selected.

6.4.6.2 Climate Change

An assessment of potential impacts from climate change is discussed for the entire project in Section 4.7.2. The impact assessment for climate change was completed for the project as a whole because there is limited variability in the potential for climate change across the routing alternatives.

6.4.6.3 Greenhouse Gases

An assessment of potential impacts from greenhouse gases is discussed for the entire project in Section 4.7.3. The impact assessment for greenhouse gases was completed for the project as a whole because there is limited variability in the potential for greenhouse gases across the routing alternatives.

6.4.6.4 Geology and Topography

An assessment of potential impacts to geology and topography is discussed for the entire project in Section 4.7.3. The impact assessment for geology and topography was not analyzed at the regional level because impacts are anticipated to largely be independent of the route selected.

6.4.6.5 Groundwater

An assessment of potential impacts to groundwater is discussed for the entire project in Section 4.7.5. The impact assessment for groundwater was not analyzed at the subregional level because impacts are anticipated to largely be independent of the route selected.

6.4.6.6 Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands often involve unique resources intended for protection and/or preservation and would be subject to short and long-term impacts depending upon their use (Section 4.7.6.2). Public and designated lands within the ROI are first identified and then further reviewed to better understand potential impacts such as vegetation clearing. Occupying public and designated lands would require coordination with the landowner (Section 4.7.6.3).

Public land and designated lands with existing easements or covenants located within the route widths and rights-of-way of routes in the White Bear Lake Subregion are summarized in Table 6-39 and shown in Map 10-7 and Map 10-8, Map 15-7 and Map 15-8, and Map 18-7 and Map 18-8.

There are no national wildlife refuges in the ROI of the White Bear Lake Subregion. State public lands in the White Bear Lake Subregion ROI include the New Prairie WMA and the White Bear WMA. Federal public lands in the White Bear Lake Subregion ROI include several WPAs.

WMAs owned and managed by the DNR are within the ROI of all routes in the White Bear Lake Subregion. The New Prairie WMA is within the ROI of WBLSR01 and WBLSR04. The New Prairie WMA contains grasslands, an ecosystem that is typically managed with prescribed burns (reference (233)). The anticipated alignments of WBLSR01 and WBLSR04 would not cross the New Prairie WMA. The routes parallel an existing road ROW, across the road from the New Prairie WMA. Impacts to the state's ability to manage the New Prairie WMA are not anticipated, but burn locations would need to be coordinated with wind direction, to ensure that smoke buildup is not blown across the road towards the transmission line. Construction activities in this area could temporarily impact public enjoyment of the New Prairie WMA, and the visibility of transmission line structures could create long-term impacts to public enjoyment of the New Prairie WMA. WBLSR02 and WBLSR03 would not impact the New Prairie WMA.

The White Bear WMA is within the ROI of all routes in the White Bear Lake Subregion. The White Bear WMA contains grasslands and prairie, ecosystems that are typically managed with prescribed burns (reference (234)). The anticipated alignments of WBLSR01, WBLSR02, and WBLSR03 would not intersect the White Bear WMA because they parallel the eastern edge. Given the close proximity of WBLSR01, WBLSR02, and WBLSR03 to the White Bear WMA, prescribed burns in this area could be constrained, potentially impacting the state's ability to manage this land. WBLSR04 would cross the western edge of the White Bear WMA for a length of 1,320 feet; impacts would include vegetation clearing in the ROW and wildlife as analyzed in Section 3.3.1. A transmission line structure may be necessary along the edge of the White Bear WMA, as the crossing distance is greater than 1,000 feet wide. Prescribed burns in the area crossed by WBLSR04 would also be constrained given the proximity of the route, thus impacts to the state's ability to manage the White Bear WMA are anticipated if WBLSR04 is selected. Construction activities in this area could temporarily impact public enjoyment of the White Bear WMA, and the visibility of transmission line structures could create long-term impacts to public enjoyment of the White Bear WMA. Due to its anticipated alignment, which crosses the White Bear WMA, WBLSR04 would have greater temporary and long-term impacts to public enjoyment of the White Bear WMA compared to WBLSR01, WBLSR02, and WBLSR03.

WPAs owned and managed by USFWS are within the ROI of all routes in the White Bear Lake Subregion. No routes would cross WPAs, and vegetation clearing is not anticipated. Construction activities could temporarily impact public enjoyment of the WPAs, and the visibility of transmission line structures could create long-term impacts to public enjoyment of WPAs. WBLSR04 would have greater temporary and long-term impacts to public enjoyment of WPAs compared to WBLSR01, WBLSR02, and WBLSR03, as WBLSR04 runs parallel to a larger WPA.

Two conservation easement programs, CREP and RIM reserve program, have lands in the White Bear Lake Subregion ROI (Map 15-7 and Map 15-8). The applicants intend to avoid conservation easements to the greatest extent practicable.

There are 5 acres of one riparian CREP easement within the ROI of WBLSR02 and WBLSR03. The CREP easement is not crossed by the anticipated alignments and associated ROWs of WBLSR02 and WBLSR03, thus it is anticipated to be avoided during final design. Impacts to the CREP easement are not anticipated. WBLSR01 and WBLSR04 avoid CREP land entirely.

There are 5 acres of one perpetual marginal cropland RIM easement with the ROI of WBLSR02 and WBLSR03. In their scoping comments, the property owner of this RIM easement raised concerns that the restored Oak Savanna and riparian lowland within the RIM easement would be negatively impacted by WBLSR02 or WBLSR03. WBLSR02 and WBLSR03 would run near the northern edge of the public commenter's property, however, the anticipated alignment and associated ROWs of WBLSR02 and WBLSR03 would not intersect the easement, and the RIM easement is anticipated to be avoided during final design ((comment #25 and #78 reference (2)). Thus, no impacts to the RIM easement from vegetation clearing for installation and maintenance of the transmission line or the creation of temporary access roads would occur. WBLSR01 and WBLSR04 avoid RIM land entirely.

Table 6-39 White Bear Lake Subregion, Public and Designated Lands within Route Width and ROW

Public and Designated Land Type	Unit	Routes			
		WBLSR01	WBLSR02	WBLSR03	WBLSR04
Waterfowl Production Areas	Acres in ROW (route width)	<1 (<1)	<1 (<1)	<1 (<1)	<1 (13)
Wildlife Management Areas	Acres in ROW (route width)	1 (7)	1 (7)	1 (7)	3 (16)
Conservation Reserve Enhancement Program (CREP)	Acres in ROW (route width)	0 (0)	0 (10)	0 (10)	0 (0)
Reinvest in Minnesota (RIM) Reserve Partnership Easement	Acres in ROW (route width)	0 (0)	0 (5)	0 (5)	0 (0)

6.4.6.7 Vegetation

The ROI for vegetation is the ROW. Potential construction and operation-related impacts to vegetation for the project as a whole are discussed in Section 4.7.7. Potential long-term impacts on vegetation would occur where structures are located or where conversion of forested vegetation to low-growing vegetation would be required. Impacts would be localized, and unavoidable. Impacts to vegetation are primarily evaluated by examining vegetative landcover types within the ROW of each routing option. Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation, as described in Section 4.7.7.

Map 11-7 and Map 11-8 provide an overview of landcover types across the White Bear Lake Subregion, and Table 6-40 summarizes the landcover types within the ROW of each route in the White Bear Lake Subregion. Agricultural vegetation, particularly cultivated cropland, represents the dominant vegetative landcover type within the ROI of all of the routes. Other sizable land cover types in the route ROIs include herbaceous wetland and low intensity development or open space. Minimal amounts of pasture/hay land are present, and no areas of open water are present among the routes.

Forested land is the vegetation that would be impacted the most by ROW clearing. Removal of woody vegetation will result in conversion to low-stature vegetation (shrubs and grasses) throughout the ROW area. The ROW would be maintained with low-growing vegetation during operations to minimize potential interference with the transmission line. Conversion of wooded landscapes to open landscapes could indirectly affect native vegetation by potentially increasing the spread of invasive and non-native species, which could permanently alter ecosystem functions. Co-locating the route with existing infrastructure right-of-way, for example, roadways or transmission lines, might limit tree removal. Use or paralleling of existing ROWs is discussed in Section 6.4.1 for the White Bear Lake Subregion.

A public commenter with property in the White Bear Lake Subregion brought forward concerns that the Oak Savanna managed with BWSR on their property as part of the RIM reserve easement program would be negatively impacted by WBLSR02 or WBLSR03 (comments #25 and #78 reference (2)). The RIM reserve program compensates landowners for granting conservation easements and establishing native vegetation habitat on lands that enter into terms with an easement contract; these lands are subject to prohibited actions and landowner agreements established in state statute (reference (170)) (reference (163)). Transmission infrastructure within these lands could violate RIM reserve program requirements and terminate the contract, resulting in significant impacts. WBLSR02 and WBLSR03 would run near the northern edge of the public commenter's property, however, the anticipated alignment would not intersect the easement. Thus, no impacts from vegetation clearing would occur. The commenter noted that the presence of the transmission line alone would still impact wildlife attracted to this property and habitat establishment on this property, general impacts of which are discussed in Sections 6.4.6.5 and 6.4.6.10.

Land cover in the route ROWs considered forested land includes deciduous forest, with only 0.3 acres present in WBLSR02. No other routes in the White Bear Lake Subregion have forested land cover. Although selecting any route other than WBLSR02 would minimize impacts to forested vegetation, given the small amount of forested vegetation in the ROW for all of the routes, impacts are anticipated to be minimal for all routes in the White Bear Lake Subregion. Potential impacts to agricultural vegetation and wetlands are discussed Section 6.4.4.1 and Section 6.4.6.12, respectively.

Table 6-40 White Bear Lake Subregion, Landcover Types in the ROW

Landcover Data	Unit	WBLSR01	WBLSR02	WBLSR03	WBLSR04
Area Within ROW	Acres	219.2	219.6	219.3	219.5
Cultivated Crops	Acres (percentages)	131.3 (59.9)	154.0 (70.1)	175.6 (80.1)	135.1 (61.6)
Deciduous Forest	Acres (percentages)		0.3 (0.1)		
Developed, Low Intensity	Acres (percentages)	23.1 (10.5)	4.2 (1.9)	5 (2.3)	17.0 (7.7)
Developed, Open Space	Acres (percentages)	62.0 (28.3)	55.7 (25.4)	31.2 (14.2)	58.6 (26.7)
Emergent Herbaceous Wetlands	Acres (percentages)	1.9 (0.9)	2.8 (1.3)	4.4 (2.0)	3.4 (1.5)
Open Water	Acres (percentages)	0.4 (0.2)		0.4 (0.2)	0.4 (0.2)
Pasture/Hay	Acres (percentages)	0.5 (0.2)	2.7 (1.2)	2.7 (1.2)	5.0 (2.3)

6.4.6.8 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. Potential construction and operation-related impacts to wildlife and wildlife habitat are discussed in Section 4.7.8. Potential short-term, localized impacts could occur from displacement, injury, or mortality during construction or maintenance activities. Potential long-term

impacts could occur as a result of habitat loss, conversion, or fragmentation. Impacts to wildlife and wildlife habitat are assessed both by considering wildlife inhabiting the ROI as well as assessing the presence of potential habitat for wildlife within the ROI. Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife and wildlife habitat, as described in Section 4.7.8.

Map 18-7 and Map 18-8 provide an overview of resources across the White Bear Lake Subregion and Table 6-41 summarizes the wildlife resources within the route width of each. Designated wildlife habitat within the White Bear Lake Subregion ROI includes GBCAs, WPAs, and WMAs. Wildlife Action Network corridors ranging from "Low" rank to "Medium" rank are present throughout the White Bear Lake Subregion ROI.

WPAs are within the local vicinity and route width of all routes in the White Bear Lake Subregion; however, the anticipated alignments of all routes avoid crossing WPAs (Map 18-7 and Map 18-8). WBLSR02 has four WPAs within its local vicinity, intersecting the greatest combined acreage, compared to the local vicinities of WBLSR01, WBLSR03, and WBLSR04, which all intersect three WPAs. The route width of WBLSR04 intersects the most acres of WPAs. The anticipated alignment of WBLSR04 would parallel an existing road ROW, across the road from a Pope County WPA. The anticipated alignments of WBLSR01, WBLSR02, and WBLSR03 would parallel an existing road ROW, across the road from the Gullickson North WPA access road. Establishment of new transmission line corridors near WPAs could increase potential impacts to flying waterfowl due to collision with conductors. Routes that intersect the most acres of WPAs within the route width (WBLSR04) or the local vicinity (WBLSR02) are expected to have greater potential impacts to flying waterfowl.

WMAs are within the route width and local vicinity of all routes in the White Bear Lake Subregion (Map 18-7). WBLSR04 intersects the most acres of WMAs and is the only route that would cross a WMA. The local vicinity and route width of all routes in the White Bear Lake Subregion intersect the White Bear WMA. The White Bear WMA contains a mixture of cover, including restored prairie, and is a good place to view wetlands birds (reference (234)). The anticipated alignment of WBLSR04 would cross the western edge of the White Bear WMA, an area that contains grasslands, emergent wetlands, and open water, parallelling an existing road ROW for a total crossing length of 1,320 feet. If WBLSR04 is selected, a transmission line structure may be necessary in the White Bear WMA, as the span needed is close to 1,400 feet, the maximum spanning distance for the project. If a single structure was constructed in the White Bear WMA, impacts could range from minimal to significant depending on consultation with the DNR. The anticipated alignments of WBLSR01, WBLSR02, and WBLSR03 would parallel an existing road ROW along the eastern edge of the White Bear WMA, an area that contains grasslands and scattered emergent wetlands. Although WBLSR01, WBLSR02, and WBLSR03 would not cross the White Bear WMA, the ROW of each route would extend into the White Bear WMA based on the anticipated alignment. Construction activities within the ROW could impact the habitat quality and resident wildlife of the White Bear WMA, and the establishment of new transmission line corridors within or near the White Bear WMA could increase potential impacts to flying birds. WBLSR04 is expected to have the greatest direct or indirect impact to habitat quality, wildlife, and flying birds within the White Bear WMA, as only WBLSR04 would cross this resource through an area containing a variety of habitat features.

The local vicinities and route widths of WBLSR01 and WBLSR04 intersect an equivalent acreage of two additional WMAs; however, neither route would cross these resources (Map 18-7). The Van Luik WMA contains emergent wetland, open water, and provides nesting and breeding habitat for ducks, geese, and nongame birds (reference (235)). The New Prairie WMA contains an open water basin surrounded by cattails and other emergent vegetation, a restored native grassland, and is managed for duck and pheasant production (reference (233)). The anticipated alignments of WBLSR01 and WBLSR04 would parallel an existing road ROW, south of the Van Luik WMA and across the road from the New Prairie WMA. Establishment of new transmission line corridors near these WMAs could increase potential impacts to flying birds due to collision with conductors. WBLSR01 and WBLSR04 intersect an equivalent acreage of these resources, and would have an equivalent potential impact to birds flying near these areas. WBLSR02 and WBLSR03 avoid the Van Luik WMA and New Prairie WMA entirely.

A GBCA is within the local vicinity of all routes in the White Bear Lake Subregion, and within the route width of WBLSR02 and WBLSR03 (Map 18-7). The route width of WBLSR02 would intersect more acres of the GBCA than the route width of WBLSR03. The anticipated alignments of WBLSR02 and WBLSR03 would cross the GBCA. Both WBLSR02 and WBLSR03 would establish new transmission line corridors in the GBCA; WBLSR03 would cross paralleling no existing infrastructure, while WBLSR02 would cross paralleling an existing road ROW for part of the crossing. Establishment of new transmission line corridors through this GBCA could increase potential impacts to flying birds; lower acreage indicates fewer impacts to birds flying in this area. Thus, WBLSR02, which intersects more acres of the GBCA, is expected to have a greater potential impact to flying birds compared to WBLSR03.

Wildlife Action Network corridors are within the route width and local vicinity of all routes in the White Bear Lake subregion, and the anticipated alignments of all routes would cross through these resources. Generally, lower acreage, lower number of crossings, and lower total crossing length indicate fewer impacts to corridors.

All routes would cross through a Medium-Low to Low rank Wildlife Action Network corridor when they cross the Little Chippewa River (Map 17-7). The area surrounding the Little Chippewa River crossing contain grasslands and scattered woods. WBLSR01 and WBLSR04 would cross the Little Chippewa River corridor paralleling an existing road ROW; impacts to wildlife and associated habitat would be minimized because the existing road has already fragmented riparian habitat in this area. WBLSR02 and WBLSR03 would cross the Little Chippewa River corridor paralleling no existing infrastructure; these routes would result in riparian habitat fragmentation in this area. A public commenter that owns property where WBLSR02 and WBLSR03 would cross the Little Chippewa River raised concerns that the flora and fauna in the area would be negatively impacted by WBLSR02 or WBLSR03 ((comment #25 and #78 reference (2)). The riparian habitat where WBLSR02 and WBLSR03 would cross the Little Chippewa River has not been fragmented by an infrastructure, while the riparian habitat where WBLSR01 and WBLSR04 has been fragmented by an existing road. Thus, WBLSR02 and WBLSR03 would have greater impacts on the flora and fauna in the area they would cross the Little Chippewa River compared to WBLSR01 and WBLSR04.

The routes in the White Bear Lake Subregion would parallel no existing transmission line ROW. Avian species traversing wildlife areas along new transmission line corridors could potentially experience increased impacts resulting from electrocution or collision with transmission line structures or conductors. As discussed in Section 4.7.8.3, avian impacts can be minimized through use of bird flight diverters.

The routes in the White Bear Lake Subregion would parallel some existing non-transmission line infrastructure rights-of-way such as roads, with WBLSR01 paralleling the most (62 percent of its length) and WBLSR03 paralleling the least (29 percent of its length). The greater length of each route that parallels existing infrastructure, the more impacts would minimize potential wildlife and habitat impacts associated with habitat fragmentation and/or edge effects because habitat fragmentation has already occurred in these areas.

Table 6-41 White Bear Lake Subregion, Wildlife Management and Conservation Areas within Route Width

Resource Area	Unit	Routes			
		WBLSR01	WBLSR02	WBLSR03	WBLSR04
Waterfowl Production Area	Acres	<1	<1	<1	13
Wildlife Management Area	Acres	20	7	7	29
Grassland Bird Conservation Areas	Acres	0	398	267	0
Wildlife Action Network corridors	Low Rank (Acres, Crossings, Length [mi])	1,064 3 10.3	1,097 3 9.4	1,076 3 10.4	1,145 3 10.3
	Medium-Low or Low Rank (Acres, Crossings, Length [mi])	40 1 0.2	21 1 0.1	17 1 0.1	40 1 0.2
	Medium Rank (Acres, Crossings, Length [mi])	0 0 0.0	9 1 <0.1	9 1 <0.1	0 0 0.0

6.4.6.9 Rare and Unique Natural Resources

Rare and unique natural resources encompass protected species and sensitive ecological resources. The ROI for protected species is the project area (one mile), and the ROI for sensitive ecological resources is the route width. Potential construction and operation-related impacts to protected species and sensitive ecological resources are discussed in Section 4.7.9.2. Potential direct or indirect impacts to protected species could occur should they be present within or near the ROW during construction or maintenance activities. While more mobile species would leave the area for nearby comparable habitats, non-mobile species, such as vascular plants or nesting birds, could be directly impacted. Construction activities also have the potential for direct impacts to sensitive ecological resources if they are present within the area subject to construction disturbance. Long-term impacts would involve permanent clearing of vegetation in areas identified as sensitive ecological resources which could indirectly impact any protected species associated with these habitats.

Impacts to protected species are evaluated by reviewing documented occurrences of these species within the ROI. Potential impacts to sensitive ecological resources, which could provide suitable habitat for protected species, are evaluated by assessing the presence of these resources within the ROI. Several measures that could be implemented to avoid, minimize, or mitigate impacts to protected species and sensitive ecological resources, including those provided in the DNR's Natural Heritage Review response (Appendix N), are described in Section 4.7.9.3.

Sensitive ecological resources within the White Bear Lake Subregion are shown on Map 15-7 and Map 15-8. To secure federally and state protected species from exploitation or destruction, documented locations of these species are not identified on maps.

6.4.6.9.1 Protected Species

According to the NHIS database, no state or federally protected species have been documented within one mile of any of the routes in the White Bear Lake Subregion. A few state special concern species have been documented within one mile of the routes in the White Bear Lake Subregion; records of state special concern species are summarized in Appendix N.

Formal protected species surveys have not been conducted for the project; as such, it is possible that additional protected species could be present where suitable habitat is available within the ROW or route width of the routes in the White Bear Lake Subregion. As part of project permitting, the applicants could be required to conduct field surveys for the potential presence of protected species; these surveys would occur prior to construction in coordination with the USFWS and/or DNR.

6.4.6.9.2 Sensitive Ecological Resources

The route widths and rights-of-way of all routes in the White Bear Lake Subregion would intersect sensitive ecological resources (Table 6-42; Map 15-7 and Map 15-8). The ROW and route width of all routes would intersect a Prairie Conservation Plan prairie corridor, WBLSR04 would also intersect a Prairie Conservation Plan strategic habitat complex. Given the extensive mapping of Prairie Conservation Plan prairie corridors and strategic habitat complexes in the White Bear Lake Subregion, all routes would require the placement of multiple structures within these areas. The route width and ROW of WBLSR02 would also intersect the edge of a Site of Biodiversity Significance ranked moderate in an area that may be too large to span (>1,000 feet), potentially requiring placement of a transmission line structure within it. The other routes in the White Bear Lake Subregion would avoid Sites of Biodiversity Significance.

Table 6-42 White Bear Lake Subregion, Sensitive Ecological Resources within the ROW and Route Width of Each Route

Resource	Units	WBLSR01	WBLSR02	WBLSR03	WBLSR04
Prairie Conservation Plan	Prairie Corridors (acres in ROW (route width))	177 (1,104)	170 (1,127)	177 (1,102)	168 (1,065)
	Strategic Habitat Complex (acres in ROW (route width))	0 (0)	0 (0)	0 (0)	16 (120)
	Total acres in ROW (route width)	177 (1,104)	170 (1,127)	177 (1,102)	184 (1,185)
Sites of Biodiversity Significance	Moderate rank (acres in ROW (route width))	0 (0)	2 (31)	0 (0)	0 (0)

6.4.6.10 Soils

The ROI for soils is the ROW. Common soil impacts include rutting, compaction, and erosion. Potential impacts would be short-term during construction, localized, and can be minimized. If long-term re-vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicants would obtain a NPDES/State Disposal System Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicles trips, and decompacting the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored a suitable location. Disturbed areas would be promptly seeded after construction. Additional details regarding potential impacts to soils and potential mitigation measures are provided in Section 4.7.10.

Map 20-7 and Map 20-8 show the surface soil textures across the subregion. Soil types within the ROW were reviewed to identify soil characteristics that could be more prone to impacts in some areas compared to others (Table 6-43). Less than one-third of soils within the ROW of the White Bear Lake Subregion routes are prone to compaction, susceptible to erosion, or have revegetation concerns. Nearly all soils within the ROW of the White Bear Lake Subregion routes have a moderate or severe rutting hazard rating. Generally, all of the routes within the White Ber Lake Subregion have similar soil characteristics. There is no route that is better suited to reduce the potential rutting, compaction, and erosion that could occur during construction.

Table 6-43 White Bear Lake Subregion, NRCS Mapped Soils within ROW

Soil Data	Units	WBLSR01	WBLSR02	WBLSR03	WBLSR04
Area within ROW	Acres	219	220	219	219
Compaction Prone[1]	Acres (Percentage)	62 (28)	41 (19)	37 (17)	65 (30)
Susceptible to Erosion Hazard[2]	Acres (Percentage)	29 (13)	16 (7)	23 (11)	29 (13)
Hydric Soils[3]	Acres (Percentage)	59 (27)	73 (33)	62 (28)	49 (22)
Revegetation Concerns[4]	Acres (Percentage)	44 (20)	36 (16)	36 (16)	43 (20)
Susceptible to Rutting Hazard[5]	Acres (Percentage)	219 (100)	220 (100)	219 (100)	219 (100)

[1] Soils considered to be Compaction Prone soils include those with a rating of "Medium" or higher.
[2] Soils considered susceptible to erosion hazard soils include those with a rating of “Medium”, “Severe”, or “Very Severe”.
[3] Hydric soil include hydric soils (100% hydric) and predominantly hydric soils (67-99% hydric).
[4] Soils considered to have revegetation concerns include soils with a non-irrigated land capability classification of 3 or greater.
[5] Soils considered susceptible to Rutting Hazard include those with a rating of "Moderate" or “Severe”.

6.4.6.11 Surface Water

The ROI for surface water is the route width. Direct impacts caused by structures placed in surface waters would be avoided by spanning the surface waters. Direct impacts to other resources can cause indirect impacts to surface waters. For example, construction activities near surface waters could cause riparian vegetation disturbance and surface erosion, which can lead to runoff impacting surface waters. Impacts to surface waters could be avoided by prudent routing, selecting the routes that cross the fewest watercourses or waterbodies and/or special or impaired waters.

Impacts would be mitigated by using BMPs. Crossing PWI waters would require a DNR license to cross public waters and work near special or impaired waters would require additional BMPs as detailed in the construction stormwater permit. Additional details regarding potential impacts to surface waters and potential mitigation measures, including those provided in the DNR’s Natural Heritage Review response (Appendix N), is provided in Section 4.7.11.

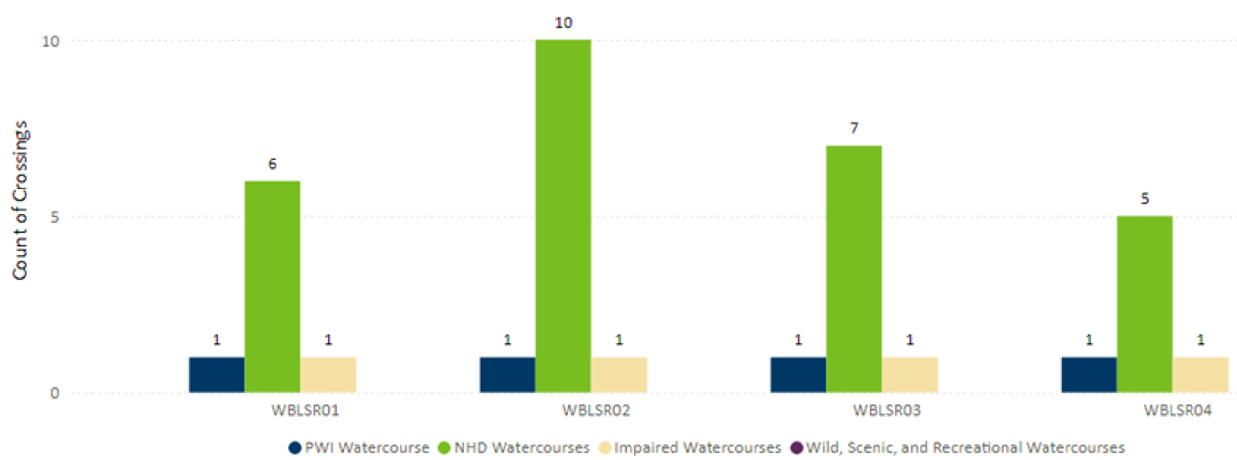
Map 14-7 and Map 14-8 show the waterbodies and watercourses across the region. There are no trout streams, state-designated outstanding resource value waters, or state wild and scenic rivers within the ROI of the White Bear Lake Subregion.

Each route in the White Bear Lake Subregion has one waterbody within the ROI, each of which are unnamed basins. All of the waterbodies present in each of the routes’ ROIs are designated as PWI basins. None of the routes have a waterbody crossing.

The routes have a total of between 5 and 10 watercourse crossings (Figure 6-25). WBLSR04 crosses the fewest watercourses while WBLSR02 crosses the most watercourses. All of the routes in the White Bear

Lake Subregion cross one watercourse classified as impaired. PWI watercourses crossed in the White Bear Lake Subregion include the Little Chippewa River. A public commenter that owns property where WBLSR02 and WBLSR03 would cross the Little Chippewa River raised concerns about vegetation removal and how construction of the project would affect erosion control measures that the commenter has installed to prevent soil and other runoff. The commenter is concerned that the project would have a negative impact on the work that has been done to improve, restore, and protect the riparian and floodplain areas. Whereas WBLSR02 and WBLSR03 would not follow existing infrastructure at the Little Chippewa River crossing, WBLSR01 and WBLSR04 would follow an existing roadway at the river crossing ((comment #25 and #78 reference (2)).

Figure 6-25 White Bear Lake Subregion, Number of Watercourse Crossings by Type



Impacts to floodplains during construction would include soil disturbance and vegetation removal. Vegetation clearing within a floodplain, especially tree removal, can greatly destabilize the area, make it more prone to ongoing erosion and sediment issues, and further contribute to water quality issues. There are no FEMA-designated floodplain crossings that exceed 1,000 feet in the White Bear Lake Subregion.

6.4.6.12 Wetlands and Calcareous Fens

The ROI for wetlands is the route width, except for forested wetlands where it is the ROW due to permanent conversion within that area. Short-term and long-term potential impacts to wetlands are discussed in Section 4.7.12.2. Impacts to wetlands are evaluated by examining wetland types, sizes, and potential for spanning. Localized direct impacts to wetlands would include vegetation clearing, movement of soils, and construction traffic which could alter or impair wetland function. Forested wetlands would be subject to long-term impacts given their conversion to non-forested wetlands. Wetland crossings longer than 1,000 feet might require one or more structures to be placed in the wetland, resulting in small, localized permanent wetland impacts.

Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting

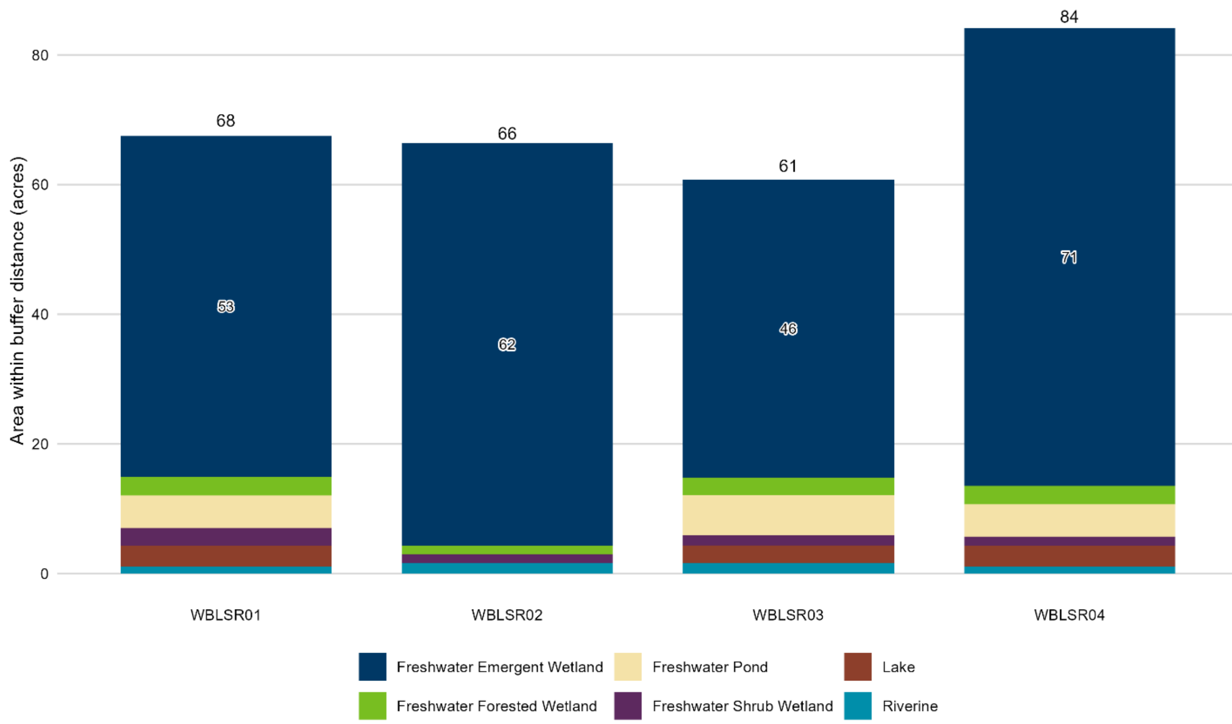
a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width. Wetland impacts would be regulated as described in Section 4.7.12.2. Additional details regarding potential impacts to wetlands, including those provided in the DNR's Natural Heritage Review response, and potential mitigation measures are provided in Section 4.7.12.3.

There are no calcareous fens in or near the ROI for this subregion.

Map 14-7 and Map 14-8 show the mapped wetlands within the ROI of the routes in the White Bear Lake Subregion. Direct wetland impacts would occur within the construction workspace within or adjacent to the ROW. Not all wetland areas within the ROI would be subject to direct impacts as most could be spanned. In most cases, wetlands can be spanned to avoid placing structures within them. However, wetland crossings longer than 1,000 feet might require one or more structures to be placed within the wetland. There are no crossings over 1,000 feet in this subregion.

Wetlands in the ROI for the White Bear Lake subregion consist mainly of emergent wetlands, ponds, and a smaller subset of forested, shrub, and riverine wetlands. Figure 6-26 shows acres of wetland that the ROI crosses for each route. Within the White Bear Lake Subregion, the WBLSR04 ROI contains the most NWI wetland at approximately 68 acres, crosses the highest number of individual wetlands (21), and has the most overall length at approximately 3,500 feet. In contrast, the WBLSR03 ROI contains the fewest NWI wetlands (61 acres). The WBLSR02 ROI has the fewest number of crossings at 7 and the lowest total length at approximately 1,300 feet. Lower acreage and lower numbers of crossings serve as an indicator of fewer direct or indirect impacts to wetlands.

Figure 6-26 White Bear Lake Subregion, Wetland Area within ROI by Route



Two routes in this subregion intersect PWI wetlands within their ROIs: WBLSR03 crosses two with approximately 2.5 acres and WBLSR04 crosses 1 with approximately 1 acre.

The ROI for each of the routes in the White Bear Lake Subregion crosses a mixture of emergent wetlands, ponds, and a smaller subset of forested wetlands. Because transmission lines cannot be safely or reliably operated with trees growing within the ROW, existing trees must be removed throughout the ROW, including forested wetlands. Forested wetlands, within any new transmission line ROW, would likely undergo a long-term to potentially permanent change in wetland/vegetation type lasting as long as the transmission line operates in the area. In the White Bear Lake Subregion, the ROW of WBLSR01 and WBLSR03 cross the most forested wetland (0.8 of an acre), while the ROW of WBLSR02 crosses the fewest acres, at just over 0.5 of an acre. Forested wetlands that are subject to permanent impacts due to their conversion would be limited to the ROW.

6.4.7 Costs that are Dependent on Design and Route

Total project costs range from $465 million to $535 million and vary based on the routes selected. Estimates include permitting, engineering, materials (for example: steel, conductor, and insulators), land rights and ROW, and construction costs. Costs are generally proportional to length with the exception of the additional factors described in Section 4.8. For comparison purposes, the construction costs for the four routes in the White Bear Lake Subregion are included in Table 6-44. Estimated construction costs associated with route segments in the White Bear Lake Subregion are discussed in Section 6.4.9.

The route with the lowest estimated cost is WBLSR01 ($58,455,500); it is also the shortest route. The route with the highest estimated cost is WBLSR02 ($62,087,000); it is also the longest route.

Table 6-44 White Bear Lake Subregion, Summary of Estimated Cost by Route

Route Alternative	Length (mi)	Estimated Cost
WBLSR01	12.0	$58,455,500
WBLSR02	12.1	$62,087,000
WBLSR03	12.1	$62,059,000
WBLSR04	12.1	$58,905,000

6.4.8 Relative Merits of the White Bear Lake Subregion Routes

The 14 routing factors that the Commission must consider when designating transmission line routes (Minnesota Rules 7850.4100) are summarized at the subregional level. Some elements of these factors have minimal impacts or do not vary significantly by route within the subregion and thus are not further discussed in this Section.

The relative merits analysis uses graphics (Table 6-45) to provide a visual assessment of the relative merits for each route in the White Bear Lake Subregion. The graphic for a specific routing factor or element is not meant to be indicative of the "best" route but is provided as a relative comparison to be evaluated together with all other routing factors. For routing factors where impacts are anticipated to vary, the graphic represents the magnitude of anticipated difference between these anticipated impacts and compares them across the different routes within a given subregion. For routing factors that express the state of Minnesota's interest in the efficient use of resources (for example, the use and paralleling of existing rights-of-way), the graphic represents the consistency of the route with these interests and compares them to each other. Table 6-46 summarizes the relative merits analysis of the four routes in the White Bear Lake Subregion for the routing factors that are anticipated to vary amongst the routes.

Table 6-45 Guide to Relative Merits Analysis

Consistency with Routing Factor or Anticipated Impacts	Symbol
• Route is consistent with the routing factor OR • Impacts are anticipated to be negligible to minimal or the impact is positive	●
• Route is consistent with routing factor but less so than the other options OR • Impacts are anticipated to be minimal but the potential for impacts is greater than the other routes or require special permit conditions OR • Impacts are anticipated to be moderate	◒
• Route is not consistent with routing factor or consistent only in part OR • Impacts might be moderate but the potential for impacts is greater than the other routes or might require special permit conditions OR • Impacts are anticipated to be significant	○

Table 6-46 White Bear Lake Subregion, Relative Merits of Subregion Routes

Routing Factor / Resource	WBLSR01	WBLSR02	WBLSR03	WBLSR04	Summary
Factor A Human Settlement					
Aesthetics	●	●	●	●	WBLSR03 has the fewest residences (12) and WBLSR01 has the most (17). WBLSR02 has the nearest residence less than 200 feet away. All routes would cross the Little Chippewa, but at each location there is little existing vegetation that would need to be removed.
Displacement	●	●	●	●	There are no residences or non-residential structures within the ROW of any of the routes.
Recreation	●	●	●	●	Impacts to recreation are anticipated to be negligible among the routes.
Factor C Land-Based Economies					
Agriculture	●	●	●	●	Impacts to recreation are anticipated to be minimal among the routes.
Mining	●	●	●	●	Impacts to mining are anticipated to be negligible among the routes.

Routing Factor / Resource	WBLSR01	WBLSR02	WBLSR03	WBLSR04	Summary
Factor D Archaeological and Historic Resources					
Archaeological					Because there are no previously identified archaeological sites in the White Bear Lake Subregion route widths, the project does not have the potential to impact known archaeological resources in this subregion.
Historic					No NRHP-listed, eligible or unevaluated historic architecture resources have been recorded within the White Bear Lake Subregion ROIs. All four routes are therefore expected to have minimal impact on significant historic resources.
Factor E Natural Resources					
Public and Designated Lands					WBLSR04 is the only route that would cross a WMA, and vegetation clearing within the ROW could impact the function of the WMA. WBLSR04 could impact the state's ability to conduct controlled burns where the route would cross the WMA. The proximity of WBLSR01, WBLSR02, and WBLSR03 to WMAs could impact the state's ability to conduct controlled burns, but to a lesser extent than WBLSR04. No routes would cross WPAs, and vegetation clearing within WPAs is not anticipated. Routes that cross public lands (WBLSR04) would have greater impacts to public enjoyment of public lands compared to routes that do not cross public lands (WBLSR01, WBSLR02, and WBLSR03). The ROI of WBLSR02 and WBLSR03 include one CREP easement and one RIM easement. WBLSR02 and WBLSR03 would not cross the CREP or RIM easement, and impacts could be avoided during final design.

Routing Factor / Resource	WBLSR01	WBLSR02	WBLSR03	WBLSR04	Summary
Soils	●	●	●	●	Nearly all the soils in the region have a moderate or severe rutting hazard rating. Impacts could be minimized with BMPs or mitigated if long-term re-vegetation impacts extend beyond construction. Impacts to soils would be independent of the route selected.
Surface Water	●	●	●	●	The total count of watercourse crossings by the anticipated alignments of the routes varies between 5 and 10. WBLSR04 crosses the fewest watercourses (5 crossings) while WBLSR02 crosses the most watercourses (10 crossings). Each route has one PWI watercourse crossing and one impaired watercourse crossing. No in-water work would occur.
Wetlands	●	●	●	●	All routes have some acres of forested wetlands. In the White Bear Lake Subregion, the ROWs cross nearly the same acreages, at just under 1. Two routes in this subregion cross PWI wetlands: WBLSR03 crosses 2 with approximately 2.5 acres in the ROI and WBLSR04 crosses 1 with approximately 1 acre in the ROI. No route would require crossings greater than 1,000 feet.
Vegetation	●	●	●	●	Forested land cover in the route ROWs include 0.3 acres in WBLSR02 and no acreage among all of the other routes.

Routing Factor / Resource	WBLSR01	WBLSR02	WBLSR03	WBLSR04	Summary
Wildlife and Wildlife Habitat					WBLSR02 and WBLSR03 would cross GCBAs, establishing new transmission line corridors that could result in avian impacts. WBLSR01 and WBLSR04 avoid GBCAs. There is one location where WBLSR02 and WBLSR03 would cross a patchy wooded Wildlife Action Network corridor in an area where there is not an existing transmission line or road ROW; as a result, this corridor would be fragmented. WBLSR02 and WBLSR04 could result in more avian impacts near WPAs relative to the other routes, as WBLSR02 intersects the most acres of WPAs at the local vicinity level, and WBLSR04 intersects the most acres of WPAs at the route width level. The route width of WBLSR04 intersects the most acres of WMAs, and WBLSR04 is the only route that would cross a WMA – however, the alignment could easily be adjusted within the permitted route width to avoid the WMA. A transmission structure may be necessary in the WMA crossed by WBLSR04; this could result in more impacts to WMA habitat quality and more avian impacts relative to the other routes, which do not cross WMAs. All routes follow no existing transmission line corridors. The majority of WBLSR03 would not follow existing non-transmission line infrastructure, which could result in more habitat fragmentation relative to WBLSR01, WBLSR02, and WBLSR04, which follow existing non-transmission line infrastructure for roughly half of their length.

Routing Factor / Resource	WBLSR01	WBLSR02	WBLSR03	WBLSR04	Summary
Factor F Rare and Unique Natural Resources					
Rare and Unique Natural Resources	◒	○	◒	◒	The ROW of all routes would intersect a similar acreage of Prairie Conservation Plan resources. The ROW of WBLSR02 would intersect 2 acres of the edge of a Site of Biodiversity Significance ranked moderate, while the other routes would avoid Sites of Biodiversity Significance. No state or federally protected species have been documented within one mile of any of the routes.
Factor H Paralleling Division Lines					
Paralleling existing survey lines, natural division lines, and agricultural field boundaries	●	●	●	●	All routes parallel division lines for 90.4 percent or more of their total lengths. WBLSR02 and WBLSR03 parallel the smallest percentage of division lines for their lengths, while WBLSR01 parallels the largest percentage of division lines.
Factor J Paralleling Existing Infrastructure Minnesota Statute § 216E.03 - Subdivision 7 (8) (roads/railroads) and (15e)(transmission lines)					
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.	●	●	◒	●	WBLSR01 follows existing infrastructure for largest percentage of the routes' lengths (62.4 percent), while WBLSR03 follows existing infrastructure for smallest percentage (29.1 percent).
Factor L Costs					
Costs Dependent on Design and Route	●	●	●	●	The route with the lowest estimated cost is WBLSR01 ($58,455,500). The route with the highest estimated cost is WBLSR02 ($62,087,000). No route has an estimated cost more than 3% higher than the average estimated cost of the applicants' proposed routes.

6.4.9 Route Segments for the White Bear Lake Subregion

No alignment alternatives are included in the White Bear Lake Subregion. A route segment (C202) was included in the scoping decision for the White Bear Lake Subregion but is not part of Routes WBLSR01 through WBLSR04. Rather, it is considered a refinement that would replace a portion of Routes WBLSR01 through WBLSR03. These replacements are compared to the same portion of the original route that they diverge from, known as route segment equivalents. Figure 6-27 provides the location of Route Segment C202. Table 6-47 summarizes the route segment in the White Bear Lake Subregion and indicates which route it would refine or replace a portion of. For purposes of analysis, a route segment is considered in standalone comparison to its route equivalent.

Figure 6-27 White Bear Lake Subregion Route Segment

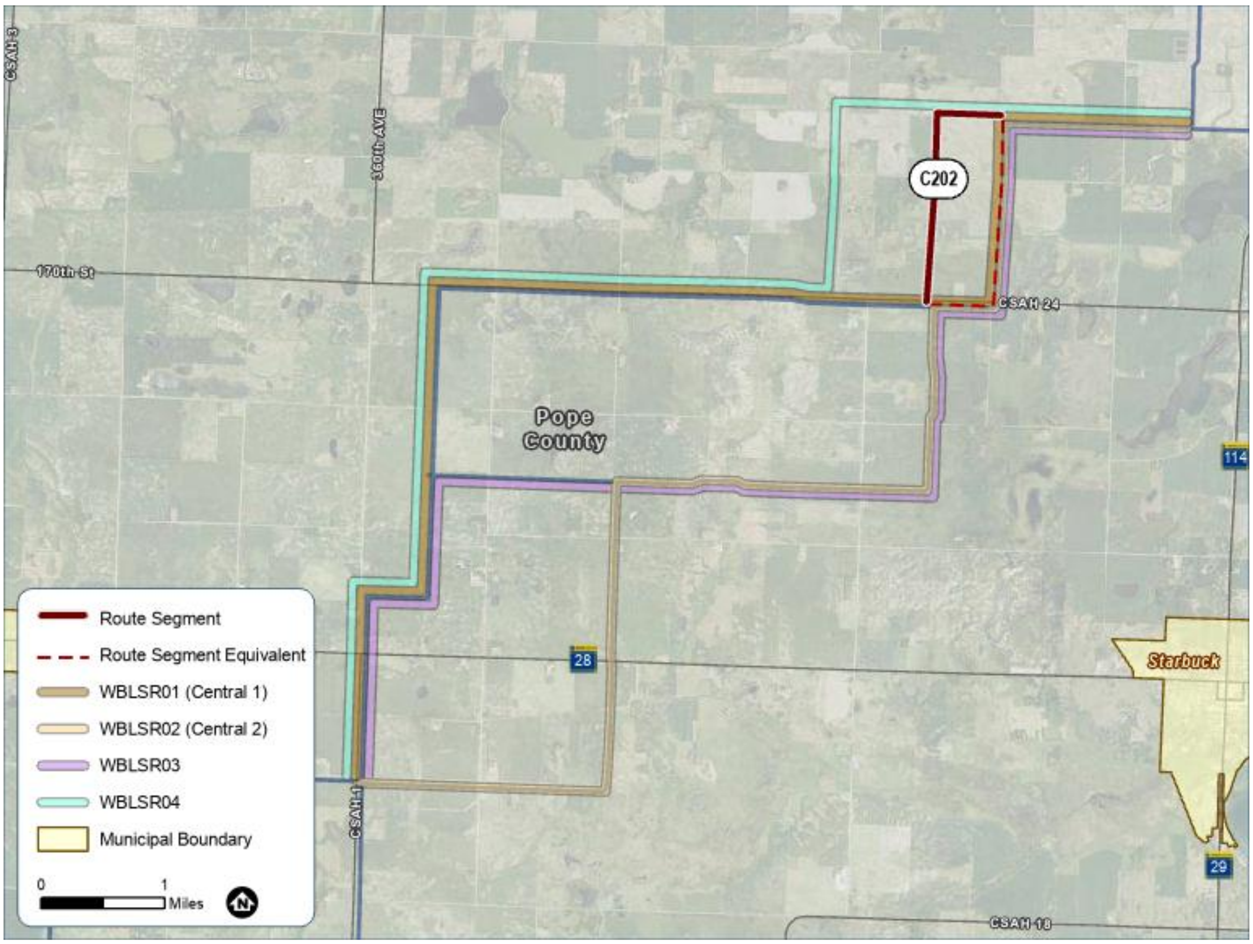


Table 6-47 White Bear Lake Subregion Route Segment

Routing Alternative	Subregion	Type	Description
C202	White Bear Lake	Route Segment	Proposed during scoping to mitigate impacts to residences. It can be used to modify routes WBLSR01, WBLSR02 or WBLSR03.

6.4.9.1 Route Segment C202

Route Segment C202 is 8.1 miles long and is an alternative to a part of Routes WBLSR01 through WBLSR03. Route Segment C202 was proposed to mitigate impacts to residences. Route Segment C202 is shown on Figure 6-27 and Table 6-48 summarizes differences in potential impacts of Route Segment C202 compared to its equivalent.

Table 6-48 Route Segment C202 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment C202 would not follow any existing infrastructure (transmission lines, roads, railroads), while its equivalent would follow existing infrastructure for 100 percent of its length. C202 would follow division lines (field, parcel, or section lines) for 62.8 percent of its length while its equivalent would follow division lines for 100 percent of its length. C202 would parallel less total ROW than its equivalent (62.8 percent and 100 percent, respectively).
Cost	Route Segment C202 costs an estimated $0.5 million (4 percent) less than its equivalent; $10,414,500 compared to $10,870,500 for its equivalent.
Human Settlement – Aesthetics	Both route segment C202 and its equivalent would box in a residence on two boundaries of their property. C202's equivalent has two residences within 500 feet whereas C202 has none, with two total residences within 1,600 feet. C202 would not follow any existing infrastructure while its equivalent follows for 100 percent of its length. C202 only follows natural division lines for 62.8 percent of its length, increasing impacts. Aesthetic impacts between C202 and its equivalent are similar with a tradeoff in impacts to an additional residence (the equivalent) or creating new built features in an unbuilt landscape that would segment contiguous agricultural fields (C202).
Human Settlement – Displacement	There are no residential or non-residential structures within the ROW of the route segment or the equivalent.
Human Settlement - Recreation	There are no changes to impacts to recreation.
Land-Based Economies – Agriculture	Route Segment C202 would parallel less existing infrastructure would cut through two agricultural fields without following natural division lines compared to its equivalent.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	There are no documented archaeological or historic resources within Route Segment C202 or its equivalent.
Natural Environment – Public and Designated Lands	Public lands within the ROI of Route Segment C202 and its equivalent include the White Bear WMA which is owned by the DNR. Additional public lands only within the ROI of the equivalent include a Pope County WPA which is owned by USFWS. The anticipated alignment of C202 crosses the White Bear WMA for a length of 1,465 feet. The equivalent does not cross the White Bear WMA. There are no conservation easement lands within the ROI of C202 or its equivalent.

Resource	Summary
Natural Environment - Vegetation	Both Route Segment C202 and its equivalent would have no forested land within their ROWs.
Natural Environment – Wildlife and Wildlife Habitat	C202 intersects more acres of WMAs than its equivalent (42 acres and 7 acres, respectively), and only C202 crosses WMAs. C202 intersects more acres of Wildlife Action Network corridors than its equivalent (251 acres and 171 acres, respectively), but the equivalent crosses corridors for a slightly longer length than C202 (approximately 44 feet more). Only the equivalent intersects WPAs within its route width (<1 acre), and equivalent intersects more acres of WPAs within its local vicinity than C202 (20 acres and 13 acres, respectively).
Natural Environment – Rare and Unique Natural Resources	Neither Route Segment C202 nor its equivalent have any documented records of federal or state protected species within one mile. The ROW of Route Segment C202 would intersect more acres of Prairie Conservation Plan prairie corridors (37 acres versus 29 acres for its equivalent).
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Route Segment C202 has one PWI basin within the ROI and one PWI basin crossing. Its equivalent does not have any PWI basins or crossings within the ROI. C202 and its equivalent each have one watercourse within their ROIs. C202 has three watercourse crossings, while its equivalent has two watercourse crossings.
Natural Environment – Wetlands and Calcareous Fens	Route Segment C202 would cross more wetlands in terms of acreage and in total length of crossing (approximately 900 feet more) when compared to the equivalent. No changes occur between the Route Segment and its equivalent when considering impacts on forested wetland acres in the ROW.

7 North Region – Potential Impacts and Mitigation

This chapter describes potential impacts in the North Region (Map 5). The North Region includes the Alexandria Subregion. There are 8 routing alternatives (2 routes and 6 route segments) in the North Region as shown on Map 5.

7.1 North Region – Environmental Setting

The North Region, which includes the Alexandria Subregion, is bound between the City of Alexandria at the northern extent and the City of Glenwood at the southern extent (Map 2). The North Region intersects Pope County in the southern half of the region and Douglas County in the northern half of the region. The cities of Alexandria, Glenwood, Lowry, Forada, Long Beach, and several townships also intersect the North Region. Existing transmission lines, the Glenwood – State Line railroad, and the West Glenwood – Thief River Falls Twin Cities Soo railroad traverse the North Region. Major highways that traverse the North Region include Interstate 94, U.S. Highway 52, State Highway 29, State Highway 55, and State Highway 114; county and local roads are also present. The North Region is dominated by agricultural land (Map 10-8 and Map 10-9). Major waterway crossed by the routing alternatives within North Region includes the Little Chippewa River (Map 14-8 and Map 14-9).

The DNR and the USFWS have developed an Ecological Classification System (ECS) for ecological mapping and landscape classification in Minnesota that is used to identify, describe, and map progressively smaller areas of land with increasingly uniform ecological features. Under this classification system, the majority of the North Region is in the Minnesota River Prairie Subsection of the North Central Glaciated Plains Section in the Prairie Parkland Province; the remaining one-third in the northwestern part of the North Region is in the Hardwood Hills Subsection of the Minnesota and Northeast Iowa Morainal Section in the Eastern Broadleaf Forest Province (Map 16-7 and Map 16-8; references (180); (181)).

The Minnesota River Prairie Subsection is characterized by large till plains that are bisected by the broad valley of the Minnesota River. Topography is steepest along the Minnesota River and the Big Stone Moraine, which has steep kames and broad slopes, while topography outside of the river valley consists of level to gently rolling ground moraine. Glacial drift generally ranges between 100 and 400 feet throughout this subsection. Soils are mostly well to moderately well-drained loams formed in gray calcareous till with some localized inclusions of clay, sand, and gravel soils. Wetlands were common within this subsection prior to pre-European contact, and most have been drained to establish usable cropland (reference (180)).

The Harwood Hills Subsection is characterized by steep slopes, high hills and lakes formed in glacial end moraines and outwash plains. Kettle lakes are abundant in the subsection, both on moraine and outwash deposits. Glacial drift generally ranges between 100 and 500 feet throughout this subsection. Soil textures range from loamy sands and sandy loams on outwash plains to loams and clay loams on moraines. Irregular topography and presence of numerous lakes and wetlands provided a partial barrier to fire, resulting in the development of woodland/forest, with tallgrass prairie growing on more level terrain in the subsection.

7.2 Alexandria Subregion Routes

The Alexandria Subregion includes two routes and six route segments. The two routes are shown in Figure 7-1 and summarized in Table 7-1. The six route segments are discussed in Section 7.2.9.

Figure 7-1 Alexandria Subregion Routes

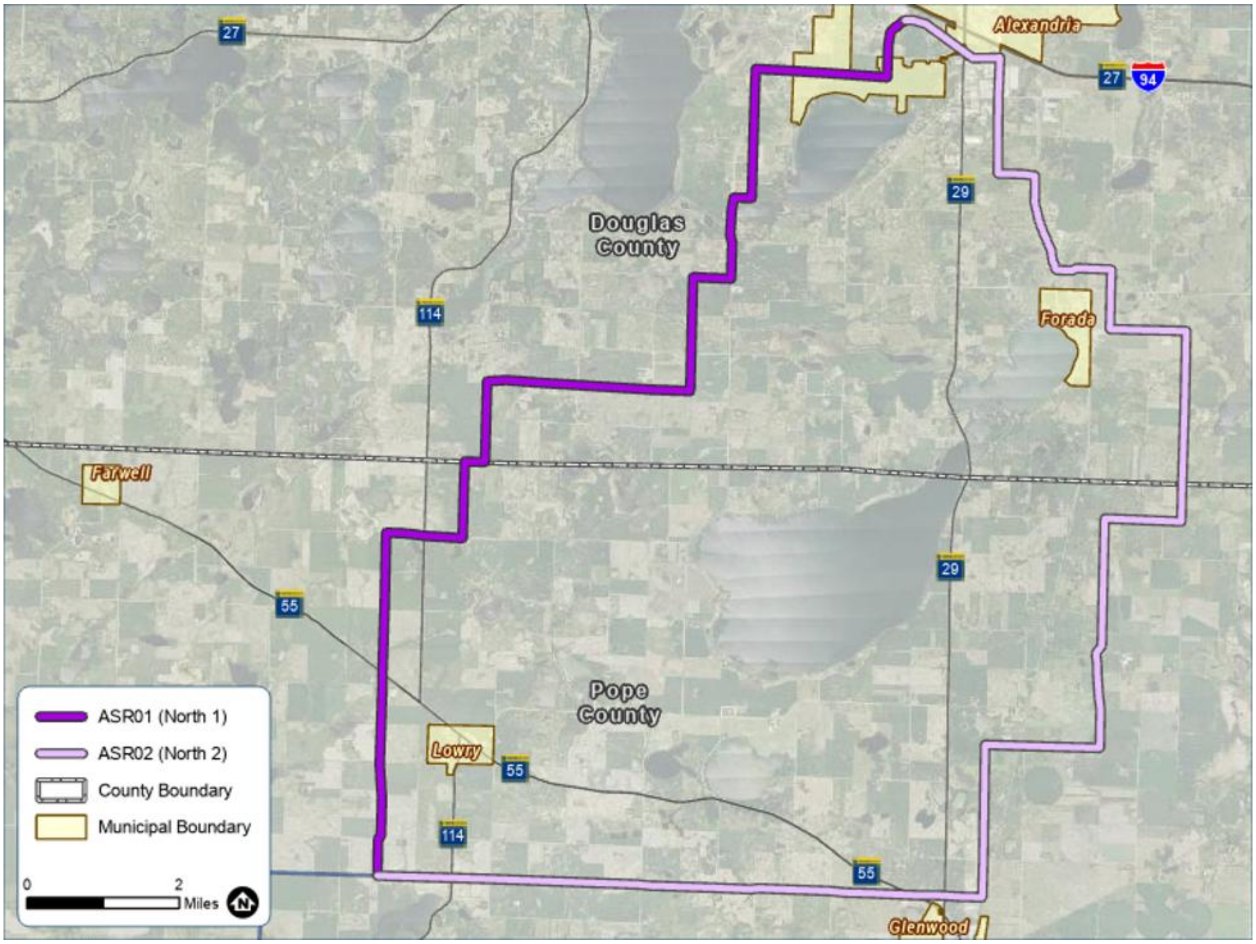


Table 7-1 Alexandria Subregion Routes

Routing Alternative	Type	Description
ASR01	Route	Follows the applicants' proposed North 1.
ASR02	Route	Follows the applicants' proposed North 2.

7.2.1 Use or Paralleling of Existing Rights-of-Way

The use and paralleling of existing ROW is considered by the Commission when determining the most appropriate route for the project. Opportunities for ROW sharing for the project include public roads, existing transmission lines and railroads.

Paralleling and/or sharing other types of existing ROW would have an incremental impact relative to existing horizontal elements, such as existing transmission lines, highways and county roads, and/or railroads (collectively referred to as “existing infrastructure”). In some cases, portions of a route could parallel ROW with more than one of these existing features at the same time (e.g., be sharing or paralleling transmission line and road ROW). Map 7-8 and Map 7-9 illustrates where ROW paralleling occurs and shows existing infrastructure.

As shown in Figure 7- and Table 7-2, ASR01 is 18.1 miles long and ASR02 is 25.4 miles long. ASR01 follows existing ROW for a larger percent of its length than ASR02 (26.4 percent and 21.4 percent, respectively).

Figure 7-2 Alexandria Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

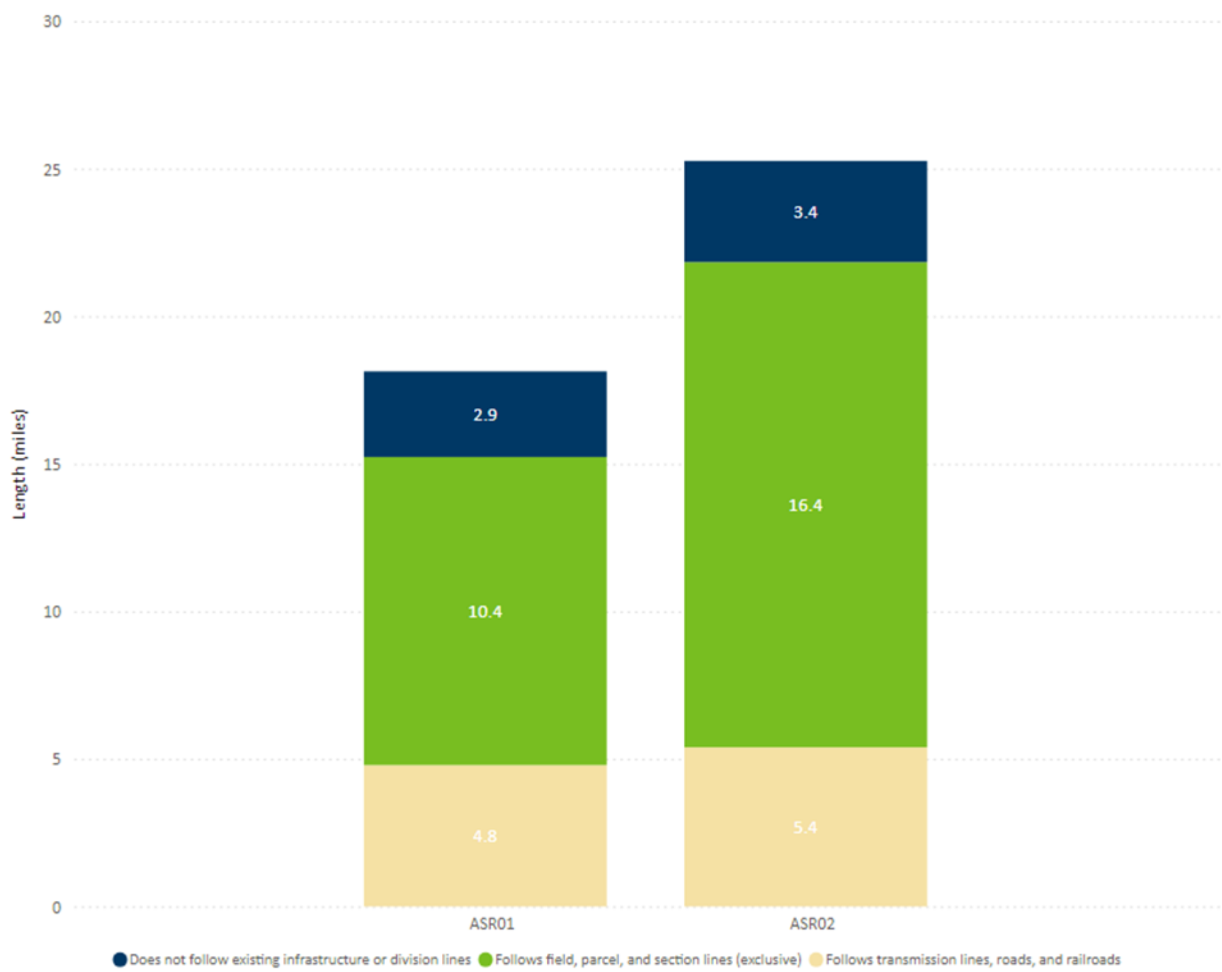


Table 7-2 Alexandria Subregion, ROW Paralleling of Existing Infrastructure and/or Division Lines Detail

		Follows existing transmission lines		Follows existing roads		Follows existing railroads		Follows existing infrastructure (transmission lines, roads, and railroads)		Follows field, parcel, and section lines	
	Total Length (mi)	Length (mi)	%	Length (mi)	%	Length (mi)	%	Length (mi)	%	Length (mi)	%
ASR01	18.1	0.0	0.0	4.8	26.4	0.0	0.0	4.8	26.4	15.1	83.5
ASR02	25.3	1.4	5.5	3.3	13.1	0.9	3.4	5.4	21.4	20.7	81.9

7.2.2 Human Settlement

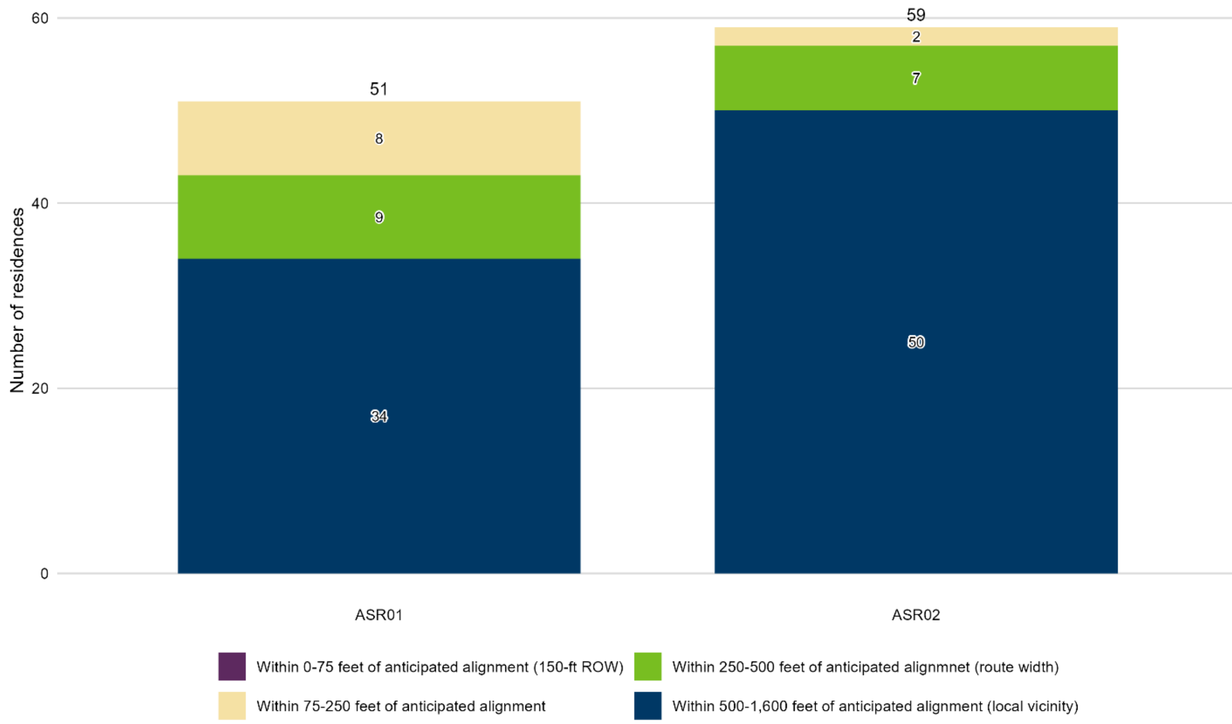
7.2.2.1 Aesthetics

The ROI for aesthetics is the local vicinity. Transmission lines alter a viewshed (Section 4.3.1). Aesthetic impacts are assessed, in part, through a consideration of the existing viewshed, landscape, character, and setting of any given area, followed by an evaluation of how a proposed routing alternative would change these aesthetic attributes. Determining the relative scenic value or visual importance in any given area is subjective and depends, in large part, on the values and expectations held by individuals and communities about the aesthetic resource in question.

Aesthetic impacts can be minimized by selecting routes farther from homes, schools, businesses, and other places where people congregate such as recreational areas. Aesthetic impacts can also be minimized by following existing transmission line ROW where elements of the built environment already define the viewshed and the addition of a transmission line would have an incremental impact. Following other infrastructure, such as roads and railroads, would also be expected to reduce potential impacts but not to the same extent. Additional details regarding potential impacts to aesthetics and potential mitigation measures for the project as a whole are provided in Section 4.3.1.

Appendix F shows human settlement features such as residences and nursing homes in the local vicinity of the routes in the Alexandria Subregion. The proximity of residential structures (homes) and non-residential structures to routes at various distances is shown in Figure 7- and Table 7-3, respectively. ASR01 has the fewest residences (51) and non-residential structures (231) within the local vicinity. ASR02 has the most residences (59) and non-residential structures (277) within the local vicinity.

Figure 7-3 Alexandria Subregion, Proximity of Residential Structures



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

Table 7-3 Alexandria Subregion, Proximity of Non-Residential Structures

Non-Residential Structures	Routes	
Distances from Anticipated Alignment	ASR01	ASR02
0-75 feet (150-foot-ROW)	0	1
75-250 feet	30	17
250-500 feet (generally route width)	38	49
500-1,600 feet (local vicinity)	163	210
Total	231	277

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

Recreational resources where people might congregate identified within the ROI include the Glacial Ridge Trail Scenic Byway, the West Central Trail Blazer snowmobile trails, and the Douglass Area snowmobile trails (Map 10-8 and Map 10-9; Section 7.2.2.8) and the Forada and Lowry WMAs (Map 18-8 and Map 18-9; Section 4.7.8.1). Recreational resources are defined and discussed for the project as a whole in Section 4.3.9. The Glacial Ridge Trail Scenic Byway enters the Alexandria Subregion from the city of Glenwood and follows State Highway 29 through the city of Alexandria. The scenic byway also heads east on County Road 28 from the intersection with State Highway 29.

ASR02 is the only route with the scenic byway in its local vicinity for a length of approximately 4 miles, crossing it three separate times (Map 10-8 and Map 10-9). Impacts to aesthetics to the scenic byway would be greatest along ASR02, as the other route in the Alexandria Subregion does not have the byway in its local vicinity. Impacts are anticipated to be minimal given existing infrastructure and development in the areas that cross ASR02. Traveling by car through any of these intersections would take a minimal amount of time before transmission lines are out of view, thus aesthetic impacts to the Glacial Ridge Trail Scenic Byway are anticipated to be minimal.

One crossing is near the city boundaries of Glenwood with developed landcover including buildings, roads, and a railroad, as well as cultivated crops. ASR02 would be less visible from the scenic byway as it runs along farming parcel lines near the Soo Line Railroad. The portion of scenic byway along County Road 28 is not in the local vicinity of ASR02 until it intersects it. This area is less developed, mostly surrounded by crops and pasture, which would cause more aesthetic impacts. Lastly, the intersection near Highway 94 in Alexandria is the most developed of all the scenic byway crossings.

Both routes, ASR01 and ASR02, have snowmobile trails in their local vicinities. ASR01 crosses the local vicinity of snowmobile trails six times whereas ASR02 crosses 18 times. ASR01 contains approximately 5.5 total miles of trail in its local vicinity, mostly in areas where it runs parallel with a roadway including County Road 21, Cross Country Lane SW, and on roads around State Highway 55. Most snowmobile trails in the local vicinity of ASR01 run along roads where the addition of a transmission line would have minimal aesthetic impacts because of existing development and infrastructure. ASR02 contains approximately 11 miles of trail in its local vicinity, mostly in areas where it runs parallel with a roadway including 160th Street, 245th Avenue, State Highway 55, 290th Avenue, 100th Street, West Lake Union Road SE, and portions of roads around the city of Alexandria and Interstate 94. Although many trails run along existing development and infrastructure, much of the Douglas Area Trails would be in the local vicinity of ASR02, causing moderate impacts. The West Central Trail Blazer snowmobile trails are not in as much of ASR02's local vicinity and would experience minimal aesthetic impacts.

Several streams, creeks, and public ditches are crossed by routes in the Alexandria Subregion (Map 14-8 and Map 14-9). Major watercourse crossings include the Little Chippewa River. Major waterbody crossings include Mud Lake. Both of these crossings would occur along ASR01.

Mud Lake is already bisected by Country Road 21 SW, so vegetation clearing would be less along the anticipated alignment in existing road ROW. Aesthetic impacts from vegetation clearing by Mud Lake for nearby residents are expected be minimal based on the anticipated alignment which mostly borders a water basin rather than vegetation at this crossing. The crossing of the Little Chippewa would require 150 foot wide removal of existing forested vegetation with one nearby resident that is buffered from aesthetic impacts with vegetative screening on their property. Aesthetic impacts from vegetation clearing by the Little Chippewa are expected to be minimal to moderate.

Aesthetic impacts will be greater in areas where no existing infrastructure that is linear, such as other transmission lines or railroads, are present. ASR02 would parallel two existing transmission lines near the city of Alexandria and Interstate 94, reducing aesthetic impacts in this area (Map 7-8). The other existing transmission line runs by a municipality and crosses both routes in the southern portion of the Alexandria Subregion. Two railroads, both considered the Soo Line Railroad, cross all routes in the subregion. One railroad segment runs along State Highway 55 and the other along 250th Avenue and County Road 87 SE (Map 7-8 and Map 7-9). Section 7.2.1 has further discussion on the use or paralleling of existing right of way for each route in the Alexandria Subregion.

Each route would parallel with existing infrastructure or division lines as shown in Map 7-8 and Map 7-9. These maps illustrate existing infrastructure and division lines in the region, including roads, railroads, transmission lines, and parcel lines. In some cases, portions of a route could parallel ROW with more than one of these existing features at the same time. Table 7-2 quantifies the length and percentage of each type of paralleling for each route in the Alexandria Subregion. Figure 7-2 demonstrates the same information in a chart based on length.

Both routes are relatively similar in the percentage of parallelling with all types of existing infrastructure, with a total length of approximately 18 miles for ASR01 and 25 miles for ASR02. ASR02 parallels the most with approximately 88 percent (22 miles) of its length. ASR01 parallels the least existing infrastructure with approximately 84 percent (18 miles) of its length. Aesthetics are minimized by paralleling with existing transmission line ROW rather than all types of existing ROW, which includes roads and parcel lines. Where transmission line structures already define the viewshed, more transmission line structures would have an incremental impact. ASR01 follows no existing transmission lines whereas ASR02 follows for approximately 5.5 percent (1.4 miles) of its length. Aesthetic impacts are more moderate for residents in the ROI along routes that parallel with less existing transmission lines.

7.2.2.2 Cultural Values

An assessment of potential impacts to cultural values is discussed for the entire project in Section 4.3.2. The impact assessment was completed for the project as a whole because there is limited variability in cultural values across the routing alternatives. Impacts to cultural values are independent of the route selected.

7.2.2.3 Displacement

There are no residences within the ROW for the routes within the Alexandria Subregion. There is one non-residential structure within the ROW of ASR02. There are no non-residential structures within the ROW of ASR01. An overview regarding displacement, the general impacts from construction and operation of the project, and ways to avoid, minimize, and mitigate these impacts are in Section 4.3.3.

7.2.2.4 Environmental Justice

No EJ areas were identified in the Alexandria Subregion routes. An impact assessment on environmental justice is discussed for the entire project in Section 4.3.5.

7.2.2.5 Land Use and Zoning

An assessment of potential impacts to land use and zoning is discussed in Section 4.3.6. The impact assessment for land use and zoning was completed for the project as a whole because there is limited variability in zoning impacts among the routing alternatives.

7.2.2.6 Noise

An assessment of potential impacts from noise is discussed for the entire project in Section 4.3.7. The impact assessment for noise was completed for the project as a whole because there is limited variability in the potential for noise across the routing alternatives.

7.2.2.7 Property Values

An assessment of potential impacts to property values is discussed for the entire project in Section 4.3.8. The impact assessment for property values was completed for the project as a whole because there is limited variability in the potential for property value impacts across the routing alternatives and changes to a specific property's value are difficult to predict. Potential impacts would be minimized by minimizing aesthetic impacts; aesthetic impacts are analyzed by subregion in Chapters 5 through 7.

7.2.2.8 Recreation

The ROI for recreation is the route width. Intermittent and localized indirect impacts could occur during construction (for example – increased noise levels); long-term impacts during operation could occur in the form of aesthetic impacts (Section 4.3.1.2). Given that direct long-term effects are predominantly related to aesthetics, the indirect long-term repercussions on recreation are anticipated to be subjective, meaning that responses vary based on individual perspectives and experiences. Impacts to recreation are assessed through identification of recreational resources within the ROI. The project is not anticipated to directly impede recreational activities within the ROI such as snowmobiling, golfing, canoeing, hunting, or fishing. Additional details regarding potential impacts to recreation and potential mitigation measures for the project is provided in Section 4.3.9.

A scenic byway and snowmobile trails are present within the Alexandria Subregion (Map 10; Table 7-4). Routes in the Alexandria Subregion do not cross any land-based public trails, state water trail, or wild and scenic rivers.

The Glacial Ridge Trail scenic byway is crossed six times by ASR02 in the Alexandria Subregion (Map 10-8 and Map 10-9). Aesthetic impacts related to the scenic byway crossings are discussed in Section 7.2.2.1. ASR01 does not cross the scenic byway.

Multiple snowmobile trails are present in the Alexandria Subregion including the Douglass Area Trails and West Central Trail Blazer Trails (Map 10). ASR02 has more snowmobile crossings (18) and linear length (4.0 miles) compared to ASR01 (6 crossings, 2.9 miles).

Public lands, including Waterfowl Production Areas and Wildlife Management Areas, in the Alexandria Subregion are publicly accessible and can be used for recreational purposes. These public lands are also used for wildlife management and are discussed in Section 7.2.6.8.

Table 7-4 Alexandria Subregion, Recreational Resources within Route Width

Recreational Resource	Unit	Routes	
		ASR01	ASR02
Glacial Ridge Trail	Crossings (linear feet) [1]	0 (0)	6 (6,428)
Snowmobile Trail [2]	Crossings (miles)	6 (2.9)	18 (4.0)

[1] Linear feet totals are taken from the DNR Minnesota State Water Trails Dataset
[2] Snowmobile trails within Alexandria Subregion include: Douglass Area Trails, West Central Trail Blazer Trails

7.2.2.9 Socioeconomics

An assessment of potential impacts to socioeconomics is discussed for the entire project in Section 4.3.10 because there is limited variability in socioeconomic impacts among the routing alternatives.

7.2.2.10 Transportation and Public Services

An assessment of potential impacts to transportation and public services, including roadways, railroads, emergency services, airports, and utilities, is discussed for the entire project in Section 4.3.11. The impact assessment for transportation and public services was not analyzed at the subregional level because there is limited variability across the routing alternatives.

7.2.3 Human Health and Safety

An assessment of potential impacts to human health and safety is discussed for the entire project in Section 4.4. The impact assessment was completed for the project as a whole because there is limited variability across the routing alternatives and impacts would be minimized by prudent routing and adhering to applicable transmission line standards and codes.

7.2.4 Land-based Economies

Impacts to land-based economies are assessed by considering four elements: agriculture, forestry, mining, and tourism. Impacts and mitigation related to land-based economies are analyzed for the project as a whole in Section 4.5. The primary land-based economic activity in the project area is agriculture. The primary means of mitigating impacts to land-based economies is prudent routing; that is, by choosing routing alternatives that avoid such economies.

7.2.4.1 Agriculture

The ROI for agriculture is the route width. Construction and operation of a transmission line impacts agriculture (Section 4.5.1.2). During construction, impacts would include the limited use of fields or

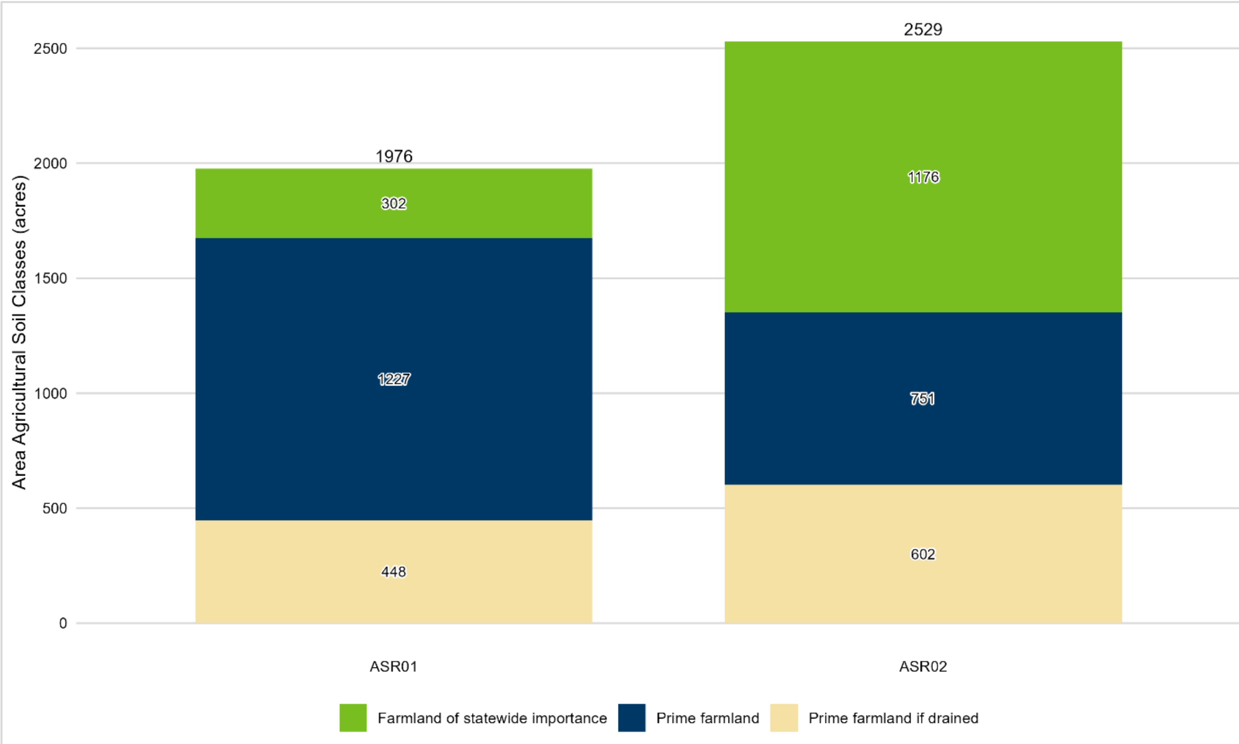
certain portions of fields for a specific time period, compacting soil, generating dust, damaging crops or drain tile, and causing erosion. Permanent impacts would also occur when the footprint of the transmission line structures directly impedes agricultural production and/or impedes efficiency of a farming operation as each structure must be carefully avoided during tillage, planting, spraying, and harvesting of fields.

Prudent routing (paralleling existing infrastructure and/or paralleling division lines) could minimize potential impacts. Implementation of the AIMP (Appendix K) would minimize and mitigate impacts to agriculture. Additional details regarding potential impacts to agriculture and potential mitigation measures is provided in Section 4.5.1.

Figure 7-4 summarizes the total acres within the route widths of the Cyrus Subregion routes that have designated soil classifications for prime farmland and farmland of statewide importance. Figure 6-16 summarizes the total acres within the route widths of the Cyrus Subregion routes that are designated agricultural land use. Most land (70 percent or more) within the route widths of the different routes in the Alexandria Subregion is designated as agricultural land use (cultivated crops and hay/pasture; see Section 7.2.6.7). ASR01 has more prime farmland than ASR02. However, ASR02 has more agricultural land than ASR01.

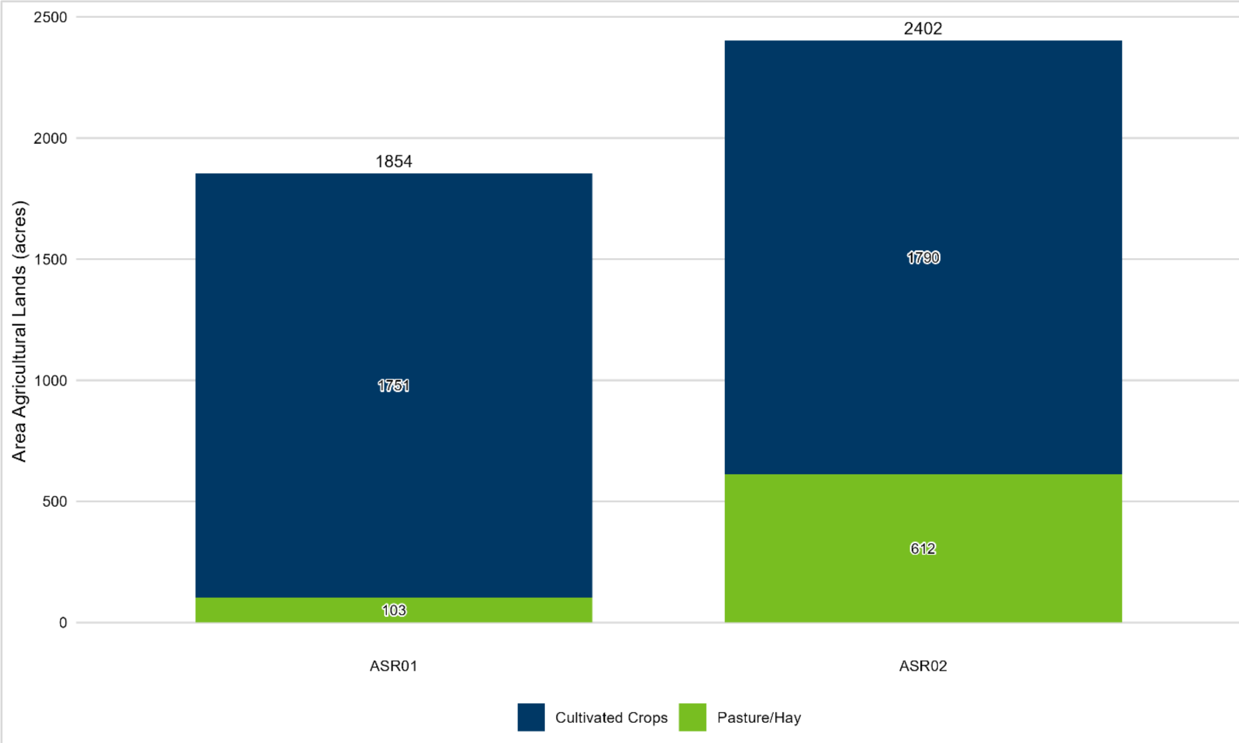
Routing with existing infrastructure or division lines, such as parcel or agricultural fields, would reduce impacts to agriculture. As noted in Table 7-2, ASR01 parallels more existing infrastructure (26 percent of its total length) than ASR02 (21 percent). ASR02 has a greater distance that does not follow existing infrastructure or division lines at 3.4 miles compared to ASR01 at 2.9 miles (Figure 7-2).

Figure 7-4 Alexandria Subregion, Prime Farmland within Route Widths



Source: Prime farmland/farmland of statewide importance, SSURGO (Appendix D)
Not all prime farmland is farmed.

Figure 7-5 Alexandria Subregion, Acres of Agricultural Lands within Route Width



Source: Agricultural land, NLCD (Appendix D)

Center pivot irrigation systems present in the Alexandria Subregion are shown on Map 13-8-and Map 13-9.

While not crossed by its anticipated alignment, there are three pivot irrigation systems within the route width of ASR02. The anticipated alignment avoids impacts to the center pivot irrigation systems because it parallels streets or does not cross the center pivot irrigation system portion of the agricultural fields (Map 13-8-and Map 13-9). No center pivot irrigation systems are present within the route width of ASR01.

The RIM/CREP program provides financial incentives to farmers to remove land from production (Section 4.7.6). Farmers within the route widths of the routes in the Alexandria Subregion participate within the RIM program (Section 7.2.6.6); however, no anticipated alignment in this subregion crosses an easement area. If one of these routes are permitted, it is anticipated the easement could be avoided during final design. Additional discussion regarding the potential to avoid the easement areas is provided in Section 7.2.6.6. Impacts can be mitigated by compensating individual landowners through negotiated easement agreements.

7.2.4.2 Forestry

Potential impacts to forestry are discussed for the entire project in Section 4.5.2. Impacts to forestry are anticipated to be negligible to minimal and independent of the route selected.

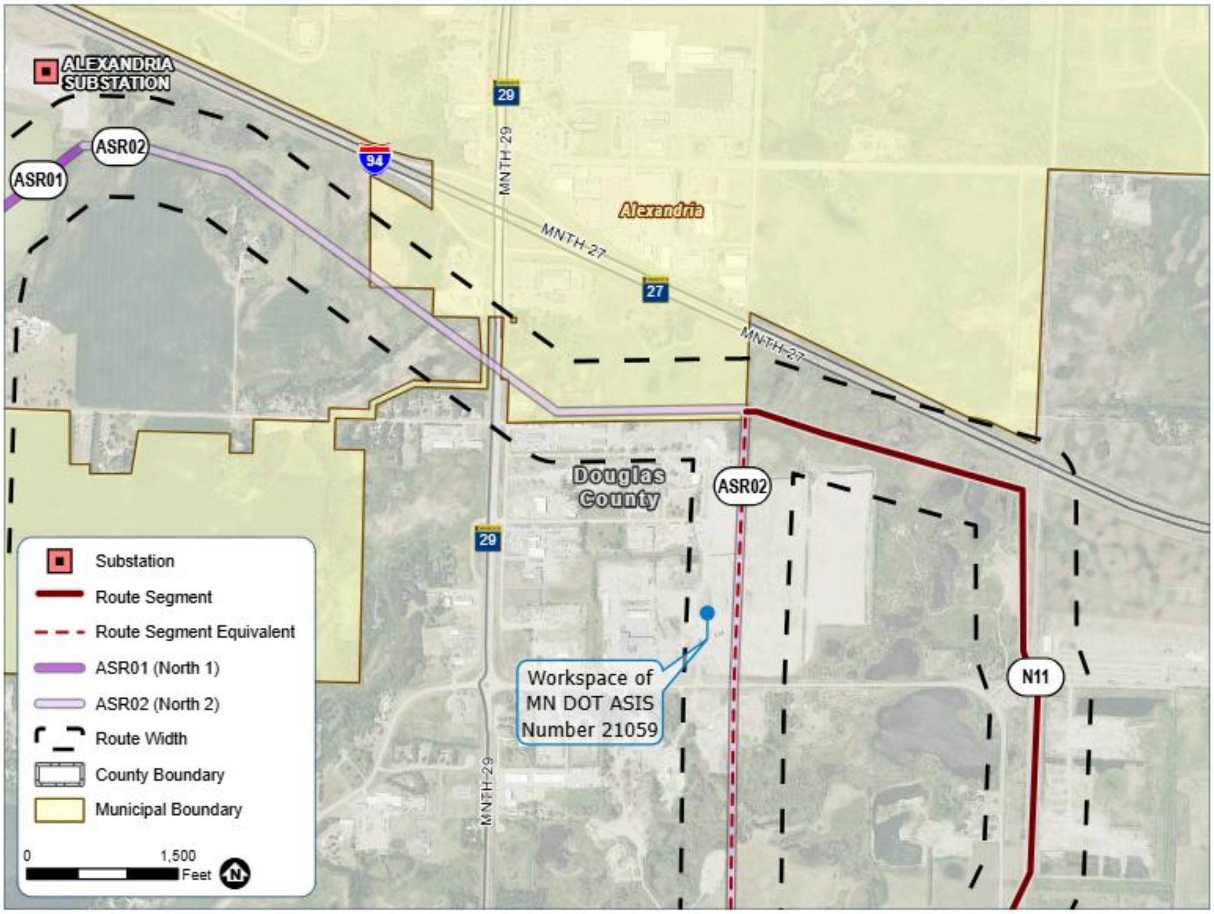
7.2.4.3 Mining

The ROI for mining is the route width. Impacts to aggregate mining could include interference with access to aggregate resources or the ability to successfully mine these reserves (Section 4.5.3.2). If future geophysical surveys are planned, the surveying technology could also be impacted. Potential impacts are assessed through identification of known, existing and prospective mining operations and assessing potential impacts to those current or potential future operations. If the potential for impacts to mining operations would occur, the applicants would be required to coordinate those impacts with the mining operator (Section 4.5.3.3).

There are no active mines within the route width of ASR01. Four active mining operations (MNDOT ASIS Numbers 61074, 61076, 21018, and 21059) are present within the route width of ASR02. Based on aerial imagery, the anticipated alignment, as well as the full width of the route width, crosses through the workspace of MNDOT ASIS Number 21059 as shown in Figure 7-6.

This could cause significant impacts to the daily operations of the commercial aggregate by interfering with access to aggregate resources or the ability to extract them. Impacts during operation of the project could also occur if heavy equipment used to haul or extract these resources would be inhibited by the transmission line structures. One commenter noted that the transmission line could require relocation of stockpiles and staging areas at this mining operation, MNDOT ASIS Number 21059 (comment #53 reference (2)). The commenter also stated the line could restrict access to their gravel deposits. ASR01 or Route Segment N11 would avoid impacts to this commercial aggregate (Section 7.2.9.3). The anticipated alignment does not cross into the workspaces of the other three mining operations aggregates; therefore, impacts to those are anticipated to be negligible.

Figure 7-6 Active Mining Operation MNDOT ASIS Number 21059



7.2.4.4 Tourism

Potential impacts to tourism are discussed for the entire project in Section 4.5.4. Impacts to tourism are anticipated to be negligible to minimal and independent of the route selected.

7.2.5 Archaeological and Historic Resources

The ROI for archaeological sites and historic cemeteries is the route width. The ROI for historic resources is the 1600-foot buffer on either side of the anticipated alignment, which accounts for resources outside of the route width but within visual range of the project.

The analysis of impacts to archaeological and historic resources takes NRHP eligibility into account. Pursuant to state (Minnesota Statutes § 138.661 to 138.669) and federal law (36 CFR 800), only resources that are eligible, listed, or unevaluated for the NRHP have the potential to be adversely affected by the project. For additional information regarding NRHP eligibility, see Section 4.6.1.

Impacts to archaeological and historic resources could result from construction activities such as ROW clearing, placement of structures, the construction of access roads, temporary construction areas, and vehicle and equipment operation (Section 4.6.2). Impacts could also result from the removal of

historic buildings or structures, or if the project is near or within view of a resource (typically a historic building, structure, or TCP). Additional details concerning potential impacts and mitigation regarding archaeological and historic resources for the project as a whole are provided in Section 4.6.3.

Documented archaeological and historic resources within the Alexandria Subregion are summarized Table 7-5 and Table 7-6. Table 7-5 summarizes the number of archaeological and historic resources within the ROI (which is the route width for archaeological sites and historic cemeteries, and a 1600-foot buffer on either side of the anticipated alignment for historic architecture). Table 7-6 provides descriptions of the resources located within the ROIs.

Additional cultural resources may be in the ROIs; reconnaissance survey and evaluation would be necessary to determine whether any other significant archaeological and/or historic resources are present and could be impacted by project activities. If a route permit is issued, the applicants would coordinate with landowners to proceed with these surveys in the permitted route and surrounding areas to include access roads and other areas of potential ground disturbances.

Table 7-5 Alexandria Subregion, Cultural Resource counts within Route's ROI

Route	Archaeological Sites				Historic Architecture				Historic Cemeteries
	Not Eligible	Unevaluated	Eligible or Listed	Total	Not Eligible	Unevaluated	Eligible or Listed	Total	
ASR01	0	1	0	**1**	4	2	1	**7**	2
ASR02	0	1	0	**1**	7	2	1	**10**	1

Table 7-6 Alexandria Subregion, Descriptions of Cultural Resources within Route's ROI

Route	Site/Resource Number	Resource Type	Resource Name/Type	NRHP Status	Description
ASR01, ASR02	21DLf	Archaeological Site	Alexandria/Alpha Site	Unevaluated	Reported artifact scatter of undetermined time period/possible habitation; no additional information available (reference (236))
ASR02	DL-ALE-00134	Historic Architecture	Bridge No. 21814	Unevaluated	Bridge crossing TH 29 over Hwy I-94; constructed 1965
ASR02	DL-ALE-00137	Historic Architecture	Trunk Highway 29	Unevaluated	Active TH 29; constructed 1967
ASR02	DL-ALE-00145	Historic Architecture	Prchal Family Farmstead/The Outside Inn/The Barn	Not Eligible	Former/ vacant farmstead, also formerly a restaurant and meeting hall. Constructed 1940-1985.
ASR02	DL-ALE-00146	Historic Architecture	Gas Station/Used Car Sales Lot	Not Eligible	Constructed 1965-1975; may be demolished
ASR01	DL-LAK-00001	Historic Architecture	Lake Mary Town Hall	Unevaluated	Constructed 1880; damaged by fire in 2003
ASR01	PO-BNW-00003	Historic Architecture	School	Unevaluated	Surveyed 1979; unknown if extant

Route	Site/Resource Number	Resource Type	Resource Name/Type	NRHP Status	Description
ASR01, ASR02	XX-ROD-00043	Historic Architecture	Trunk Highway 55	Not Eligible	Active TH 55; constructed 1921/1970
ASR02	XX-ROD-00060	Historic Architecture	Trunk Highway 29	Not Eligible	Active TH 29; constructed 1921
ASR01, ASR02	XX-ROD-00100	Historic Architecture	Trunk Highway 114	Not Eligible	Active TH 114; constructed c. 1920-1970
ASR01, ASR02	XX-ROD-00180	Historic Architecture	Trunk Highway 27	Not Eligible	Active TH 29; constructed c. 1920s
ASR01, ASR02	XX-ROD-00185	Historic Architecture	Trunk Highway 52	Not Eligible	Current TH 20/3/64 and Hwy I-94; constructed 1920/1955
ASR01, ASR02	XX-RRD-SOO002	Historic Architecture	Minneapolis & Pacific Railway Company/Minneapolis, St. Paul & Sault Ste. Marie Railroad: Mainline	Eligible	Active railroad corridor; constructed 1880s
ASR01	20368	Historic Cemetery	Johnny Thoen Farm Burial Site/Oscar Lake Lutheran Cemetery Historic Site	N/A	Mapped at PLS Township level; exact location unknown
ASR01, ASR02	20365	Historic Cemetery	Sunset Memorial Cemetery	N/A	Mapped at PLS Township level; exact location unknown

7.2.5.1 Archaeological Resources

Five documented archaeological sites, all unevaluated for listing on the NRHP, are present within various route widths in the Alexandria Subregion (Table 7-5). Site 21DLf intersects the route width for both proposed routes (ASR02 and ASR02). This site is an alpha site, which is an archaeological site reported based on historic maps, first-hand accounts, or other documentation, but has not been investigated by a qualified archaeologist. It is reported to consist of an artifact scatter from an undetermined time period, and may be a habitation site. No information is available on the nature of the recovered artifacts nor whether this site is pre or post contact.

The route widths of both ASR01 and ASR02 cross the boundaries of alpha site 21DLf and therefore have equal potential to impact this archaeological resource.

7.2.5.2 Historic Resources

Historic architectural resources within the route ROIs in the Alexandria Subregion include one NRHP-eligible resource (XX-RRD-SOO002/Minneapolis & Pacific Railway Company/Minneapolis, St. Paul & Sault Ste. Marie Railroad: Mainline), six unevaluated resources, and seven ineligible resources (Table 7-5).

XX-RRD-SOO002 (Minneapolis & Pacific Railway Company/Minneapolis, St. Paul & Sault Ste. Marie Railroad: Mainline) is an active railroad corridor connecting Minneapolis to North Dakota, constructed in the 1880s. This resource was determined eligible for listing on the NRHP in 2003 under Criterion A for its association with significant events in the category of transportation with a period of significance from 1886 to 1930. It was reevaluated in 2024 and again recommended eligible. This resource is significant as the only efficient means of transportation to rural western Minnesota wheat growing regions, thus facilitating the settlement of the region. It also played a significant role in the expansion of the flour milling industry by connecting wheat suppliers with the milling center in Minneapolis (reference (237).

Both of the proposed routes in the Alexandria subregion cross the NRHP eligible historic resource XX-RRD-SOO002/Minneapolis & Pacific Railway Company/Minneapolis, St. Paul & Sault Ste. Marie Railroad: Mainline. In addition, the ROI for both routes contain two unevaluated historic resources. ASR01 and ASR02 would therefore have equal impact on significant historic architectural resources. Unevaluated resources in the ASR02 ROI include DL-ALE-00134 (a bridge crossing I-94) and DL-ALE-0037 (active Trunk Highway 29). Unevaluated resources in the ASR01 ROI include DL-LAK-00001 (the Lake Mary Town Hall) and PO-BNW-00003 (a historic schoolhouse).

7.2.5.3 Historic Cemeteries

There are two historic cemeteries that may be within the route widths in the Alexandria Subsection Table 7-5. These consist of the Johnny Thoen Farm Burial Site/Oscar Lake Lutheran Cemetery Historic Site and the Sunset Memorial Cemetery. Both cemeteries are mapped at the PLS Township level, and their exact locations are unknown. No additional information is available regarding these resources. The ROI for ASR01 crosses the mapped boundary of both the Johnny Thoen Farm Burial Site/Oscar Lake Lutheran Cemetery Historic Site and the Sunset Memorial Cemetery, while the ROI for ASR02 crosses only the boundary of the Sunset Memorial Cemetery.

Sunset Memorial Cemetery may be within the ROI of both ASR01 and ASR02. The ROI of ASR01 may additionally contain the Johnny Thoen Farm Burial Site/Oscar Lake Lutheran Cemetery Historic Site. However, the Johnny Thoen Farm Burial Site/Oscar Lake Lutheran Cemetery Historic Site is mapped at the PLS township level in Township 127N, and the Sunset Memorial Cemetery is mapped at the PLS township level in Township 128N. The two cemeteries may be located anywhere within these townships and are not necessarily located within the ROIs for ASR01 and ASR02.

7.2.6 Natural Environment

Electric infrastructure, such as transmission lines, can impact the natural environment. The Commission must consider effects on the natural environment when designating transmission lines routes and making a decision on a route permit. Impacts are dependent upon many factors, such as how the project is designed, constructed, and maintained. Other factors, such as the environmental setting, influence potential impacts.

7.2.6.1 Air Quality

An assessment of potential impacts to air quality is discussed for the entire project in Section 4.7.1. The impact assessment for air quality was not analyzed at the subregional level because impacts are anticipated to largely be independent of the route selected.

7.2.6.2 Climate Change

An assessment of potential impacts from climate change is discussed for the entire project in Section 4.7.2. The impact assessment for climate change was completed for the project as a whole because there is limited variability in the potential for climate change across the routing alternatives.

7.2.6.3 Greenhouse Gases

An assessment of potential impacts from greenhouse gases is discussed for the entire project in Section 4.7.3. The impact assessment for greenhouse gases was completed for the project as a whole because there is limited variability in the potential for greenhouse gases across the routing alternatives.

7.2.6.4 Geology and Topography

An assessment of potential impacts to geology and topography is discussed for the entire project in Section 4.7.4. The impact assessment for geology and topography was not analyzed at the regional level because impacts are anticipated to largely be independent of the route selected.

7.2.6.5 Groundwater

An assessment of potential impacts to groundwater is discussed for the entire project in Section 4.7.5. The impact assessment for groundwater was not analyzed at the subregional level because impacts are anticipated to largely be independent of the route selected.

7.2.6.6 Public and Designated Lands

The ROI for public and designated lands is the route width. Public and designated lands often involve unique resources intended for protection and/or preservation and would be subject to short and long-term impacts depending upon their use (Section 4.7.6.2). Public and designated lands within the ROI are first identified and then further reviewed to better understand potential impacts such as vegetation clearing. Occupying public and designated lands would require coordination with the landowner (Section 4.7.6.3).

Public land and designated lands with existing easements or covenants located within the route widths and rights-of-way of routes in the Alexandria Subregion are summarized in Table 7-7 and shown in Map 10-8 and Map 10-9, Map 15-8 and Map 15-9, and Map 18-8 and Map 18-9.

There are no national wildlife refuges in the ROI of the Alexandria Subregion. State public lands in the Alexandria Subregion ROI include the Forada WMA and the Lowry WMA. Federal public lands in the Alexandria Subregion ROI include several WPAs.

WMAs owned and managed by the DNR in the Alexandria Subregion are within the ROI of both routes. The North East Unit of the Lowry WMA is within the ROI of ASR01. This unit of the Lowry WMA contains grasslands, an ecosystem that is typically managed with prescribed burns (reference (238)). The anticipated alignment of ASR01 would cross the eastern edge of the Lowry WMA for a length of 1,397 feet; impacts from the crossing would include vegetation clearing in the ROW and wildlife as analyzed in Section 3.3.1. A transmission line structure may be necessary along the eastern edge of the Lowry WMA, as the crossing distance is greater than 1,000 feet wide. Prescribed burns in the area crossed by ASR01 would be constrained; impacts to the state's ability to manage the Lowry WMA are anticipated if ASR01 is selected. Construction activities in this area could temporarily impact public enjoyment of the Lowry WMA, and the visibility of transmission line structures could create long-term impacts to public enjoyment of the Lowry WMA. ASR02 would not impact the Lowry WMA.

The Forada Management Area is within the ROI of ASR02. The Forada Wildlife Management Area contains grasslands and brushlands, ecosystems that are typically managed with prescribed burns (reference (239)). The anticipated alignment of ASR02 would cross the southwestern corner of the Forada WMA for a length of 18 feet; impacts from the crossing would include vegetation clearing in the ROW and wildlife as analyzed in Section 3.3.1. A corner structure may be necessary on the southwestern point of the Forada WMA, as the anticipated alignment of ASR02 turns west at this location. Prescribed burns in the area crossed by ASR02 would be constrained, but due to the small crossing length, impacts to the state's ability to manage the Forada WMA are anticipated to be minimal. Temporary and/or permanent impacts to public enjoyment of the Forada WMA from construction activities or visibility of transmission line structures are also anticipated to be minimal. ASR01 would not impact the Forada WMA.

WPAs owned and managed by USFWS are within the ROI of both routes in the Alexandria Subregion. The anticipated alignment of ASR02 would cross WPAs. Impacts to WPAs crossed by ASR02 would include vegetation clearing in the ROW and wildlife as analyzed in Section 3.3.1. The anticipated alignment of ASR01 would not cross WPAs. Construction activities in this area could temporarily impact public enjoyment of WPAs, and the visibility of transmission line structures could create long-term impacts to public enjoyment of WPAs. ASR02 would have greater temporary and long-term impacts to public enjoyment of WPAs compared to ASR01, as ASR01 does not cross WPAs. The applicants requested narrower route widths at one location along ASR01 and four locations along ASR02 (Section 3.3.1) in the Alexandria Subregion (Map 6). The narrower route widths were requested in areas where Waterfowl Production Area easements exist to avoid USFWS lands or easements to the greatest extent practicable. If a route were permitted in these areas, the narrower route width would ensure placing transmission structures directly into these lands would be avoided.

One conservation easement program, the RIM reserve program, has lands in the Alexandria Subregion ROI (Map 15-8 and Map 15-9). The applicants intend to avoid conservation easements to the greatest extent practicable. There is 1 acre of one wetland restoration RIM easement land within the ROI of ASR02. The RIM easement is not crossed by the anticipated alignment and associated ROW of ASR02; thus it is anticipated to be avoided during final design. Impacts to the RIM easement are not anticipated. ASR01 avoids RIM land entirely.

Table 7-7 Alexandria Subregion, Public and Designated Lands within Route Width and ROW

Public and Designated Land Type	Unit	Routes	
		ASR01	ASR02
Waterfowl Production Areas	Acres in ROW (route width)	0 (<1)	29 (88)
Wildlife Management Areas	Acres in ROW (route width)	7 (45)	0.1 (5)
Reinvest in Minnesota (RIM) Reserve Partnership Easement	Acres in ROW (route width)	0 (0)	0 (1)

7.2.6.7 Vegetation

The ROI for vegetation is the ROW. Potential construction and operation-related impacts to vegetation for the project as a whole are discussed in Section 4.7.7. Potential long-term impacts on vegetation would occur where structures are located or where conversion of forested vegetation to low-growing vegetation would be required. Impacts would be localized, and unavoidable. Impacts to vegetation are primarily evaluated by examining vegetative landcover types within the ROW of each routing option. Several measures could be implemented to avoid, minimize, or mitigate impacts to vegetation, as described in Section 4.7.7.

Map 11-8 and Map 11-9 provide an overview of landcover types across the Alexandria Subregion, and Table 7-8 summarizes the landcover types within the ROW of each route in the Alexandria Subregion. Agricultural vegetation, particularly cultivated cropland, represents the dominant vegetative landcover type within the ROW of both routes, ASR01 and ASR02, in the Alexandria Subregion. Other sizable land cover types in the route ROWs include pasture/hay, herbaceous wetland, and low intensity development or open space. Some areas of open water are present among the route, all of which are expected to be spanned completely by the transmission line.

Forested land is the vegetation that would be impacted the most by ROW clearing. Removal of woody vegetation will result in conversion to low-stature vegetation (shrubs and grasses) throughout the ROW area. The ROW would be maintained with low-growing vegetation during operations to minimize potential interference with the transmission line. Conversion of wooded landscapes to open landscapes could indirectly affect native vegetation by potentially increasing the spread of invasive and non-native species, which could permanently alter ecosystem functions. Co-locating the route with existing infrastructure right-of-way, for example, roadways or transmission lines, might limit tree removal. Use or paralleling of existing ROWs is discussed in Section 7.2.1 for the Alexandria Subregion.

Land cover in the route ROWs considered forested land include woody wetlands and deciduous forest, which are present in minimal amounts. ASR01 has the most forested land cover, with 5 acres of deciduous forest and 0.1 acres of woody wetlands, comprising approximately 1.5% of the total ROW acreage. Conversely, ASR02 has the least forested land cover, with 1.8 acres of deciduous forest and 0.2 acre of woody wetlands, comprising approximately 0.4% of the total ROW acreage.

Although ASR02 would minimize impacts to forested vegetation, given the small amount of forested vegetation in the ROW for all of the routes, impacts are anticipated to be minimal for all routes in the Alexandria Subregion. Potential impacts to agricultural vegetation and wetlands are discussed 7.2.4.1 and Section 7.2.6.12, respectively.

Table 7-8 Alexandria Subregion, Landcover Types in the ROW

Landcover Data	Unit	ASR01	ASR02
Area Within ROW	Acres	329.7	459.4
Barren Land (Rock/Sand/Clay)	Acres (percentages)		4.8 (1.0)
Cultivated Crops	Acres (percentages)	252.4 (76.6)	242.3 (52.7)
Deciduous Forest	Acres (percentages)	5 (1.5)	1.8 (0.4)
Developed, Low Intensity	Acres (percentages)	8.4 (2.5)	14.3 (3.1)
Developed, Medium Intensity	Acres (percentages)	1.4 (0.4)	7.5 (1.6)
Developed, Open Space	Acres (percentages)	33.4 (10.1)	49.2 (10.7)
Emergent Herbaceous Wetlands	Acres (percentages)	13.8 (4.2)	43.9 (9.6)
Grassland/Herbaceous	Acres (percentages)	0.2 (<0.1)	0.1 (<0.1)
Mixed Forest	Acres (percentages)	0 (0)	
Open Water	Acres (percentages)	3.9 (1.2)	0.8 (0.2)
Pasture/Hay	Acres (percentages)	11.1 (3.4)	94.4 (20.5)
Woody Wetlands	Acres (percentages)	0.1 (<0.1)	0.2 (<0.1)

7.2.6.8 Wildlife and Wildlife Habitat

The ROI for wildlife and wildlife habitat is the route width except for potential impacts to birds which is the local vicinity. Potential construction and operation-related impacts to wildlife and wildlife habitat are discussed in Section 4.7.8. Potential short-term, localized impacts could occur from displacement, injury, or mortality during construction or maintenance activities. Potential long-term impacts could occur as a result of habitat loss, conversion, or fragmentation. Impacts to wildlife and wildlife habitat are assessed both by considering wildlife inhabiting the ROI as well as assessing the presence of potential habitat for wildlife within the ROI. Several measures could be implemented to avoid, minimize, or mitigate impacts to wildlife and wildlife habitat, as described in Section 4.7.8.

Map 18-8 and Map 18-9 provides an overview of resources across the Alexandria Subregion and Table 7-9 summarizes the wildlife resources within the route width of each route in the Alexandria

Subregion. Designated wildlife habitat within the Alexandria Subregion ROI includes shallow wildlife lakes, GBCAs, WPAs, and WMAs. Wildlife Action Network corridors ranging from “Medium” rank to “High or Medium-High” rank are scattered throughout the Alexandria Subregion ROI.

Two DNR-identified priority shallow wildlife lakes are within the local vicinity and route width of ASR01 (Map 14-8 and Map 14-9). The route width of ASR01 intersects 15 acres of Mud Lake and 10 acres of an unnamed wildlife lake along the Little Chippewa River. The anticipated alignment of ASR01 would cross the edge of Mud Lake twice, paralleling an existing road ROW, spanning Mud Lake for a total of 224 feet (Map 14-9). The anticipated alignment of ASR01 would cross the edge of the unnamed wildlife lake along the Little Chippewa River once, spanning the unnamed lake for 589 feet (Map 14-8). Construction activities within the ASR01 ROW could impact the habitat quality and resident wildlife of the wildlife lakes. ASR01 would establish new transmission line corridor near shallow wildlife lakes, and could increase potential impacts to flying birds. ASR02 avoids wildlife lakes entirely.

WPAs are within the local vicinity and route width of both routes in the Alexandria Subregion; however, only ASR02 would cross WPAs (Map 18-8 and Map 18-9). ASR02 intersects substantially more acres of WPAs within its local vicinity and route width (759 acres and 88 acres, respectively) compared to the acres of WPAs within the local vicinity and route width of ASR01 (85 acres and 0.02 acres, respectively). The anticipated alignment of ASR01 would not cross WPAs; ASR01 would parallel an existing road ROW, across the road from a singular WPA. The anticipated alignment of ASR02 would cross WPAs four times, paralleling no existing infrastructure, for a total crossing length of 2.0 miles (10,560 feet). Transmission line structures may be necessary in WPAs crossed by ASR02 for individual crossings greater than 1,000 feet; construction activities within the ASR02 ROW could impact the habitat quality and resident wildlife of the WPAs, and new transmission line corridors established by ASR02 within or near WPAs could increase potential impacts to flying waterfowl due to collision with conductors. ASR02 is expected to have the greatest direct or indirect impacts to habitat quality, wildlife, and flying birds within WPAs, as only ASR02 would cross WPAs.

The North East Unit of the Lowry WMA is within the route width and local vicinity of ASR01, and the anticipated alignment would cross this resource (Map 18-8). This unit of the Lowry WMA contains a large open water basin, grasslands, an extensive area of dense cattail cover, and is a busy stopover for migrating waterfowl in the spring and fall (reference (238)). ASR01 would cross the eastern edge of the Lowry WMA, an area that contains grasslands and wetlands, parallelling an existing road ROW for a total crossing length of 1,397 feet. A transmission line structure may be necessary in the Lowry WMA, as the span needed is close to 1,400 feet, the maximum spanning distance for the project, and construction activities within the ASR01 ROW could impact the habitat quality and resident wildlife of the Lowry WMA. ASR01 would establish a new transmission line corridor in the Lowry WMA that could increase potential impacts to flying birds due to collision with conductors; these impacts to the Lowry WMA could be significant as migrating waterfowl are known to frequent the area and are prone to collision with nearby transmission lines.

The Forada WMA is within the route width and local vicinity of ASR02, and the anticipated alignment would cross this habitat (Map 18-9). The Forada WMA contains forest shrubland, grassland, and emergent wetlands (reference (239)). ASR02 would cross the southwestern corner of the Forada WMA, an area that contains grasslands, parallelling no existing infrastructure for a total crossing length of 18 feet. A corner structure may be necessary in this area, as the anticipated alignment of ASR02 turns west at this location. ASR02 would establish a new transmission line corridor in the Forada WMA that could increase potential impacts to flying birds, and construction activities within the ROW of ASR02 could impact the habitat quality and resident wildlife of the habitat. Considering the length of each crossing, ASR01 is expected to have greater direct or indirect impacts to habitat quality, wildlife, and flying birds within WMAs compared to ASR02.

GBCAs are within the local vicinity and route width of ASR02, and the anticipated alignment of ASR02 would cross two GBCAs (Map 18-8 and Map 18-9). ASR02 would cross the GBCAs paralleling existing road rights-of-way for only a portion of the crossings; establishing new transmission line corridors through each GBCA that could increase potential impacts to flying birds. ASR01 avoids GBCAs entirely.

Wildlife Action Network corridors are within the local vicinity of ASR02, which intersects 1 acre of a High or Medium-High rank corridor and 34 acres of a Medium rank corridor south of Lowry (Map 17-8). ASR02 would not cross the corridors, and impacts to the corridors are not expected. ASR01 avoids Wildlife Action Network corridors entirely.

The routes in the Alexandria Subregion would parallel little to no existing transmission line ROW, with ASR02 paralleling 6 percent of its length and ASR01 paralleling none. Avian species traversing wildlife areas along new transmission line corridors could potentially experience increased impacts resulting from electrocution or collision with transmission line structures or conductors. As discussed in Section 4.7.8.3, avian impacts can be minimized through use of bird flight diverters.

The routes in the Alexandria Subregion would parallel minimal existing non-transmission line infrastructure rights-of-way such as roads, with ASR01 paralleling the most (26 percent of its length) and ASR02 paralleling the least (21 percent of its length). All routes in the Alexandria Subregion would minimize potential wildlife and habitat impacts associated with habitat fragmentation and/or edge effects by paralleling existing infrastructure rights-of-way, because habitat fragmentation has already occurred in these areas.

Table 7-9 Alexandria Subregion, Wildlife Management and Conservation Areas within Route Width

Resource Area	Unit	Routes	
		ASR01	ASR02
Priority Shallow Wildlife Lakes	Count	2	0
Waterfowl Production Area	Acres	<1	88
Wildlife Management Area	Acres	45	5
Grassland Bird Conservation Areas	Acres	0	2,452

7.2.6.9 Rare and Unique Natural Resources

Rare and unique natural resources encompass protected species and sensitive ecological resources. The ROI for protected species is the project area (one mile), and the ROI for sensitive ecological resources is the route width. Potential construction and operation-related impacts to protected species and sensitive ecological resources are discussed in Section 4.7.9.2. Potential direct or indirect impacts to protected species could occur should they be present within or near the ROW during construction or maintenance activities. While more mobile species would leave the area for nearby comparable habitats, non-mobile species, such as vascular plants or nesting birds, could be directly impacted. Construction activities also have the potential for direct impacts to sensitive ecological resources if they are present within the area subject to construction disturbance. Long-term impacts would involve permanent clearing of vegetation in areas identified as sensitive ecological resources which could indirectly impact any protected species associated with these habitats.

Impacts to protected species are evaluated by reviewing documented occurrences of these species within the ROI. Potential impacts to sensitive ecological resources, which could provide suitable habitat for protected species, are evaluated by assessing the presence of these resources within the ROI. Several measures that could be implemented to avoid, minimize, or mitigate impacts to protected species and sensitive ecological resources, including those provided in the DNR's Natural Heritage Review response (Appendix N), are described in Section 4.7.9.3.

Sensitive ecological resources within the Alexandria Subregion are shown on Map 15-8 and Map 15-9. To secure federally and state protected species from exploitation or destruction, documented locations of these species are not identified on maps.

7.2.6.9.1 Protected Species

According to the NHIS database, no federally or state-protected species have been documented within one mile of route ASR01, and two federally and state-protected butterflies and one state-protected fish have been documented within one mile of ASR02; these are summarized in Table 7-10. None of the species have been documented within the ROW of ASR02. In addition, state special concern species have been documented within one mile of the routes in the Alexandria Subregion; records of state special concern species are summarized in Appendix N.

Formal protected species surveys have not been conducted for the project; as such, it is possible that additional protected species could be present where suitable habitat is available within the ROW or route width of the routes in the Alexandria Subregion. As part of project permitting, the applicants could be required to conduct field surveys for the potential presence of protected species; these surveys would occur prior to construction in coordination with the USFWS and/or DNR.

Table 7-10 Alexandria Subregion, Natural Heritage Information System Database Records of Protected Species within One Mile

Scientific Name	Common Name	Type	State/Federal Status	Routes	
				ASR01	ASR02
Hesperia dacotae	Dakota skipper	Butterfly	Endangered/threatened		X
Oarisma Poweshiek	Poweshiek skipperling	Butterfly	Endangered/not listed		X
Notropis anogenus	Pugnose shiner	Fish	Threatened/not listed		X

7.2.6.9.2 Sensitive Ecological Resources

The route widths and rights-of-way of both routes in the Alexandria Subregion would intersect sensitive ecological resources, including native plant communities and Sites of Biodiversity Significance (Table 7-11; Map 15-8 and Map 15-9). The ROW and route width of ASR02 would intersect more acres of both native plant communities and Sites of Biodiversity Significance. The anticipated alignment of ASR02 would cross one of the Sites of Biodiversity Significance ranked below in an area that may be too large to span (>1,000 feet), thus potentially requiring the placement of a transmission line structure within this Site of Biodiversity Significance. All other Sites of Biodiversity Significance and native plant communities should be spannable by both routes in the Alexandria Subregion.

Table 7-11 Alexandria Subregion, Sensitive Ecological Resources within the ROW and Route Width of Each Route

Resource	Units	ASR01	ASR02
Native Plant Community	Conservation Status S1, S2, or S3 (acres in ROW (route width))	0 (9)	7 (41)
	Conservation Status S4 or S5 (acres in ROW (route width))	<1 (6)	0 (0)
	Total acres in ROW (route width)	<1 (15)	7 (41)
Sites of Biodiversity Significance	Moderate rank (acres in ROW (route width))	<1 (15)	7 (43)
	Below rank (acres in ROW (route width))	<1 (8)	7 (47)
	Total acres in ROW (route width)	<1 (23)	14 (90)

7.2.6.10 Soils

The ROI for soils is the ROW. Common soil impacts include rutting, compaction, and erosion. Potential impacts would be short-term during construction, localized, and can be minimized. If long-term re-

vegetation impacts extend beyond construction, they would be mitigated through additional restoration efforts requiring additional time.

Soil impacts would be mitigated by implementing erosion prevention and sediment control practices such as silt fencing, erosion control blankets, turf reinforcement mats, and vehicle tracking controls. To control erosion and runoff, the applicants would obtain a NPDES/State Disposal System Construction Stormwater Permit if required, develop a SWPPP, grade contours for proper drainage, and protect storm drain inlets. Soil compaction and rutting would be mitigated by restricting equipment to the limits of disturbance, minimizing vehicles trips, and decompaction of the soil after construction. Finally, any excavated topsoil would be segregated from the subsoil and stored a suitable location. Disturbed areas would be promptly seeded after construction. Additional details regarding potential impacts to soils and potential mitigation measures are provided in Section 4.7.10.

Map 20-8 and Map 20-9 shows the surface soil textures across the subregion. Soil types within the ROW were reviewed to identify soil characteristics that could be more prone to impacts in some areas compared to others (Table 7-12). Less than one-third of soils within the ROW of ASR01 are prone to compaction, susceptible to erosion, hydric soils, or have revegetation concerns. More than 50 percent of the soils within the ROW of ASR02 are compaction-prone and have revegetation concerns. Nearly all soils within the ROW of the Alexandria Subregion routes have a moderate or severe rutting hazard rating. Generally, all of the routes within the Alexandria Subregion have similar soil characteristics. ASR02 is more susceptible to erosion, compaction, and has more revegetation concerns than ASR01.

Table 7-12 Alexandria Subregion, NRCS Mapped Soils within ROW

Soil Data	Unit	ASR01	ASR02
Area within ROW	Acres	330	459
Compaction Prone[1]	Acres (Percentage)	105 (32)	242 (53)
Susceptible to Erosion Hazard[2]	Acres (Percentage)	43 (13)	97 (21)
Hydric Soils[3]	Acres (Percentage)	91 (28)	121 (26)
Revegetation Concerns[4]	Acres (Percentage)	107 (32)	282 (61)
Susceptible to Rutting Hazard[5]	Acres (Percentage)	329 (100)	458 (100)

[1] Soils considered to be Compaction Prone soils include those with a rating of "Medium" or higher.
[2] Soils considered susceptible to erosion hazard soils include those with a rating of "Medium", "Severe", or "Very Severe".
[3] Hydric soil include hydric soils (100% hydric) and predominantly hydric soils (67-99% hydric).
[4] Soils considered to have revegetation concerns include soils with a non-irrigated land capability classification of 3 or greater.
[5] Soils considered susceptible to Rutting Hazard include those with a rating of "Moderate" or "Severe".

7.2.6.11 Surface Water

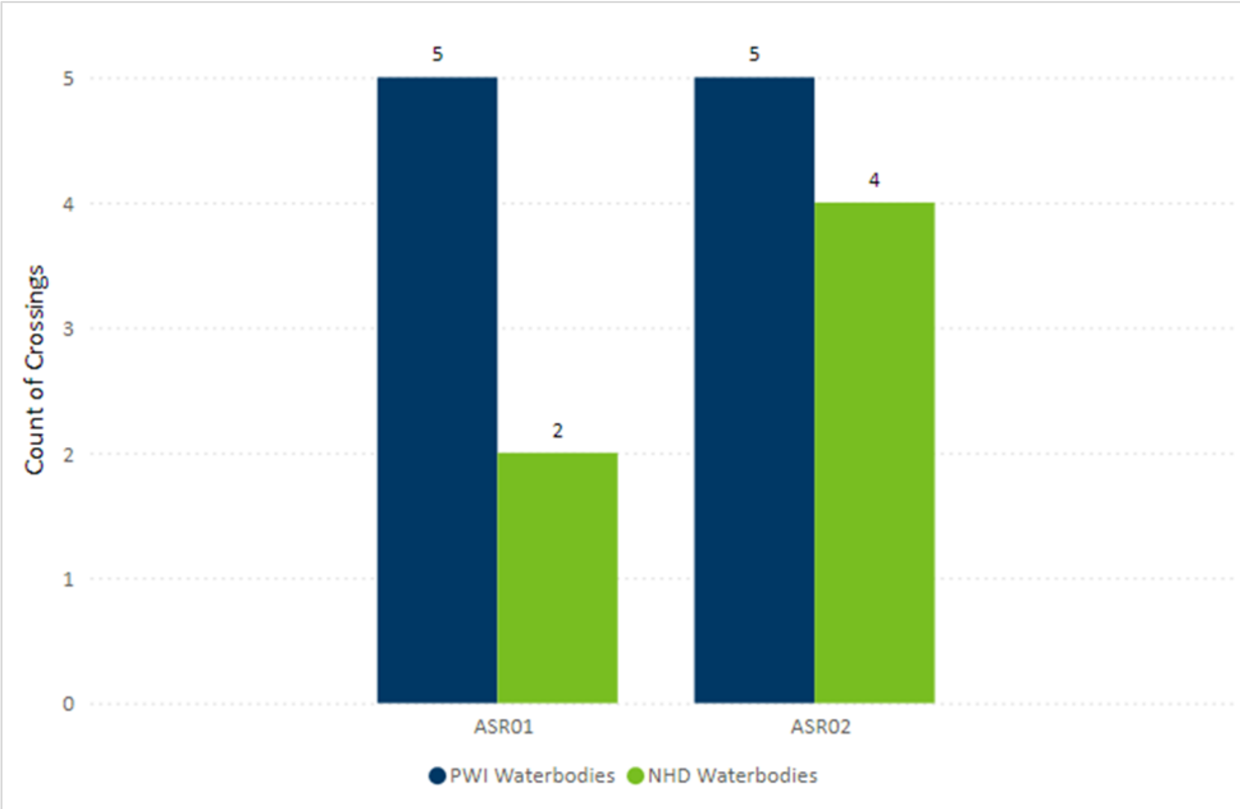
The ROI for surface water is the route width. Direct impacts caused by structures placed in surface waters would be avoided by spanning the surface waters. Direct impacts to other resources can cause indirect impacts to surface waters. For example, construction activities near surface waters could cause riparian vegetation disturbance and surface erosion, which can lead to runoff impacting surface waters. Impacts to surface waters could be avoided by prudent routing, selecting the routes that cross the fewest watercourses or waterbodies and/or special or impaired waters.

Impacts would be mitigated by using BMPs. Crossing PWI waters would require a DNR license to cross public waters and work near special or impaired waters would require additional BMPs as detailed in the construction stormwater permit. Additional details regarding potential impacts to surface waters and potential mitigation measures, including those provided in the DNR's Natural Heritage Review response (Appendix N), is provided in Section 4.7.11.

Map 14-8 and Map 14-9 show the waterbodies and watercourses across the region. There are no trout streams or state-designated outstanding resource value waters or state wild and scenic rivers within the ROI of the Alexandria Subregion.

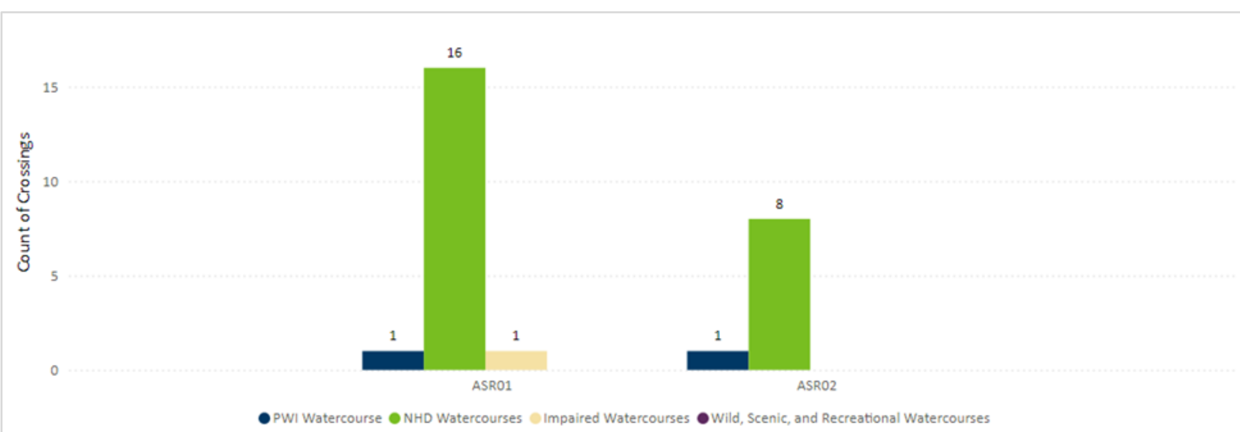
Both routes in the Alexandria Subregion have waterbodies within the ROI, ASR01 has two and ASR02 has one. All of the waterbodies present in each of the routes' ROIs are designated as PWI basins. The PWI basins are within the route width of ASR01 and ASR02, and both routes have PWI crossings (Figure 7-7).

Figure 7-7 Alexandria Subregion, Number of Waterbody Crossings by Type



The routes have a total of between five and 10 watercourse crossings (Figure 7-8). WBLSR04 crosses the fewest watercourses while WBLSR02 crosses the most watercourses. All of the routes in the Hancock Subregion cross one watercourse classified as impaired. PWI watercourses crossed in the White Bear Lake Subregion include the Little Chippewa River.

Figure 7-8 Alexandria Subregion, Number of Watercourse Crossings by Type



Impacts to floodplains during construction would include soil disturbance and vegetation removal. Vegetation clearing within a floodplain, especially tree removal, can greatly destabilize the area, make it more prone to ongoing erosion and sediment issues, and further contribute to water quality issues. There are no FEMA-designated floodplain crossings that exceed 1,000 feet in the Alexandria Subregion.

7.2.6.12 Wetlands and Calcareous Fens

The ROI for wetlands is the route width, except for forested wetlands where it is the ROW due to permanent conversion within that area. Short-term and long-term potential impacts to wetlands are discussed in Section 4.7.12.2. Impacts to wetlands are evaluated by examining wetland types, sizes, and potential for spanning. Localized direct impacts to wetlands would include vegetation clearing, movement of soils, and construction traffic which could alter or impair wetland function. Forested wetlands would be subject to long-term impacts given their conversion to non-forested wetlands. Wetland crossings longer than 1,000 feet might require one or more structures to be placed in the wetland, resulting in small, localized permanent wetland impacts.

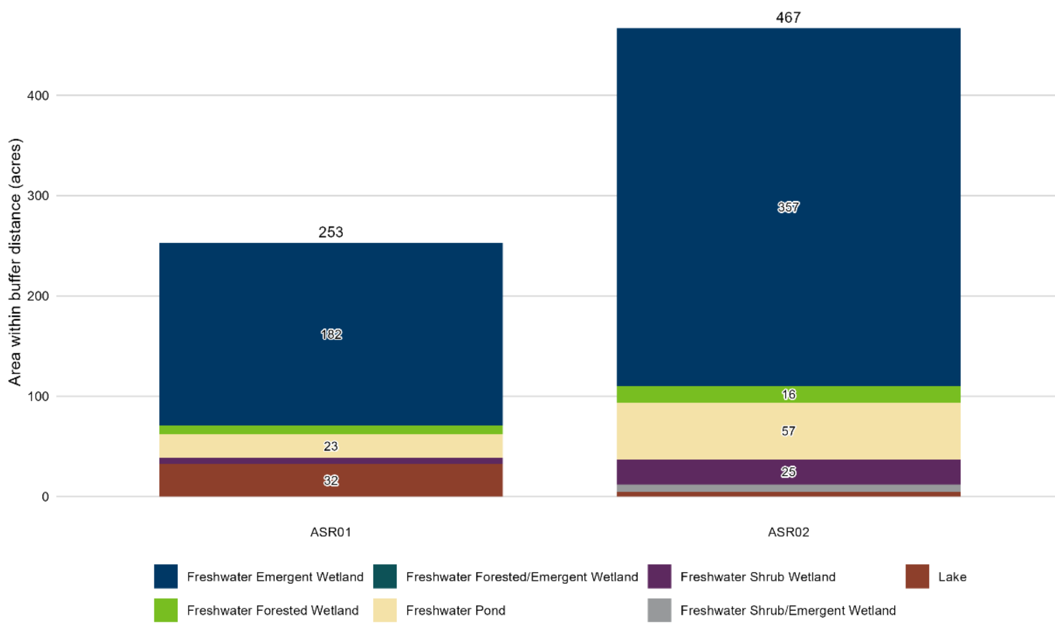
Impacts can be minimized using BMPs. Impacts to non-forested wetlands can be minimized by spanning wetlands where possible. Impacts to forested wetlands can be minimized by either selecting a route alternative with fewer forested wetlands in the ROW or moving the anticipated alignment to a least impactful alignment within the route width. Wetland impacts would be regulated as described in Section 4.7.12.2. Additional details regarding potential impacts to wetlands, including those provided in the DNR's Natural Heritage Review response, and potential mitigation measures are provided in Section 4.7.12.3.

There are no calcareous fens in or near the ROI for this subregion.

Map 14-8 and Map 14-9 show the mapped wetlands within the ROI of the potential routes in the Alexandria subregion. Direct wetland impacts would occur within the construction workspace (which would be within or adjacent to the ROW). Not all wetland areas within the ROI would be subject to direct impacts as most could be spanned. In most cases, wetlands can be spanned to avoid placing structures within them. However, wetland crossings longer than 1,000 feet might require one or more structures to be placed within the wetland. There are no crossings over 1,000 feet in this subregion.

Wetlands in the ROI for the Alexandria subregion consist mainly of emergent wetlands, ponds, and a smaller subset of forested, shrub, and riverine wetlands. Figure 7-9 shows acres of wetland that the ROI crosses. Within the Alexandria Subregion, the ASR02 ROI contains the most NWI wetland (467 acres), crosses the highest number of individual wetlands (114), and has the most overall length at approximately 3 miles. The ASR01 ROI includes the fewest acres of wetland at roughly 253 acres, has the fewest number of crossings, and has the shortest crossings at just under 2.5 miles. Lower acreage and lower numbers of crossings serve as an indicator of fewer direct or indirect impacts to wetlands.

Figure 7-9 Alexandria Subregion, Wetland Area within ROI by Route



The ROI for each route in this subregion intersects PWI wetlands: 4 for ASR01 with 13 acres in the ROI, and 8 for ASR02 with 36 acres in the ROI.

The ROI for each of the routes in the Alexandria Subregion crosses some forested wetlands. Because transmission lines cannot be safely or reliably operated with trees growing within the ROW, existing trees must be removed throughout the ROW, including forested wetlands. Forested wetlands, within any new transmission line ROW, would likely undergo a long-term to potentially permanent change in wetland/vegetation type lasting as long as the transmission line operates in the area. In the Alexandria Subregion, both route ROWs cross approximately 1.75 acres of forested wetland. Forested wetlands that are subject to permanent impacts due to their conversion would be limited to the ROW.

7.2.7 Costs that are Dependent on Design and Route

Total project costs range from $465 million to $535 million and vary based on the route selected. Estimates include permitting, engineering, materials (for example: steel, conductor, and insulators), land rights and ROW, and construction costs. Costs are generally proportional to length with the exception of the additional factors described in Section 4.8. For comparison purposes, the construction costs for the two routes in the Alexandria Subregion are included in Table 7-13. Estimated construction costs associated with route segments in the Alexandria Subregion are discussed in Section 7.2.9.

The route with the lowest estimated cost is ASR01 ($95,246,500); it is also the shortest route. The route with the highest estimated cost is ASR02 ($127,668,000); it is also the longest route.

Table 7-13 Alexandria Subregion, Summary of Estimated Cost by Route

Route Alternative	Length (mi)	Estimated Cost
ASR01	18.1	$95,246,500
ASR02	25.3	$127,668,000

7.2.8 Relative Merits of the Alexandria Subregion Routes

The 14 routing factors that the Commission must consider when designating transmission line routes (Minnesota Rules 7850.4100) are summarized at the subregional level. Some elements of these factors have minimal impacts or do not vary significantly by route within the subregion and thus are not further discussed in this Section.

The relative merits analysis uses graphics (Table 7-14) to provide a visual assessment of the relative merits for each route in the Alexandria Subregion. The graphic for a specific routing factor or element is not meant to be indicative of the “best” route but is provided as a relative comparison to be evaluated together with all other routing factors. For routing factors where impacts are anticipated to vary, the graphic represents the magnitude of anticipated difference between these anticipated impacts and compares them across the different routes within a given subregion. For routing factors that express the state of Minnesota’s interest in the efficient use of resources (for example, the use and paralleling of existing rights-of-way), the graphic represents the consistency of the route with these interests and compares them to each other. Table 7-15 summarizes the relative merits analysis of the two routes in the Alexandria Subregion for the routing factors that are anticipated to vary amongst the routes.

Table 7-14 Guide to Relative Merits Analysis

Consistency with Routing Factor or Anticipated Impacts	Symbol
• Route is consistent with the routing factor OR • Impacts are anticipated to be negligible to minimal or the impact is positive	
• Route is consistent with routing factor but less so than the other options OR • Impacts are anticipated to be minimal but the potential for impacts is greater than the other routes or require special permit conditions OR • Impacts are anticipated to be moderate	
• Route is not consistent with routing factor or consistent only in part OR • Impacts might be moderate but the potential for impacts is greater than the other routes or might require special permit conditions OR • Impacts are anticipated to be significant	

Table 7-15 Alexandria Subregion, Relative Merits of Subregion Routes

Routing Factor / Resource	ASR01	ASR02	Summary
Factor A Human Settlement			
Aesthetics	◒	◒	ASR01 has the fewest residences (51) and ASR02 has the most (59). ASR01 has 6 more residences within 75-250 feet than ASR02. ASR02 is the only route with a scenic byway in its ROI with three crossings along four miles. Existing infrastructure in these areas reduce impacts. ASR01 impacts 5.5 miles of snowmobile trail whereas ASR02 impacts 11 miles. The mileage in ASR02's ROI would cause more of an aesthetic impact. ASR01 would cross the Little Chippewa and Mud Lake, causing moderate and minimal to moderate impacts, respectively. ASR02 crosses no major watercourses or waterbodies. Both routes parallel over 80% with existing infrastructure.
Displacement	●	◒	There are no residences the ROW of any of the routes. There is one non-residential structure within the ROW of ASR02, while there are no non-residential structures within the ROW of ASR01.
Recreation	●	◒	ASR01 has fewer crossings of the Glacial Ridge scenic byway and snowmobile trails. ASR01 has fewer scenic byways and snowmobile trails within the ROI.
Factor C Land-Based Economies			
Agriculture	●	◒	ASR01 has less distance that does not follow existing infrastructure/division lines and does not impact any center pivot irrigation systems. ASR02 has three center pivot irrigation systems in the ROI but none would be impacted by the anticipated alignment.
Mining	●	○	ASR01 would have negligible impacts on mining. ASR02 crosses the workspace of an active mining operation and would cause significant impacts. These impacts would be avoided with route segment N11.
Factor D Archaeological and Historic Resources			
Archaeological	◒	◒	The route widths of both ASR01 and ASR02 cross the boundaries one unevaluated archaeological site, alpha site 21DLf, and therefore have equal potential to impact known archaeological resources.

Routing Factor / Resource	ASR01	ASR02	Summary
Historic			Both of the proposed routes in the Alexandria subregion cross the NRHP eligible historic resource XX-RRD-SOO002/Minneapolis & Pacific Railway Company/Minneapolis, St. Paul & Sault Ste. Marie Railroad: Mainline. In addition, the ROI for both routes contain two unevaluated historic resources. ASR01 and ASR02 would therefore have equal impact on significant historic resources.
Factor E Natural Resources			
Public and Designated Lands			ASR01 and ASR02 would cross a WMA, with ASR01 crossing for a considerably greater length (1,397 feet) than ASR02 (18 feet). ASR01 would have greater vegetation clearing impacts within the ROW and greater impacts to the state's ability to conduct controlled burns in WMAs due to the larger crossing length. ASR02 would cross a WPA, and vegetation clearing within the ROW could impact the function of the WPA. ASR01 would not cross a WPA. Both routes would impact public enjoyment of public lands, as both routes cross public lands. The ROI of ASR02 includes one RIM easement. ASR02 would not cross the RIM easement, and impacts could be avoided during final design.
Soils			Nearly all the soils in the region have a moderate or severe rutting hazard rating. Impacts could be minimized with BMPs or mitigated if long-term re-vegetation impacts extend beyond construction. Impacts to soils would be independent of the route selected.
Surface Water			ASR02 crosses the fewest watercourses (8 crossings) while ASR01 crosses the most watercourses (16 crossings). Each route has one PWI watercourse crossing. ASR01 has one impaired watercourse crossing, while ASR02 has no impaired watercourse crossings. No in-water work would occur.
Wetlands			All routes have some acres of forested wetlands. In the Alexandria Subregion, both route ROWs cross approximately 1.75 acres of forested wetland. Both routes in this subregion cross PWI wetlands: 4 for ASR01 with 13 acres in the ROI, and 8 for ASR02 with 36 acres in the ROI. No route would require crossings greater than 1,000 feet.
Vegetation			ASR01 has the most forested land cover, with 5.1 acres or 1.5% of the total ROW acreage. ASR02 has the least with 2.0 acres or 0.4% of the total ROW acreage.

Routing Factor / Resource	ASR01	ASR02	Summary
Wildlife and Wildlife Habitat			ASR02 would cross GCBAs, establishing new transmission line corridors that could result in avian impacts. ASR02 would cross WPAs and may require transmission structures to be placed within WPAs, impacting the habitat quality and creating an avian collision risk. ASR01 avoids GCBAs and does not cross WPAs. ASR01 would cross two shallow wildlife lakes; construction activities could impact the habitat quality of the lakes and establishment of a new transmission line corridor could create an avian collision risk. ASR02 avoids shallow wildlife lakes. Both routes cross WMAs; ASR01 is expected to have greater impacts to WMA habitat quality and result in more avian impacts relative to ASR02, as ASR01 crosses a WMA frequented by migrating waterfowl for a much longer crossing distance compared to ASR02 (1,397 feet compared to 18 feet, respectively). Both routes follow little to no existing transmission line corridors, and the majority of both routes would not follow existing non-transmission line infrastructure.
Factor F Rare and Unique Natural Resources			
Rare and Unique Natural Resources			The ROW of ASR01 would intersect less than 1 acre of a native plant community with a conservation status of S4 or S5, while ASR02 would intersect 7 acres of a native plant community with a conservation status of S1, S2, or S3. The ROW of ASR01 would intersect less than 1 acre of Sites of Biodiversity Significance ranked moderate and below; ASR02 would intersect 14 acres of Sites of Biodiversity Significance ranked moderate and below. No federally or state protected species have been documented within one mile of route ASR01 and two federally and state protected butterflies and one state protected fish have been documented within one mile of ASR02.
Factor H Paralleling Division Lines -			
Paralleling existing survey lines, natural division lines, and agricultural field boundaries			ASR01 follows more division lines for a larger percent of its length (83.5 percent) than ASR02 (81.9 percent).
Factor J Paralleling Existing Infrastructure Minnesota Statute § 216E.03 - Subdivision 7 (8) (roads/railroads) and (15e)(transmission lines)			
Paralleling existing transportation, pipeline, and electrical transmission systems or rights-of-way.			ASR01 follows existing infrastructure for a larger percentage of its length (26.4 percent) than ASR02 (21.4 percent).

Routing Factor / Resource	ASR01	ASR02	Summary
Factor L Costs			
Costs Dependent on Design and Route			The route with the lowest estimated cost is ASR01 ($95,246,500). The estimated cost of ASR02 is 34% higher than ASR01.

7.2.9 Route Segments for the Alexandria Subregion

No alignment alternatives are included in the Alexandria Subregion. Route segments were included in the scoping decision for the Alexandria Subregion but are not part of Routes ASR01 and ASR02. Rather, they are refinements that would replace a portion of routes ASR01 and ASR02. Figure 7-10 provides the locations of the route segments in the Alexandria Subregion. Table 7-16 summarizes the six route segments in the Alexandria Subregion and indicates which route each would replace a portion of. These replacements are compared to the same portion of the original route that they diverge from, known as route segment equivalents. For purposes of analysis, route segments are considered in standalone comparisons to their route equivalents.

Figure 7-10 - Alexandria Subregion Route Segments

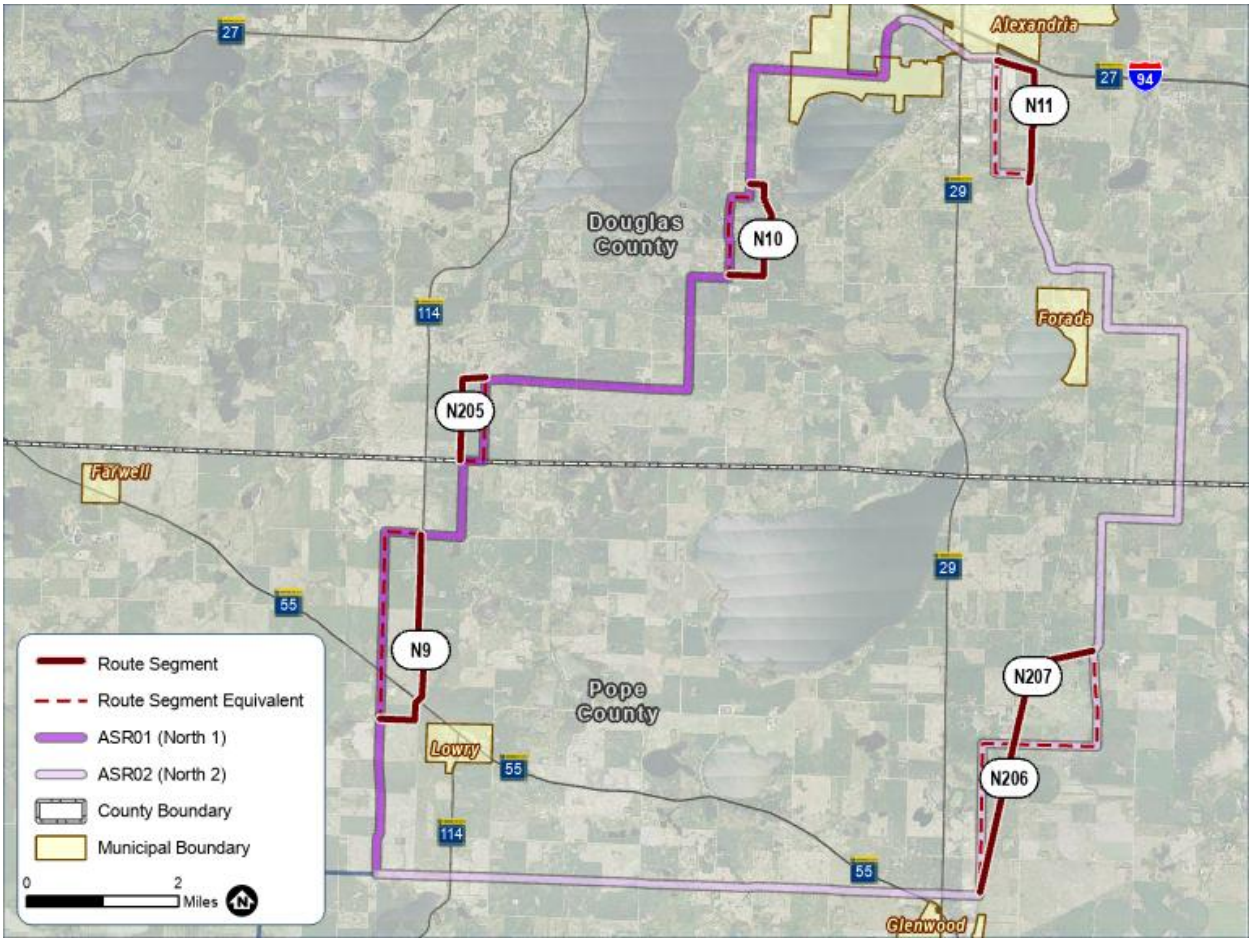


Table 7-16 Alexandria Subregion Route Segments

Routing Alternative	Type	Description
N9	Route Segment	Included by the applicants in the route permit application as an alternative to avoid four additional homes. It can be used to modify route ASR01.
N10	Route Segment	Included by the applicants in the route permit application as an alternative to avoid four additional homes. It can be used to modify route ASR01.
N11	Route Segment	Included by the applicants in the route permit application as an alternative to avoid four additional homes. It can be used to modify route ASR02.
N205	Route Segment	Proposed during scoping to mitigate impacts to residences. It can be used to modify route ASR01.
N206	Route Segment	Proposed by the Commission to increase the sharing of existing ROW by paralleling an existing railroad ROW. It can be used to modify route ASR02.
N207	Route Segment	Proposed by the Commission to increase the sharing of existing ROW by paralleling an existing railroad and transmission line ROW. It can be used to modify route ASR02.

7.2.9.1 Route Segment N9

Route Segment N9 is 3.0 miles long and is an alternative to a part of Route ASR01. Route Segment N9 was proposed by the applicants to mitigate routing constraints at the State Highway 55 crossing. Route Segment N9 is shown on Figure 7-10 and Table 7-17 summarizes differences in potential impacts of Route Segment N9 compared to its equivalent.

Table 7-17 Route Segment N9 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment N9 would follow existing infrastructure (transmission lines, roads, railroads) for 60.8 percent of its length, while its equivalent would not follow existing infrastructure. N9 would follow division lines (field, parcel, or section lines) for 83.8 percent of its length while its equivalent would follow division lines for 100 percent of its length. N9 would parallel less total ROW than its equivalent (83.8 percent and 100 percent, respectively).
Cost	Route Segment N9 costs an estimated $2.2 million (15 percent) more than its equivalent; $17,115,500 compared to $14,894,500 for its equivalent.

Resource	Summary
Human Settlement – Aesthetics	Route Segment N9 would have one residence within 250 feet and six within 1,600 feet. N9's equivalent would have one within 250 feet, one within 500 feet, and three within 1,600 feet. N9 would follow natural division lines for 83.8 percent of its length while its equivalent would follow for 100 percent. N9's equivalent would require 3.6 acres of tree clearing for the ROW, increasing impacts in unbuilt landscapes whereas N9 requires no tree clearing and would have incremental impacts mostly along a roadway in a built landscape. Residences along both routes generally have vegetative screening from the transmission line, however, 3.6 acres of tree clearing results in higher aesthetic impacts overall for N9's equivalent compared to N9.
Human Settlement – Displacement	There are no residential or non-residential structures within the ROW of the route segment or the equivalent.
Human Settlement - Recreation	There are no changes to impacts to recreation.
Land-Based Economies – Agriculture	Route Segment N9 would traverse more agricultural land than its equivalent, but it would parallel more existing infrastructure. Route Segment N9 would require angles along the route in two agricultural fields, increasing impacts to farming operations.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	The ROI for Route Segment N9 contains three historic architectural resources, two of which are ineligible and one of which is eligible for the NRHP. All of these resources are also present within the N9 equivalent ROI. The ROI for the Route Segment N9 equivalent contains these three resources, plus one additional historic architectural resource that is unevaluated for the NRHP. Therefore, the Route Segment N9 equivalent has slightly more potential to impact significant historic resources.
Natural Environment – Public and Designated Lands	Public lands within the ROI of Route Segment N9 and its equivalent include a Pope County WPA, which is owned by USFWS, and the Lowry WMA, which is owned by the DNR. Impacts to the Pope County WPA would not substantially differ between N9 and its equivalent. The N9 equivalent would have greater impacts the Lowry WMA than N9, as the anticipated alignment of the equivalent runs along the eastern edge of the Lowry WMA, while the anticipated alignment of N9 turns away from the Lowry WMA. There are no conservation easement lands within the ROI of N9 or its equivalent.
Natural Environment - Vegetation	Route Segment N9 would have no forested land within its ROW whereas its equivalent would have 3.6 acres, increasing vegetation impacts.
Natural Environment – Wildlife and Wildlife Habitat	N9 and its equivalent intersect an equal acreage of WPAs (4 acres). The equivalent crosses a shallow wildlife lake for a length of 589 feet, N9 entirely avoids this resource. The equivalent intersects more acres of WMAs than N9 (34 acres and 9 acres, respectively).
Natural Environment – Rare and Unique Natural Resources	Neither Route Segment N9 nor its equivalent have any documented records of federal or state protected species within one mile. The ROW of Route Segment N9 would intersect less than 1 acre of a Site of Biodiversity Significance ranked below, while its equivalent would avoid this resource.

Resource	Summary
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Route Segment N9 and its equivalent each have one waterbody and one PWI basin within their ROIs. The equivalent has one PWI basin crossing. Route Segment N9 and its equivalent have two watercourses within their ROIs. They each have one PWI and one impaired stream within the ROIs. N9 has two watercourse crossings and one PWI and one impaired watercourse crossing. Its equivalent has three watercourse crossings, one PWI and one impaired watercourse crossing. These would not require in water work.
Natural Environment – Wetlands and Calcareous Fens	Route Segment N9 would cross more wetlands than its equivalent and have more total length of crossing (approximately 300 feet more). No changes occur between N9 and its equivalent when considering impacts on PWI wetlands or forested wetlands in the ROW.

7.2.9.2 Route Segment N10

Route Segment N10 is 2.1 miles long and is an alternative to a part of Route ASR01. Route Segment N10 was proposed by the applicants to avoid a pinch point paralleling County Road 21 SW between waterbodies and several homes. Route Segment N10 is shown on Figure 7- and Table 7-18 summarizes differences in potential impacts of Route Segment N10 compared to its equivalent.

Table 7-18 Route Segment N10 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment N10 would follow existing infrastructure (transmission lines, roads, railroads) for 11.3 percent of its length, while its equivalent would follow existing infrastructure for 70.1 percent of its length. N10 would follow division lines (field, parcel, or section lines) for 69.9 percent of its length while its equivalent would follow division lines for 77 percent of its length. N10 would parallel less total ROW than its equivalent (69.9 percent and 83 percent, respectively).
Cost	Route Segment N10 is approximately 0.5 miles longer than its equivalent and costs an estimated $2.3 million (22 percent) more; $12,678,500 compared to $10,427,500 for its equivalent.
Human Settlement – Aesthetics	Route Segment N10 has 16 residences within 1,600 feet whereas its equivalent has four within 250 feet, four within 500 feet, and seven within 1,600 feet. While its equivalent has more residences near the alignment, this route parallels existing infrastructure for 70.1 percent of its length and seven of these residences have partial vegetative screening of the route. N10 only parallels 11.3 percent of its length with existing infrastructure, and while it follows natural division lines for 69.9 percent of its length, much of this is forested land that would require clearing for the ROW. One residence on N10 would be unaffected by tree clearing, however, two would be significantly impacted – one of these residences submitted public comment to request specifically avoiding this impact.

Resource	Summary
Human Settlement – Displacement	There are no residential or non-residential structures within the ROW of the route segment or the equivalent.
Human Settlement – Recreation	Route Segment N10 would decrease linear feet of snowmobile trails within the ROI by approximately 4,000 compared to its equivalent.
Land-Based Economies – Agriculture	Route Segment N10 would traverse more agricultural land than its equivalent, and it would parallel less existing infrastructure. Route Segment N10 would cut through two agricultural fields without following natural division lines.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	Route Segment N10 has the potential to impact more significant archaeological resources compared to its equivalent. While one unevaluated historic resource (DK-LAK-0000/Lake Mary Town Hall) is within the ROI of the N10 equivalent and not within the ROI of Route Segment N10, four unevaluated archaeological sites (21DL0119, 21DL0120, 21DL0121, 21DL0123) are within the route width of Route Segment N10, and do not intersect the route width of its equivalent. Sites 21DL0119/Major's Creek Crossing ((reference (240)) and 21DL0121/Lake Andrew II (reference (241)) consist of Woodland period artifact scatters, and sites 21DL0120/Lake Andrew I (reference (242)) and 21DL0123/Mud Lake Overlook(reference (243)) are precontact lithic scatters of unspecified cultural association.
Natural Environment – Public and Designated Lands	There are no conservation easement or public lands within the ROI of Route Segment N10 or its equivalent.
Natural Environment - Vegetation	Route Segment N10 would have 4.9 acres of forested land within its ROW whereas its equivalent would have 0.4 acres. N10 would bisect a contiguously forested area, resulting in moderate vegetation impacts.
Natural Environment – Wildlife and Wildlife Habitat	Route Segment N10 and its equivalent both cross Mud Lake, a shallow wildlife lake. The equivalent crosses Mud Lake twice, parallel to an existing road ROW, with a total crossing length of 224 feet. N10 crosses Mud Lake once, spanning the body of the lake and creating a new infrastructure corridor, with a total crossing length of 895 feet.
Natural Environment – Rare and Unique Natural Resources	Neither Route Segment N10 nor its equivalent have any documented records of federal or state protected species within one mile. The ROW of Route Segment N10 would intersect 3 acres of a Site of Biodiversity Significance ranked below, while its equivalent would intersect less than 1 acre of Sites of Biodiversity Significance ranked moderate and below and less an 1 acre of a native plant community.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Route Segment N10 and its equivalent each have one waterbody and one PWI basin within their ROIs. N10 has one water crossing of a waterbody crossing, PWI waterbody, and impaired waterbody. Its equivalent has three PWI waterbody crossings. N10 and its equivalent each have one watercourse within their ROI. N10 has one watercourse crossing, while its equivalent has three watercourse crossings. None of these crossings are anticipated to require in water work.

Resource	Summary
Natural Environment – Wetlands and Calcareous Fens	Route Segment N10 would cross more wetlands than its equivalent in terms of acreage and in total length of crossing (approximately 300 feet more) when compared to the equivalent. N10 adds in a crossing over 1000 feet as well, potentially necessitating structure placement in wetlands. N10 crosses roughly .3 of an acre more forested wetlands in the ROW versus its equivalent. N10 avoids a PWI wetland.

7.2.9.3 Route Segment N11

Route Segment N11 is 2.1 miles long and is an alternative to a part of Route ASR02. Route Segment N11 was proposed by the applicants to avoid spanning several gravel pits and to parallel the Soo Line Railroad and existing transmission line for a longer duration. Route Segment N11 is shown on Figure 7- and Table 7-19 summarizes differences in potential impacts of Route Segment N11 compared to its equivalent.

Table 7-19 Route Segment N11 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment N11 would follow existing infrastructure (transmission lines, roads, railroads) for 100 percent of its length, while its equivalent would follow existing infrastructure for 4.9 percent of its length. N11 would follow division lines (field, parcel, or section lines) for 65.6 percent of its length while its equivalent would follow division lines for 92.3 percent of its length. N11 would parallel more total ROW than its equivalent (100 percent and 92.3 percent, respectively).
Cost	Route Segment N11 costs an estimated $0.5 million (4 percent) less than its equivalent; $11,569,000 compared to $12,026,500 for its equivalent.
Human Settlement – Aesthetics	Route Segment N11 has two residences within 500 feet and five within 1,600 feet. N11's equivalent has four residences within 1,600 feet, two of which would have partial vegetative screening of the transmission line. N11 would parallel an existing railroad and transmission line ROW for its entire length in an existing built environment, resulting in incremental aesthetic impacts. N11's equivalent would follow existing infrastructure for 4.9 percent of its length and natural division lines for 92.3 percent – these natural division lines would require more tree clearing for the ROW and bisection of a contiguous agricultural field, resulting in higher impacts.
Human Settlement – Displacement	There are no residences within the ROW of N11 or its equivalent. There are no non-residential structures within the ROW of N11, but there is one non-residential structure within the ROW of its equivalent.
Human Settlement – Recreation	Route Segment N11 would increase linear feet of snowmobile trails within the ROI by approximately 5,000 compared to its equivalent.

Resource	Summary
Land-Based Economies – Agriculture	Route Segment N11 would traverse more agricultural land than its equivalent, but it would entirely parallel existing infrastructure. Route Segment N11 would cut through fewer agricultural fields that do not follow natural division lines.
Land-Based Economies – Mining	Route Segment N11 would remove two active commercial aggregates (ASIS 21018 and ASIS 21059) from the route width compared to its equivalent. This would relieve significant impacts on one of the aggregates (ASIS Route 21059) due to the anticipated alignment of ASR02 cutting through the mining workspace. Route Segment N11 would parallel the western boundary of the workspace of an additional commercial aggregate (ASIS 21067), but it would entirely parallel existing infrastructure.
Archaeological and Historic Resources	The ROI for Route Segment N11 contains four historic architectural resources, two of which are unevaluated for the NRHP (DL-HUD-00005/Bridge No. 21815 and DL-HUD-00006/Bridge No. 21816) and two of which are not eligible for the NRHP. Conversely, the Route Segment N11 equivalent crosses the same two ineligible historic resources but does not include the unevaluated resources in the ROI. Therefore, Route Segment N11 has greater potential to impact significant historic resources than its equivalent.
Natural Environment – Public and Designated Lands	Route Segment N11 crosses the Douglas County WPA while its equivalent avoids crossing the Douglas County WPAs. Conservation easements within the ROI of N11 and its equivalent include a wetland restoration RIM easement land; neither anticipated alignment crosses the easement, and it is anticipated to be avoided during final design.
Natural Environment - Vegetation	Route segment N11 would have no forested land within its ROW whereas its equivalent would have 1.3 acres.
Natural Environment – Wildlife and Wildlife Habitat	Route Segment N11 intersects more acres of WPAs than its equivalent (90 acres and 66 acres, respectively), and only N11 crosses WPAs. Both N11 and its equivalent cross GBCAs, with the equivalent intersecting slightly more acreage than N11 (274 acres and 269 acres, respectively).
Natural Environment – Rare and Unique Natural Resources	Both Route Segment N11 and its equivalent have one record of a state threatened species within one mile; no records of federal or state protected species have been documented within the ROW of Route Segment N11 or its equivalent. No sensitive ecological resources intersect the ROW of Route Segment N11 or its equivalent.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Route Segment N11 and its equivalent each have one unnamed waterbody within their ROIs. N11 has no waterbody crossings, while its equivalent has three waterbody crossings. Neither N11 nor its equivalent have watercourses within their ROIs.
Natural Environment – Wetlands and Calcareous Fens	Route Segment N11 would cross fewer wetlands than its equivalent but not in total length of crossing (where it is approximately 1200 feet longer). N11 crosses roughly a quarter acre fewer acres of forested wetlands in the ROW versus its equivalent. No changes occur between N11 and its equivalent when considering impacts PWI wetlands.

7.2.9.4 Route Segment N205

Route Segment N205 is 1.3 miles long and is an alternative to a part of Route ASR01. Route Segment N205 was proposed to mitigate impacts to federally protected USFWS lands. Route Segment N205 is shown on Figure 7- and Table 7-20 summarizes differences in potential impacts of Route Segment N205 compared to its equivalent.

Table 7-20 Route Segment N205 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment N205 would not follow any existing infrastructure (transmission lines, roads, railroads), while its equivalent would follow existing infrastructure for 80 percent of its length. Both N205 and its equivalent would follow division lines (field, parcel, or section lines) for 100 percent of their lengths. Both N205 and its equivalent parallel ROW for 100 percent of their lengths.
Cost	Route Segment N205 costs an estimated $1.9 million (22 percent) less than its equivalent; $6,742,000 compared to $8,595,500 for its equivalent.
Human Settlement – Aesthetics	Route Segment N205 would box in a residential parcel on two boundaries of its property, however, this residence requested this alternative route as a mitigation to the transmission line being in front of their home. N205 would result in moderate impacts to this property as there are vegetative buffers that would partially screen the route on both boundaries. N205's equivalent would be within 500 feet of this residence, but would not box the property in. N205's equivalent has one residence within 1,600 feet whereas N205 has two residences within 1,600 feet. N205 does not follow any existing infrastructure as its equivalent does for 80 percent of its length, but N205 does follow natural division lines for 100 percent of its length. Aesthetic impacts are higher for N205's equivalent due to the impacted residence's preference and because other aesthetic impacts are similar.
Human Settlement – Displacement	There are no residential or non-residential structures within the ROW of the route segment or the equivalent.
Human Settlement – Recreation	There are no changes to impacts to recreation.
Land-Based Economies – Agriculture	Route Segment N205 would traverse less agricultural land than its equivalent, but it would parallel less existing infrastructure. Route Segment N205 would cut through two agricultural fields without following natural division lines.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	One cemetery, Johnny Thoen Farm Burial Site/Oscar Lake Lutheran Cemetery Historic Site, is located within the ROI of Route Segment N205 and its equivalent, because it is mapped at the PLS township level. Impacts to Johnny Thoen Farm Burial Site/Oscar Lake Lutheran Cemetery Historic Site are not anticipated, regardless of the alternative selected.
Natural Environment – Public and Designated Lands	There are no conservation easement or public lands within the ROI of Route Segment N205 or its equivalent.

Resource	Summary
Natural Environment - Vegetation	Both Route Segment N205 and its equivalent have no forested land within their ROW.
Natural Environment – Wildlife and Wildlife Habitat	The local vicinity of Route Segment N205 intersects 9 acres of the Lowry WMA and 4 acres of the Pocket Lake WPA; the equivalent avoids these resources.
Natural Environment – Rare and Unique Natural Resources	Neither Route Segment N205 nor its equivalent have any documented records of federal or state protected species within one mile. No sensitive ecological resources intersect the ROW of Route Segment N205 or its equivalent.
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Route Segment N205 and its equivalent have no waterbodies or crossings within their ROI. N205 and its equivalent have no watercourses or crossings within their ROI.
Natural Environment – Wetlands and Calcareous Fens	Route Segment N205 would cross more wetlands than its equivalent. No changes occur between N205 and its equivalent when considering impacts on PWI wetlands or forested wetlands.

7.2.9.5 Route Segment N206

Route Segment N206 is 2.1 miles long and is an alternative to a part of Route ASR02. Route Segment N205 was proposed to mitigate impacts to federally protected USFWS lands. Route Segment N206 is shown on Figure 7- and Table 7-21 summarizes differences in potential impacts of Route Segment N206 compared to its equivalent.

Table 7-21 Route Segment N206 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment N206 would follow existing infrastructure (transmission lines, roads, railroads) for 97.4 percent of its length, while its equivalent would follow existing infrastructure for less than one percent of its length. N206 would follow division lines (field, parcel, or section lines) for 97.41 percent of its length, while its equivalent would follow division lines for 83 percent of its length. N205 would parallel more ROW than its equivalent (100 percent and 90.2 percent, respectively).
Cost	Route Segment N206 costs an estimated $1.6 million (12 percent) less than its equivalent; $11,178,500 compared to $12,731,500 for its equivalent.

Resource	Summary
Human Settlement – Aesthetics	Route Segment N206 would increase impacts three residences, one within 250 feet of the alignment and one within 500 feet. N206's equivalent has six residences within 1,600 feet of the alignment and none nearer whereas N206 has five residences within 1,600 feet in addition to those nearer. N206 would parallel a railroad ROW in an existing built environment, resulting in incremental aesthetic impacts whereas its equivalent would follow existing infrastructure for less than one percent of its length and natural division lines for 83 percent of its length. N206 and its equivalent represent a trade off in impacts to three residences (N206) or new features in an unbuilt environment that partially does not follow natural division lines (N206 equivalent).
Human Settlement – Displacement	There are no residential or non-residential structures within the ROW of the route segment or the equivalent.
Human Settlement - Recreation	There are no changes to impacts to recreation.
Land-Based Economies – Agriculture	Route Segment N206 would traverse less agricultural land than its equivalent, and it would entirely parallel existing infrastructure.
Land-Based Economies – Mining	Route Segment N206 would remove paralleling on east side of the workspace of a commercial aggregate (ASIS 61076) compared to its equivalent.
Archaeological and Historic Resources	There are no documented archaeological or historic resources within Route Segment N206 or its equivalent.
Natural Environment – Public and Designated Lands	There are no conservation easement or public lands within the ROI of Route Segment N206 or its equivalent.
Natural Environment - Vegetation	Route Segment N206 would have 0.5 acres of forested land within the ROW whereas its equivalent would have none.
Natural Environment – Wildlife and Wildlife Habitat	Route Segment N206 and its equivalent would both cross GBCAs, with the equivalent intersecting slightly more acres than N206 (299 acres and 270 acres, respectively).
Natural Environment – Rare and Unique Natural Resources	Neither Route Segment N206 nor its equivalent have any documented records of federal or state protected species within one mile. The ROW of Route Segment N206 would intersect more acres of a Site of Biodiversity Significance ranked below (10 acres versus 2 acres for its equivalent).
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Route Segment N206 and its equivalent both have waterbodies within their ROIs, but the equivalent has one PWI basin where N206 does not. The equivalent has two waterbody crossings and one PWI basin crossing. There are no watercourses within the ROI for N206 or its equivalent.
Natural Environment – Wetlands and Calcareous Fens	Route Segment N206 would cross fewer wetlands and has a shorter total length of crossings than its equivalent and in total length of crossing (at approximately 1900 feet less). No changes occur between N206 and its equivalent when considering impacts on PWI wetlands or forested wetlands in the ROW.

7.2.9.6 Route Segment N207

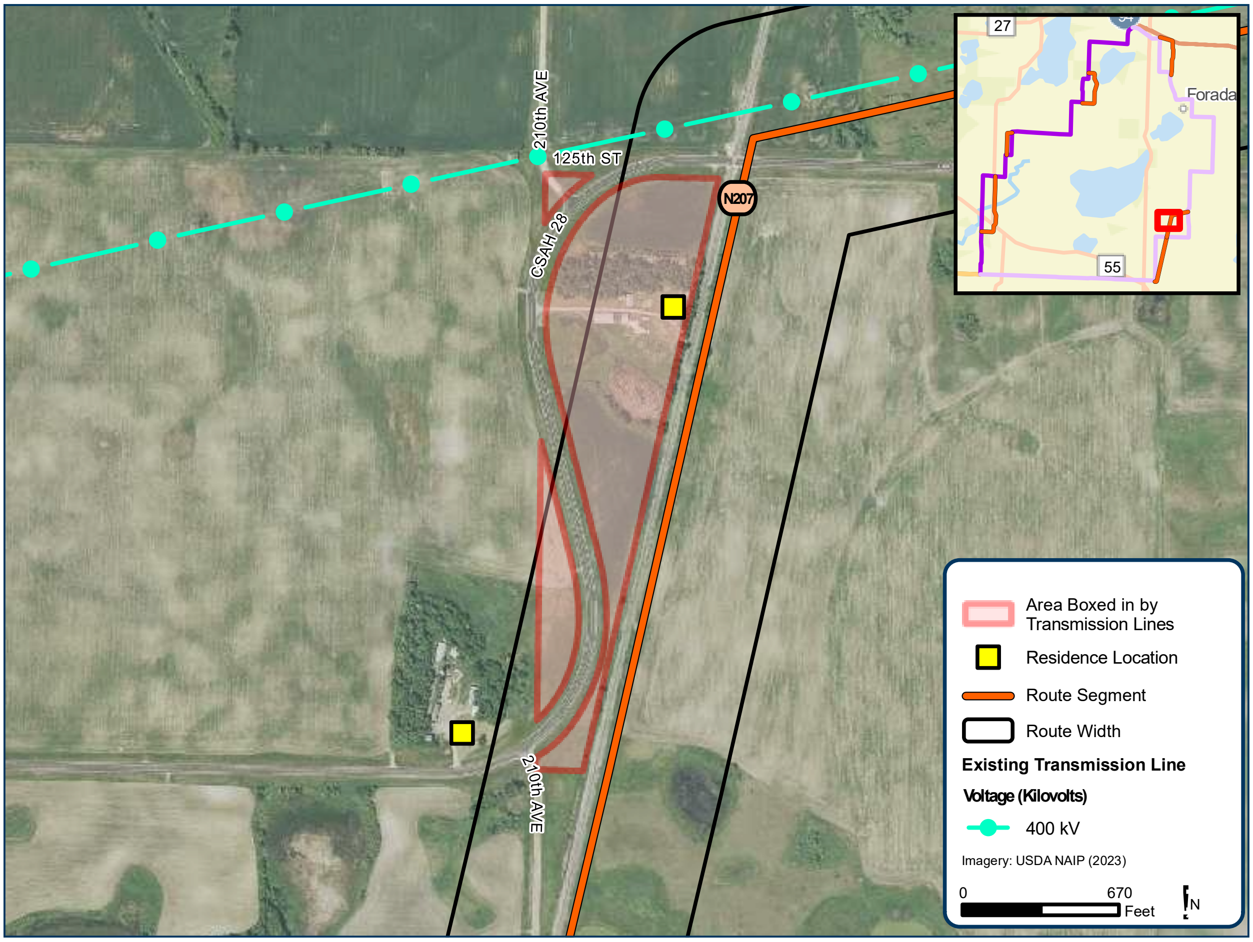
Route Segment N207 is 1.8 miles long and is an alternative to a part of Route ASR02. Route Segment N207 was proposed to mitigate impacts to federally protected USFWS lands. Route Segment N207 is shown on Figure 7- and Table 7-22 summarizes differences in potential impacts of Route Segment N207 compared to its equivalent.

Table 7-22 Route Segment N207 vs Its Equivalent Impacts Summary

Resource	Summary
ROW Paralleling and Sharing	Route Segment N207 would follow existing infrastructure (transmission lines, roads, railroads) for 99.2 percent of its length, while its equivalent would follow existing infrastructure for less than one percent of its length. N207 would follow division lines (field, parcel, or section lines) for 57.1 percent of its length, while its equivalent would follow division lines for 66.9 percent of its length. N207 would parallel more ROW than its equivalent (99.2 percent and 68.3 percent, respectively).
Cost	The cost estimates for Route Segment N207 and its equivalent are nearly identical; $11,011,000 compared to $10,990,500 for its equivalent.
Human Settlement – Aesthetics	Route Segment N207 would box in one residential parcel with an existing transmission line as shown in Figure 7-11. This residence would be subject to significant aesthetic impacts. Route Segment N207's equivalent would not box in or create pinch points with existing transmission lines for any residences or parcels. Route Segment N207 has one residence within 250 feet that its equivalent does not and one less residence within 500 feet than its equivalent. N207 has three residences within 1,600 feet whereas its equivalent has two. N207 would route near a railroad ROW in an existing built environment, resulting in incremental aesthetic impacts, however, would still cause significant impacts for one residence whereas it's equivalent would not. N207 has a residence closer to the alignment and one more residence overall than its equivalent, thus aesthetic impacts are higher for N207.
Human Settlement – Displacement	There are no residential or non-residential structures within the ROW of the route segment or the equivalent.
Human Settlement – Recreation	Route Segment N207 would increase the linear feet of scenic byway in the route width compared to its equivalent.
Land-Based Economies – Agriculture	Route Segment N207 would traverse less agricultural land than its equivalent, and it would parallel more existing infrastructure. Route Segment N207 would cut through fewer agricultural fields that do not following natural division lines.
Land-Based Economies – Mining	There are no changes to impacts to mining.
Archaeological and Historic Resources	There are no documented archaeological or historic resources within Route Segment N207 or its equivalent.

Resource	Summary
Natural Environment – Public and Designated Lands	There are no conservation easement or public lands within the ROI of Route Segment N207 or its equivalent.
Natural Environment - Vegetation	Both Route Segment N207 its equivalent would have no forested land within their ROW.
Natural Environment – Wildlife and Wildlife Habitat	Route Segment N207 and its equivalent both cross GBCAs, with the equivalent intersecting more acres than N207 (155 acres and 26 acres, respectively).
Natural Environment – Rare and Unique Natural Resources	Neither Route Segment N207 nor its equivalent have any documented records of federal or state protected species within one mile. The ROW of Route Segment N207 would intersect more acres of a Site of Biodiversity Significance ranked below (8 acres versus 5 acres for its equivalent).
Natural Environment – Soils	There are no changes to impacts on soil resources.
Natural Environment – Surface Water	Route Segment N207 and its equivalent each have one waterbody within their ROI, and neither of them have any waterbody crossings. N207 and its equivalent each have one watercourse within their ROIs, but the equivalent has two watercourse crossings while N207 has none.
Natural Environment – Wetlands and Calcareous Fens	Route Segment N207 would cross more wetlands than its equivalent and in total length of crossing (approximately 1800 feet more). No changes occur between N207 and its equivalent when considering impacts on PWI wetlands or forested wetlands in the ROW.

Figure 7-11 Alexandria Subregion Areas Boxed in by N207



8 Associated Facilities – Potential Impacts and Mitigation

This chapter provides an overview of the human and environmental resources that could be affected by the new fiber optic regeneration station as well as the associated mitigation measures. Expansions and modifications to the existing Big Stone South Substation in Big Stone City, South Dakota and the Alexandria Substation in Alexandria, Minnesota are required for the project.

8.1 Big Stone South Substation Expansion

The existing Big Stone South Substation is the western endpoint of the project in Grant County, South Dakota one mile west of Big Stone City. The existing ring bus configuration would be modified to a breaker and half configuration by adding one additional row to the 345 kV portion of the substation. This new row would allow for additional reactive power equipment and new breaker positions on the transmission line to the Alexandria Substation.

The currently fenced area for the Big Stone South Substation would be expanded on land owned by Otter Tail Power Company to accommodate the new equipment. The Big Stone South Substation is entirely in South Dakota, therefore potential impacts from the expansion are not analyzed as part of this EIS. Additionally, permits from the state of South Dakota would be obtained for the expansion and the transmission line portions of the project in that state.

8.2 Fiber Optic Regeneration Substation

A new fiber optic regeneration station may be needed along the permitted route to amplify and regenerate optical communications between substations if another communication connection is not available. Fiber optic regeneration stations are typically required when the line length exceeds 75 miles. The applicants anticipate constructing this new building within the Central Region within the permitted route width. The exact placement depends on the route chosen by the Commission for the final route permit.

The equipment required to regenerate optical communications would be placed within a new shelter building approximately 15-feet by 25-feet and 15 feet above grade. The final footprint would be approximately 100-feet wide by 100-feet long (0.23 acre). This area would be permanently fenced, covered with gravel, and may have low wattage flood lighting on the outside of the shelter building for security purposes.

8.2.1 Potential Impacts

The applicants state that they will attempt to locate the fiber optic regeneration station in a previously disturbed area to avoid potential habitats associated with protected wildlife and plant species. In addition, the applicants state the fiber optic regeneration station will not be within delineated wetlands or immediately adjacent to surface water features. A temporary construction workspace of 150 feet by 200 feet (0.69 acre) would be needed to construct the fiber optic regeneration station.

The applicants anticipate using a battery bank or a propane generator for backup power, which would operate intermittently for monthly maintenance and during power outages. Backup power would be within the fenced footprint of the fiber optic regeneration station, where it will be kept free of vegetation and adequate drainage will be maintained. No water supply is required for construction or operation of the fiber optic regeneration station. A new 30-foot-wide permanent access road would be needed for the fiber optic regeneration station which would change the land cover type and function along with the building footprint. Underground 240-volt electrical utilities would be required.

8.2.2 Mitigation

Because the site for the fiber optic regeneration station is unknown, specific mitigation is difficult to ascertain. However, the fiber optic regeneration station would be sited within the permitted route width, and the permitted route would presumably be chosen to mitigate the most impacts among routing options per the factors that must be considered when the Commission makes a decision (Section 2.2.1). The Commission could consider including a special permit condition requiring the applicants to site the fiber optic regeneration station in a previously disturbed area to decrease potential impacts to agriculture, residences, wetlands, habitats, and the like. The Commission could also include a special permit condition prohibiting the applicants from siting the fiber optic regeneration station in an area that would cause displacement or impacts to wetlands, habitats, and the like if impacts can be avoided. Regardless, construction spaces and practices would be subject to standard route permit conditions that reduce impacts to soils, topography, soils, water resources, and the like.

8.3 Alexandria Substation Expansion

The existing Alexandria Substation is the terminus of the project southwest of the city of Alexandria, Minnesota, south of Interstate 94. New substation equipment necessary to accommodate the transmission line would be installed including termination structures, circuit breakers, reactive power equipment, relays, and associated control equipment. This expansion would be 4 to 6 acres from the existing fenced area and require purchase of additional land that would support the overall project's termination position.

The Alexandria Substation expansion was analyzed in an Environmental Assessment completed for the Alexandria to Big Oaks 345 kV Transmission Project (eDockets No. TL-23-159) that was ultimately issued a route permit. The Alexandria Substation expansion is considered an associated facility in requirement 2.2 of the route permit issued for the Alexandria to Big Oaks 345 kV Transmission Project. Thus, construction for the Alexandria Substation expansion has already been authorized and may commence before the route permit decision for the Big Stone South to Alexandria Project is made. The potential impacts and mitigation information provided below is a reiteration of the environmental review that was already conducted for this part of the project. Both the Alexandria to Big Oaks 345 kV Transmission Project and Big Stone South to Alexandria Project will require and use the Alexandria Substation expansion.

The equipment and improvements required inside the Alexandria Substation will be owned solely by Western Minnesota Municipal Power Agency. The route permit issued for the Alexandria to Big Oaks 345 kV Transmission Project covers the tap line along 0.2 miles of new ROW with one new structure.

8.3.1 Potential Impacts

Human and environmental impacts associated with the expansion and continued operation of the Alexandria Substation would be incremental and blend with current operations. As such, potential impacts are anticipated to be negligible and are not discussed in-depth.

According to the NWI database there are two wetlands (0.23 acres) within the proposed expansion area for the Alexandria Substation. These wetlands are classified as a seasonally flooded basin (0.01 acres) and hardwood forest wetland (0.22 acres). The applicants for the Alexandria to Big Oaks 345 kV Transmission Project stated they will complete a field wetland delineation to confirm the boundaries of these two wetlands as well as consult with the local government unit and USACE prior to construction.

At the Alexandria Substation, short duration outages of specific pieces of equipment will be required to connect the project into the substation and for relay and communication testing. Outages at the Alexandria Substation will be submitted and granted by MISO with no customer outages expected.

8.3.2 Mitigation

Measures to mitigate potential impacts caused by construction and operation of the expanded Alexandria Substation would be similar to mitigation measures discussed for the routing alternatives in Chapter 4. Additionally, the route permit issued for the Alexandria to Big Oaks 345 kV Transmission Project has several requirements for mitigating impacts to wetlands and agricultural lands, which are the main impacts of this expansion. If permanent fill is required in wetlands, those permanent impacts would be permitted with the applicable agencies. Western Minnesota Municipal Power Agency would coordinate with landowners for land acquisition and negotiation.

9 Unavoidable Impacts and Irreversible and Irretrievable Commitments of Resources

This chapter describes unavoidable impacts as well as irreversible and irretrievable commitments of resources.

9.1 Unavoidable Impacts

Resource impacts are unavoidable when an impact cannot be avoided even with mitigation strategies.

Transmission lines are infrastructure projects that have unavoidable adverse human and environmental impacts. These potential impacts and the possible ways to mitigate against them were discussed in the previous chapters. However, even with mitigation strategies, certain impacts cannot be avoided.

Unavoidable adverse impacts associated with construction of the project include:

- Possible traffic delays and fugitive dust on roadways
- Visual and noise disturbances
- Potential impacts to agricultural operations, such as crop losses
- Soil compaction and erosion
- Vegetative clearing; permanent removal of trees and changes to wetland type and function
- Disturbance and temporary displacement of wildlife, as well as direct impacts to wildlife inadvertently injured during construction activities
- Disturbance to users of recreational areas
- Minimal habitat loss
- Converting the underlying land use to an industrial use (fiber optic regeneration station)
- Potential impacts to wetlands, to be confirmed after delineations are completed
- Criteria pollutant GHG emissions

Unavoidable adverse impacts associated with the operation of the project include:

- Depending on the final alignment, potential displacement of residences or other buildings that cannot be avoided in the Swift Subregion
- Visual impact of structures, conductors, and the fiber optic regeneration station

- Change in landscape character and any subsequent impact to cultural values
- Loss of land use for other purposes, such as agriculture, where structures are placed and ROW is maintained
- Potential loss of prime farmland where structures are placed in the ROW
- Injury or death of avian species that collide with, or are electrocuted by, conductors
- Potential impacts to rare and unique resources such as MBS sites of biodiversity significance, NPCs, WPAs, Lakes of Biological Significance, calcareous fens, and conservation easements such as CREP and RIM
- Interference with AM radio signals
- Potential decrease to property values
- Potential impacts to wetlands, to be confirmed after delineations are completed
- Conversion of forested areas in maintained ROW; continued maintenance of tall-growing vegetation such as trees
- Criteria pollutant GHG emissions
- Increased EMF on the landscape (potential impacts from EMF are minimal and are not expected to impact human health)

9.2 Irreversible and Irretrievable Commitments of Resources

Resource commitments are irreversible when it is impossible or very difficult to redirect that resource to a different future use; an irretrievable commitment of resources means the resource is not recoverable for later use by future generations.

Irreversible impacts include the land required to construct the transmission line. While it is possible that the structures, conductors, and the fiber optic regeneration station could be removed and the ROW/land restored to previous conditions, this is unlikely to happen in the reasonably foreseeable future (approximately 50 years). The loss of forested wetlands is considered irreversible, because replacing these wetlands would take a significant amount of time. Certain land uses within the ROW will no longer be able to occur, especially at the fiber optic regeneration station.

An irretrievable commitment of resources means the resource is not recoverable for later use by future generations. These impacts are primarily related to project construction, including the use of water, aggregate, hydrocarbon fuels, steel, concrete, wood, and other consumable resources. The commitment of labor and fiscal resources is also considered irretrievable.

10 Cumulative Potential Effects

Cumulative potential effects result from the incremental effects of a project in addition to other projects in the environmentally relevant area. Consideration of cumulative potential effects is intended to aid decision-makers so that they do not make decisions about a specific project in a vacuum. Effects that may be minimal in the context of a single project may accumulate and become significant when all projects are considered.

Minnesota Rules 4410.0200, subpart 11a, defines cumulative potential effects, in part, as the "effect on the environment that results from the incremental effects of a project in addition to other projects in the environmentally relevant area that might reasonably be expected to affect the same environmental resources, including future projects ... regardless of what person undertakes the other projects or what jurisdictions have authority over the project."

Consideration of cumulative potential effects is intended to aid decision-makers so that they do not make decisions about a specific project in a vacuum. Effects that may be minimal in the context of a single project may accumulate and become significant when all projects are considered. Cumulative potential effects—where they coincide—increase or decrease the breadth of the impact to the resources and elements studied in this EIS. This may or may not change the impact intensity level assigned to the resource or element.

The "environmentally relevant area" includes locations where the potential effects of the project coincide with the potential effects of other projects that could impact the human and/or environmental resources studied in this EIS. Generally, this area includes the ROI identified in the assessment of each resource.

Cumulative effects are discussed here for projects that are currently happening or are reasonably likely to occur with construction or operation schedules that would overlap the project's or are otherwise foreseeable within the environmentally relevant area. Cumulative potential effects focus on current or future projects. The aggregate effects from past projects with overlapping footprints contribute to the conditions of the existing landscape in the environmentally relevant geographic area.

To identify projects that are currently happening or are planned with construction schedules that overlap the project's, the websites of agencies/local governments were reviewed, and in some cases agencies/local governments were directly contacted to identify current and reasonably foreseeable future projects that are located within areas traversed by the project; these included: the Minnesota Environmental Quality Board, Commission, Department, MnDOT, BWSR, MPCA, and DNR. In addition, the websites for Big Stone, Lac qui Parle, Swift, Stevens, Pope, and Douglas counties and associated Soil and Water Conservation Districts for each county were reviewed; as well as larger municipalities in the area, including the city of Ortonville, Hancock and Alexandria.

Current and reasonably foreseeable future projects are summarized in Table 10-1 and shown on Figure 10-1. The foreseeable future projects are scattered across the project and all but one of the projects identified, the Fern-Roth 40 MW Solar Farm in the Alexandria Subregion, are culvert replacement projects or transportation-related projects, which generally include routine maintenance and repair activities. The MnDOT website was used to identify state-level projects (Districts 4 and 8) that intersect or are adjacent to routing alternatives or associated facilities. Local transportation projects were identified by reaching out to the counties crossed by the project. While the entire extents of relevant MnDOT projects are shown on Figure 10-1, the locations of local transportation projects are identified at the point of the nearest proximity to this project. While these transportation-related projects would provide long-term benefits to the area, their potential for cumulative effects would generally be minimal and tied to short-term construction related effects. Continued coordination efforts with MnDOT would be required to confirm the status of planned MnDOT projects.

It is assumed that the construction-related impacts of these foreseeable projects are short-term, for example, construction impacts may cause local disturbances, such as increased noise levels, fugitive dust, and traffic delays/and reroutes. Thus, the cumulative potential effects discussion is focused on potential long-term impacts.

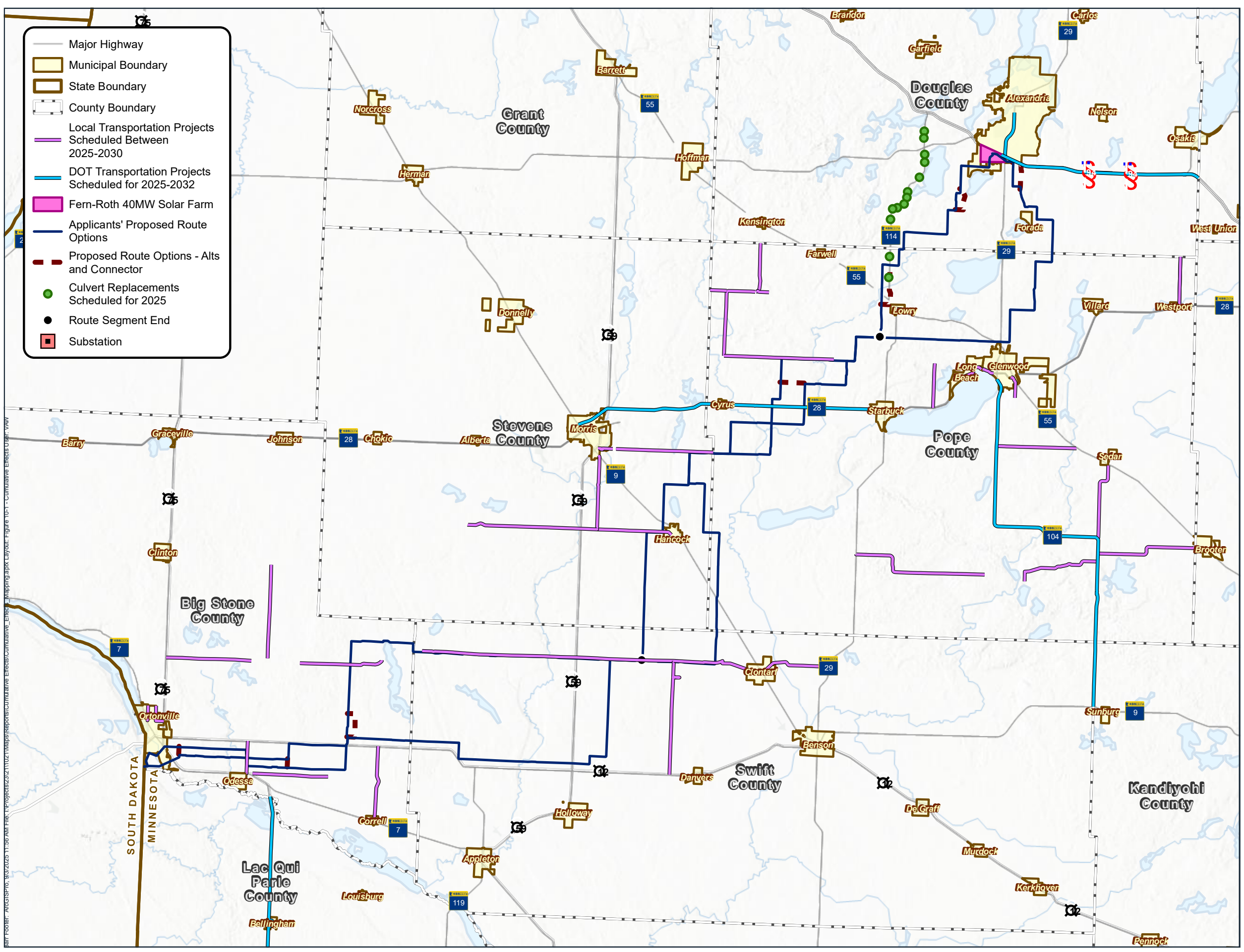
Table 10-1 Current and Reasonably Foreseeable Future Projects

Project Name	Description	Location	Source
Fern-Roth 40 megawatt (MW) Solar Farm	SolarGen of Minnesota, LLC and Allied Solar, LLC, are proposing a 40 MW solar electrical generation facility on 241 acres in Lake Mary Township, Douglas County. Facility construction includes site grading; installation of racking, panels, equipment and fencing; and final landscaping. Estimated facility lifespan is 25-years, after which all equipment and appurtenances will be removed and the land restored.	North Region, Alexandria Subregion	https://webapp.pca.state.mn.us/eqb-search/project-detail/53478?siId=53478-PROJ0000000001
Hwy 28 Morris to Starbuck	In 2026, the MnDOT will resurface Highway 28 from Morris to Starbuck, including reconstructing the roadway in Cyrus. -Robust resurfacing (reclaim) from Morris to Starbuck -Culvert replacements from Morris to Starbuck -Guardrail repairs -Bridge repairs east of Cyrus -Utility replacements in Cyrus -Sidewalk upgrades in Cyrus	Pope County	https://www.dot.state.mn.us/d4/projects/hwy28morris-starbuck/index.html
Hwy 29 - 8th Avenue to 18th Avenue, Alexandria	The MnDOT is partnering with the City of Alexandria for the 2028 reconstruction project on Highway 29. The project will address pavement concerns, pedestrian accessibility (ADA) requirements and include traffic signal work.	North Region, Alexandria Subregion	https://www.dot.state.mn.us/d4/projects/hwy298thave/index.html

Project Name	Description	Location	Source
I-94 Overlay & Bridge Improvements	The MnDOT completed concrete resurfacing (unbonded concrete overlay) on westbound Interstate 94 from Alexandria to the Douglas/Todd County line near Osakis. There are seven bridges total on the project, four of which will include full replacements of the eastbound and westbound bridges that cross the Canadian Pacific (CP) Railway and County Road 23. Construction is being completed over two years. In 2024, westbound I-94 closed for concrete resurfacing and bridge work/replacements. In 2025, eastbound I-94 will close near the CR 23 and CP Railway bridges for eastbound bridge replacements. Motorists can expect to encounter crossovers and head-to-head traffic in this area during construction. The overall project will address identified needs of pavement condition and ride quality, and guardrail improvements to improve safety and reduce ongoing maintenance costs.	North Region, Alexandria Subregion	https://www.dot.state.mn.us/d4/projects/alex94bridges/index.html
Hwy 114 Highway 55 near Lowry to Interstate 94	Starting in May 2025, the MnDOT will construct a roundabout at the intersection of Highway 114 and Highway 27 and replace culverts between Highway 55 near Lowry to Interstate 94. Then, in 2026, MnDOT will resurface Highway 114 from Highway 55 to Interstate 94.	North Region, Alexandria Subregion	https://www.dot.state.mn.us/d4/projects/hwy114lowry-94/index.html
Pope County Road Construction/Maintenance Projects	Various road improvement projects including milling, paving, and overlays.	Central Region, White Bear Lake Subregion and Cyrus Subregion	Data received from Pope County
City of Alexandria Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays.	North Region, Alexandria Subregion	Data received from Douglas County
Big Stone County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays.	Central Region, Swift Subregion; South Region, Big Stone Subregion	Data received from Big Stone County
Stevens County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays.	Central Region, Swift Subregion and Hancock Subregion	Data received from Stevens County

Project Name	Description	Location	Source
Swift County Road Construction/ Maintenance Projects	Various road improvement projects including milling, paving, and overlays.	Central Region, Swift Subregion and Hancock Subregion	Data received from Swift County
Culvert Repairs	-Placing plastic liners inside existing pipes -Fixing separated joints between pipe sections on larger concrete culverts -Replacing unrepairable culverts -Placing riprap to repair and prevent erosion -Cleaning ditches adjacent to culverts	North Region, Alexandria Subregion	https://www.dot.state.mn.us/d8/projects/districtwide-culverts/index.html

Figure 10-1 Cumulative Potential Effects



10.1 Human Settlement

This project, in combination with the Fern-Roth 40 MW Solar Farm, could interact to result in cumulative effects on aesthetics in the Alexandria Subregion. In this area, the visual setting would further transition to a more developed and industrial landscape. However, this area already contains existing transmission lines, a highway, and industrial facilities; as such, cumulative effects on aesthetics would be minimal. Given the short-term nature of the transportation projects and culvert replacement projects in the area, cumulative effects on aesthetics from these projects are not anticipated.

10.2 Human Health and Safety

This project, in combination with the Fern-Roth 40 MW Solar Farm, could interact to result in cumulative effects on human health and safety. This project, in combination with the Fern-Roth 40 MW Solar Farm, would add to background EMF levels in the northern part of the Alexandria Subregion. As a permit condition, the Commission imposes a maximum electric field limit of 8 kV/m for new transmission projects. The EMF generated by solar arrays, such as the Fern-Roth 40 megawatt Solar Farm, is at the level generally experienced near common household appliances, which would be consistent with the Commission's limit. The potential human health impacts related to induced voltages are anticipated to be minimal. In general, it is anticipated that this project in combination with the Fern-Roth 40 MW Solar Farm would have minimal impacts on human health and safety when operational. Given the short-term nature of the transportation projects and culvert replacement projects in the area, cumulative effects on human health and safety from these projects are not anticipated.

10.3 Land-based Economies

This project, in combination with the Fern-Roth 40 MW Solar Farm, could interact to result in minimal cumulative effects on land-based economies. Cumulative effects on land-based economies may occur as a result of conversion of more agricultural land to land developed with energy infrastructure. The Fern-Roth 40 MW Solar Farm would result in more land use conversion than this project, as agricultural activity would generally not be able to continue in the area, whereas much of the land underneath transmission lines can still be farmed. However, lost farming revenues from solar projects tend to be offset by easement agreements. Given that the transportation projects and culvert replacement projects in the area would occur on existing infrastructure and would not alter land use, cumulative effects on land-based economies from these projects are not anticipated.

10.4 Archaeological and Historic Resources

This project, in combination with the Fern-Roth 40 MW Solar Farm, could interact to result in minimal to moderate cumulative effects on archaeological and historic architectural resources. Any time new ground disturbance would occur as the result of a project, there is the potential to impact significant archaeological and historic architectural resources. However, survey and identification of these resources during project planning stages can help determine the presence of these resources. Once identified, prudent routing and/or efforts to avoid or minimize impacts to these resources would reduce the potential for cumulative effects. Given that the transportation projects and culvert replacement projects in the area would occur on existing infrastructure and would not alter land use, cumulative effects on archaeological and historic resources from these projects are not anticipated.

10.5 Natural Environment

This project, in combination with the Fern-Roth 40 MW Solar Farm, could interact to result in minimal effects on the natural environment. The location where this project intersects the Fern-Roth 40 megawatt Solar Farm is largely agricultural, along roadways, or otherwise disturbed. This project and the Fern-Roth 40 MW Solar Farm are expected to be designed to avoid or span surface waters to the extent practicable; as such, the potential for cumulative effects on surface waters are anticipated to be negligible. Cumulative potential effects on wildlife and associated habitat could occur as a result of vegetation clearing and associated habitat conversion; however, where this project intersects the Fern-Roth 40 MW Solar Farm, the landscape is primarily industrial or agricultural and similar agricultural habitat is abundant in the vicinity, with minimal native habitat. This project, in combination with the Fern-Roth 40 MW Solar Farm, could interact to result in minimal cumulative potential effects on federally and/or state protected species, should any be inhabiting the area. To the extent practicable, this project and the foreseeable projects would be expected to avoid or span sensitive ecological resources, which may provide habitat for protected species.

Potential impacts would be minimized through project design, impact minimization measures, and permit conditions that would be incorporated into this project. It is anticipated that potential impacts to the natural environment from the Fern-Roth 40 MW Solar Farm project would also be minimized through prudent design and mitigation measures. Given that the transportation projects and culvert replacement projects in the area would occur on existing infrastructure and would not alter land use, cumulative effects on the natural environment from these projects are not anticipated.

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